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Epidemiological patterns of poisoning worldwide: A comparative narrative review of high-income and low-income countries

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ABSTRACT

Poisoning remains a major global public health concern and a significant cause of morbidity and mortality worldwide. This narrative review synthesizes current evidence on poisoning patterns across countries, with emphasis on epidemiological characteristics including affected populations, causal agents, routes of exposure, and circumstances of poisoning. Particular attention is given to differences between high-income and low-income settings. Relevant literature was identified through online searches and bibliographic screening of databases including PubMed, Medline, JSTOR, EBSCOhost, Publons, and Google Scholar. Evidence was extracted from original studies, systematic reviews, narrative reviews, and institutional reports. Findings suggest that poisoning epidemiology differs substantially by national income level. In high-income countries, medications—particularly paracetamol—are the leading agents of poisoning, with children aged 0–5 years representing the most affected group. Most cases occur unintentionally, mainly through accidental ingestion. In contrast, in low-income countries, pesticides are the predominant toxic agents, and young adults are the most affected population. Poisoning in these settings is frequently intentional, commonly associated with suicide and interpersonal conflict. Despite limitations related to data scarcity in low-income countries, consistent patterns highlight important epidemiological disparities. Strengthening poison control centers, improving toxicovigilance, and implementing regulatory policies targeting pesticide access are strongly recommended in resource-limited settings.

INTRODUCTION

Poisoning is defined as the ingestion, inhalation, or absorption of a toxic substance—whether natural or synthetic—resulting in acute or chronic pathological effects (Fabresse & Alvarez, 2020). Acute poisoning results

from immediate toxic exposure and the amount of substance absorbed, whereas chronic poisoning results from repeated or prolonged exposure. Once absorbed, toxic substances may disrupt physiological functions, cause severe illness, and lead to death. Poisoning therefore represents a major global public health concern.

Problem Statement

The World Health Organization (WHO) estimates that approximately 40,000 to 60,000 industrial chemicals are currently available on the global market (World Health Organization, 2021). In addition, more than 6,000 medicines have been approved for clinical use, and hundreds of new psychoactive substances have emerged, posing significant toxicological risks. Globally, human populations are also exposed to toxic plants, venomous animals, and countless household, industrial, and cosmetic products (World Health Organization, 2021). These exposures may occur accidentally or intentionally, with serious consequences for population health.

The burden of poisoning remains substantial. In 2016, accidental poisoning accounted for 106,683 deaths and approximately 6.3 million disability-adjusted life years (DALYs) lost worldwide. Earlier WHO estimates suggested that poisoning contributes to nearly 300,000 deaths annually (Fabresse & Alvarez, 2020). These figures highlight the magnitude of poisoning as a global cause of preventable morbidity and mortality.

From an epidemiological perspective, poisoning is a key topic in public health and clinical toxicology because it involves the study of the distribution and determinants of toxic exposures across populations. This includes identifying the affected groups (age and sex), the toxic agents involved (e.g., pharmaceuticals, pesticides, household chemicals), and the circumstances of poisoning (accidental, intentional, occupational).

Epidemiological Differences Across Countries

Evidence suggests that the epidemiological profile of poisoning differs across regions and income levels. With regard to age, poisoning affects children, adolescents, adults, and older adults worldwide. However, children are disproportionately affected in high-income countries, whereas young adults are more frequently affected in low-income or developing countries (Acherjya et al., 2020; Boukhorb et al., 2021; Fabresse & Alvarez, 2020; Mbarouk et al., 2017). In terms of sex distribution, both males and females are affected globally, although several studies report a slight predominance among males (Acherjya et al., 2020; Boukhorb et al., 2021; Fabresse & Alvarez, 2020; Mbarouk et al., 2017).

With respect to causal agents, poisoning sources are highly diverse and include pharmaceuticals, household chemicals, pesticides, plant toxins, animal venoms, and industrial products (Fabresse & Alvarez, 2020; Kyolo et al., 2018, 2019; Mwabi et al., 2020; Tan et al., 2021). Medications—particularly paracetamol—are commonly reported as the main cause of poisoning in high-income countries, whereas pesticides appear to be the leading cause in many low-income settings (Fabresse & Alvarez, 2020; Kyolo et al., 2018, 2019). Although the reasons for these differences remain insufficiently explained, available evidence suggests that unintentional poisoning predominates in high-income settings, while intentional poisoning is more frequently reported in low-income contexts (Fabresse & Alvarez, 2020; Kyolo et al., 2018, 2019).

Circumstances of poisoning also vary considerably. In high-income countries, poisonings are most often accidental and largely involve pharmaceutical products (Fabresse & Alvarez, 2020; Mbarouk et al., 2017). In contrast, studies from several low-income countries describe poisoning as frequently intentional, occurring in the context of suicide, abortion attempts, interpersonal violence, jealousy, revenge, and community conflict (Diallo et al., 2013; Mwabi et al., 2020; Nsapu, 2014; Tan et al., 2021). These intentional poisonings may involve toxic agents being mixed into food or beverages, making detection and investigation difficult in settings with limited toxicological and forensic capacity.

Research Gap

Despite increasing documentation of poisoning worldwide, the underlying reasons for differences in poisoning patterns between high-income and low-income countries remain insufficiently explored. In particular, there is limited comparative synthesis of how risk groups, causal agents, and poisoning circumstances differ according to national income level. This gap is important

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because understanding these disparities is essential for designing prevention strategies, strengthening toxicovigilance, and improving clinical management in resource-limited settings.

Objectives of the Study

General Objective

This narrative review synthesizes global epidemiological evidence on poisoning patterns according to national income level, with emphasis on affected populations, causal agents, and poisoning circumstances.

Specific Objectives

This review aims to:

1. Describe the main causal agents, at-risk groups, and poisoning circumstances worldwide.
2. Compare the predominant risk groups, toxic agents, and poisoning circumstances between high-income and low-income countries.
3. Analyze disparities in poisoning epidemiology between high-income and low-income countries in terms of the most affected population groups, leading toxic agents, and dominant circumstances of poisoning.

METHODS

Study Design

This study employed a narrative literature review to synthesize and compare epidemiological patterns of poisoning worldwide. The review focused on three major dimensions of poisoning epidemiology: at-risk populations, causal agents, and circumstances/modes of poisoning, with particular emphasis on differences between high-income and low-income countries.

A narrative approach was selected due to its flexibility and suitability for summarizing broad public health issues and emerging trends, particularly where evidence is heterogeneous and derived from diverse study designs.

Search Strategy

The literature search was conducted over a four-month period, from May 2024 to August 2024. Relevant studies were identified through online database searches and manual screening of bibliographic references. The following databases were consulted:

- PubMed
- Medline
- JSTOR
- EBSCOhost
- Publons
- Google Scholar

Search terms were applied in both English and French. Key terms included combinations of:

- "poisoning"
- "intoxication"
- "epidemiological profiles"
- "epidemiology"
- "risk factors"
- "socioeconomic factors"
- "demographic factors"
- "high-income countries"
- "low-income countries"
- "worldwide" / "global"

Boolean operators (AND, OR) were used to broaden or narrow searches depending on database requirements.

Eligibility Criteria

Inclusion criteria

Studies were included if they:

1. Addressed poisoning or acute intoxication in human populations
2. Provided epidemiological data on at least one of the following:
    - age or sex distribution
    - toxic agents involved
    - routes of exposure
    - circumstances of poisoning (accidental vs. intentional)
3. Were published in peer-reviewed journals or issued as institutional reports
4. Were written in English or French
5. Were relevant to either high-income or low-income country contexts

Exclusion criteria

Studies were excluded if they:

1. Focused solely on animal experiments without relevance to human poisoning patterns

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2. Did not provide epidemiological or descriptive data
3. Were duplicates or unavailable in full text
4. Were unrelated to the scope of poisoning epidemiology (e.g., purely laboratory toxicology studies)

Study Selection Process

Titles and abstracts were screened to identify potentially relevant publications. Full texts were then reviewed for eligibility. Additional sources were identified through citation tracking and manual review of reference lists from key articles.

Data Extraction

Data were extracted and organized into thematic categories including:

- country and setting
- study design and population characteristics
- main toxic agents involved
- age and sex distribution of cases
- route of exposure (ingestion, inhalation, dermal, parenteral)
- circumstance of poisoning (accidental, intentional, occupational, abuse-related)
- reported outcomes when available (morbidity and mortality)

The extracted information was then synthesized narratively and compared across income levels.

Classification of Countries by Income Level

Countries were classified as high-income or low-income according to the World Bank income classification system. High-income countries were defined as those with a gross national income (GNI) per capita equal to or greater than USD 12,696, whereas low-income countries were defined as those below this threshold (World Bank, 2020, 2025).

Data Synthesis

The findings were summarized using descriptive narrative synthesis. Comparative interpretation was performed to identify key disparities in:

- predominant toxic agents
- most affected age groups
- leading circumstances of poisoning
- contextual factors linked to poisoning patterns

A summary table was developed to highlight major differences between high-income and low-income countries.

Ethical Considerations

This study was based exclusively on published and publicly available literature. Therefore, no ethical approval was required, and no direct contact with human participants occurred.

CONCEPTUAL FRAMEWORK

Definition of Key Concepts

Toxicology is a branch of medical science concerned with the study of toxic substances, including poisons. A poison is defined as a toxic substance capable of disrupting or destroying the vital functioning of a living organism (Mwabi et al., 2020).

Poisoning refers to the ingestion, inhalation, or absorption of a toxic substance—whether natural or synthetic—into the human body, resulting in acute or chronic pathological effects (Fabresse & Alvarez, 2020). Acute poisoning is typically associated with immediate toxicity and the amount of substance absorbed, whereas chronic poisoning results from repeated or prolonged exposure to a toxic agent.

Poisoning can occur through several routes of exposure.

The most common routes include:

1. **Digestive route**, through ingestion of toxic substances, contaminated food, or pharmaceutical products
2. **Respiratory route**, through inhalation of toxic gases, fumes, or aerosols
3. **Cutaneous route**, through dermal absorption following contact with toxic substances (Acherjya et al., 2020; Mwabi et al., 2020)

Poisoning is considered intentional (also referred to as voluntary or criminal poisoning) when a toxic substance is deliberately administered to another person with the intention to harm or kill. Poisoning is classified as suicidal when an individual intentionally ingests or uses a toxic agent to end their own life (Acherjya et al., 2020).

Conceptual Model

The conceptual foundation of this review is based on the epidemiological triangle, which conceptualizes poisoning as the interaction between three key components: the agent, the host, and the circumstances of exposure.

1. Agent (Causal Toxic Substance)

The agent refers to the toxic substance responsible for poisoning. It includes pharmaceutical drugs (e.g., benzodiazepines and paracetamol), household cleaning products, pesticides, industrial chemicals, gases, and psychoactive substances such as alcohol and illicit drugs.

2. Host (At-Risk Individual or Population Group)

The host refers to the individual or population group exposed to the toxic agent. Host-related factors include demographic characteristics (age and sex), health status, vulnerability, and occupational exposure. Certain groups, such as children, agricultural workers, and industrial workers, may be at increased risk due to behavioral, physiological, or environmental factors.

3. Circumstances and Mode of Exposure

The circumstances of poisoning describe the context in which exposure occurs. Poisoning may be:

- **Unintentional (accidental)**, commonly occurring in domestic environments, especially among children
- **Intentional**, including suicide attempts and interpersonal or criminal poisoning
- **Occupational**, resulting from workplace exposure
- **Abuse-related**, associated with recreational or excessive use of alcohol or drugs

Modes of exposure include ingestion, inhalation, dermal absorption, and parenteral exposure (e.g., injection or venomous bites).

Conceptual Interpretation

This conceptual framework supports the comparative analysis of poisoning patterns by highlighting how variations in toxic agents, population vulnerability, and exposure circumstances influence epidemiological profiles. Differences between high-income and low-income settings may be explained by disparities in regulatory systems, access to toxic substances, mental health resources, healthcare infrastructure, occupational safety, and the availability of toxicological surveillance systems.

EPIDEMIOLOGICAL ASPECTS OF POISONING WORLDWIDE

This section describes the major causal agents, at-risk populations, and modes/circumstances of poisoning reported worldwide.

Causal Agents

A wide range of toxic substances have been associated with poisoning globally. These include pharmaceutical, household, industrial, agricultural, plant-based, animal-based, and psychoactive substances.

Pharmaceutical Products

Pharmaceutical poisoning represents a major cause of intoxication, particularly in high-income countries. Frequently reported drug categories include dermatological medications, benzodiazepines, non-steroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen and aspirin, anti-infective agents, analgesics such as paracetamol (acetaminophen), antidepressants, cardiotropic drugs, sedatives, and neuroleptics (Fabresse & Alvarez, 2020).

Household Chemical Products

Household poisoning is commonly linked to corrosive and irritant chemicals, such as drain cleaners containing sodium hydroxide (caustic soda), oven cleaners, and descaling agents containing hydrochloric acid, which can cause severe burns. Chlorinated products, including bleach and toilet cleaners, are also frequently implicated, particularly when mixed with acids, producing toxic chlorine gas. Other common agents include solvents and aerosols (e.g., degreasers, glass cleaners, deodorants, and furniture polishes), as well as detergents and liquid laundry capsules, which pose a particularly high risk for young children (Fabresse & Alvarez, 2020).

Psychoactive Substances and Drugs of Abuse

Poisoning related to psychoactive substances includes ethanol, illicit drugs, and synthetic stimulants. Substances such as cannabis, heroin, amphetamines, and methylenedioxymethamphetamine (MDMA) have been associated with severe acute intoxication. Psychotropic medications such as alprazolam, chlorpromazine,

bromazepam, and prazepam are also frequently reported (Fabresse & Alvarez, 2020).

Plant-Derived Toxins

Toxicity from plant substances remains an important cause of poisoning in several regions. Reported plants include species of *Cymbopogon*, *Artemisia*, *Cynanchum argel*, *Equisetum*, and *Strychnos icaja* (Kyolo et al., 2018, 2019).

Animal-Derived Toxins

Poisoning from animal toxins is linked to envenomation and, in some contexts, to the intentional extraction and use of animal-derived substances. Agents include toxins from spiders, snakes, toads, geckos, scorpions, chameleons, and lizards (Nassenstein, 2019; Tagwireyi et al., 2016).

Pesticides and Agricultural Chemicals

Agricultural chemicals represent a leading cause of poisoning in many low-income countries. Common toxic agents include rodenticides, organophosphates, pyrethroids, and carbamates (Acherjya et al., 2020; Fabresse & Alvarez, 2020).

Gases and Vapors

Poisoning may also result from inhalation of toxic gases such as carbon monoxide, helium, tear gas, vehicle exhaust fumes, nitrogen oxides, sulfur dioxide, and hydrocarbon vapors (Fabresse & Alvarez, 2020).

Industrial Chemicals

Industrial products containing hydrochloric acid, sulfuric acid, and sodium hypochlorite are also reported causes of poisoning, especially in occupational settings (Diallo et al., 2013).

At-Risk Populations

The epidemiology of poisoning varies according to demographic and occupational characteristics.

Age

Poisoning affects individuals of all age groups, including children under five years, adolescents, adults, and older adults (Fabresse & Alvarez, 2020). Children are particularly vulnerable due to behavioral exploration and physiological immaturity.

Sex

Both males and females are affected worldwide, although some studies report a slight predominance among males depending on the setting and circumstances of exposure (Fabresse & Alvarez, 2020).

Occupational Groups

Certain occupations involve increased exposure to toxic agents, including:

- industrial and chemical manufacturing workers exposed to solvents and fumes
- cleaning and maintenance personnel exposed to detergents and corrosive agents
- construction workers exposed to silica, asbestos, paints, and adhesives
- farmers and landscapers exposed to pesticides, herbicides, and fertilizers
- healthcare and laboratory personnel exposed to sterilization chemicals, disinfectants, and chemotherapeutic agents
- metallurgical workers exposed to welding fumes and metal vapors

These occupational exposures may result in both acute and chronic toxic effects.

Routes, Modes, and Circumstances of Poisoning

Routes of Exposure

Poisoning occurs through several exposure routes:

- **Ingestion (digestive route):** the most common route, especially in children, involving medications, household products, spoiled food, plants, or mushrooms
- **Inhalation (respiratory route):** exposure to gases such as carbon monoxide or chlorine, as well as fumes and aerosols
- **Dermal or mucosal absorption:** contact with acids, bases, pesticides, or other chemicals, including ocular exposure
- **Parenteral exposure:** direct introduction into the body through injection, venomous animal bites, or drug use (Mbarouk et al., 2017; Mwabi et al., 2020)

Circumstances of Poisoning

Poisoning may occur under the following circumstances:

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- **Accidental (unintentional):** most common among young children, often linked to unsafe storage of household chemicals and medications
- **Intentional (self-harm or suicide):** more frequent among adolescents and adults, often associated with psychological distress, social pressure, or interpersonal conflict
- **Substance abuse or recreational use:** excessive non-medical consumption of alcohol or drugs (Fabresse & Alvarez, 2020; Kyolo et al., 2019; Mwabi et al., 2020)

Section Summary

Overall, poisoning agents, affected populations, and exposure circumstances vary considerably across the world. Pharmaceutical poisoning, chemical exposure, pesticide-related intoxication, plant-derived toxicity, animal envenomation, and psychoactive substance use all contribute substantially to the global burden of poisoning. This diversity highlights poisoning as a major public health challenge requiring coordinated prevention and surveillance strategies.

Key public health priorities include:

- restricting access to highly toxic substances and enforcing regulatory control
- increasing taxation and limiting advertising of toxic products when appropriate
- strengthening collaboration between emergency services, primary care, and psychiatric services
- enforcing pesticide restrictions, particularly in low-income countries
- establishing poison control centers to reduce mortality and improve toxicovigilance systems

DISPARITIES IN POISONING PATTERNS ACCORDING TO NATIONAL INCOME LEVEL

This section compares the predominant at-risk populations, causal agents, and circumstances of poisoning in high-income countries versus low-income countries. Differences are presented using the World Bank classification criteria.

According to the World Bank, high-income countries are defined as those with a gross national income (GNI) per capita equal to or above USD 12,696, whereas low-income countries are those with a GNI per capita below this threshold (World Bank, 2020, 2025).

Causal Agents (Primary Sources of Poisoning)

Evidence suggests that pharmaceutical products are the leading cause of poisoning in high-income countries, with paracetamol (acetaminophen) being among the most frequently implicated drugs. This pattern has been documented in several developed countries, including France, Australia, the United Kingdom, Belgium, and Bahrain (Aljalahma et al., 2025; Fabresse & Alvarez, 2020).

In high-income settings, accidental medication poisoning is frequently linked to analgesics (paracetamol), anti-inflammatory drugs (e.g., ibuprofen), and psychotropic agents such as anxiolytics and antidepressants (Fabresse & Alvarez, 2020). Although poisonings occur in diverse contexts, unsafe storage practices and medication management errors are commonly reported contributing factors (Aljalahma et al., 2025). Therefore, prevention strategies should focus on improving medication safety across the entire chain of prescription, dispensing, storage, and administration, both in healthcare facilities and at home.

In contrast, in low-income countries, poisoning is predominantly associated with household and agricultural chemicals, particularly pesticides. This pattern has been documented in countries such as South Africa, Ethiopia, and Bangladesh (Acherjya et al., 2020; Fabresse & Alvarez, 2020).

The WHO identifies several contextual factors that contribute to pesticide poisoning in low-resource settings, including the widespread availability of highly toxic products, weak regulation, inadequate packaging safety standards, and uncontrolled pesticide use (World Health Organization, 2021). Preventive strategies should therefore include restricting access to highly toxic pesticides, enforcing packaging standards (including child-resistant containers), and promoting Integrated Pest Management (IPM) approaches to reduce reliance on chemical pest control.

At-Risk Populations

High-income countries

In high-income settings, children under five years of age represent the most vulnerable population group. This pattern has been widely documented in Switzerland, the United States, Australia, and Bahrain (Aljalahma et al., 2025; Fabresse & Alvarez, 2020). The predominance of poisoning in early childhood is largely explained by developmental behaviors such as oral exploration and curiosity, combined with physiological immaturity that increases vulnerability to toxic doses (Hauptman & Woolf, 2017).

Evidence from France and other high-income countries indicates that pediatric poisonings are largely unintentional, occurring mainly in domestic environments. Similar trends have been reported in Switzerland, Sweden, Belgium, the United Kingdom, the United States, Australia, and Bahrain (Aljalahma et al., 2025; Fabresse & Alvarez, 2020). In Bahrain, the highest incidence was reported among children aged 2–3 years during 2022 and 2023 (Aljalahma et al., 2025).

The main drivers of childhood poisoning in these contexts include unsafe household storage of medications and chemicals, insufficient adult supervision, and dosing errors during home administration (Aljalahma et al., 2025; Hauptman & Woolf, 2017).

Low-income countries

In low-income settings, adolescents and young adults are the most affected populations. Several studies suggest that young women, typically aged 20–40 years, constitute a particularly exposed group (Fabresse & Alvarez, 2020; Mbarouk et al., 2017). These poisonings frequently involve pesticides and other easily accessible household toxic substances.

Unlike high-income settings, poisoning in low-income countries often occurs in complex social contexts. Interpersonal conflict, community violence, and social hostility have been reported as common contributing factors, particularly in conflict-affected regions (Kyolo et al., 2018, 2019).

Circumstances and Intent of Poisoning

High-income countries

In high-income countries, poisoning cases are predominantly accidental, largely occurring through unintended ingestion of medications or household chemicals. This pattern has been documented in France, Switzerland, Sweden, Belgium, the United Kingdom, the United States, and Australia (Fabresse & Alvarez, 2020; Gauthey et al., 2019). Strong regulatory frameworks and poison control systems may contribute to lower rates of criminal or intentional poisoning, although accidental pediatric poisonings remain common.

Low-income countries

In low-income countries, poisoning is more frequently intentional. In several settings, toxic substances may be deliberately mixed into food or beverages to harm or kill individuals, particularly in contexts of interpersonal hostility, revenge, and social conflict (Mwabi et al., 2020; Nassenstein, 2019). Such patterns have been reported in Morocco, Ethiopia, India, Tanzania, and the Democratic Republic of the Congo (Fabresse & Alvarez, 2020; Kyolo et al., 2019; Mbarouk et al., 2017).

Intentional poisoning is also used as a method of suicide. For example, suicide-related poisonings have been reported in Dakar, Senegal, where paracetamol and psychotropic drugs are frequently implicated (Lam et al., 2024). Similar trends have been noted in several African countries, including Lesotho, Côte d'Ivoire, and Mali (Lam et al., 2024).

According to Nsapu (2014), sociological perspectives suggest that intentional poisoning may be more prevalent in settings characterized by tribal tensions or persistent community conflict. In such environments, poisoning may serve as a means of revenge, contributing to cycles of violence and mistrust (Kyolo et al., 2018, 2019).

A major challenge in low-income settings is the difficulty of diagnosing poisoning due to limited laboratory capacity, lack of poison control centers, and insufficient forensic systems. As a result, intentional poisonings may remain underreported and may not be legally investigated as criminal acts. Police investigations often fail due to the absence of toxicological evidence, which contributes to weak accountability for perpetrators (Nsapu, 2014).

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Similarly, health facilities may be unable to identify the causal agent due to limited diagnostic infrastructure, further reducing the availability of reliable epidemiological data.

Table 1:
Key disparities in poisoning patterns between high-income and low-income countries

Characteristic	High-income countries	Low-income countries
Main at-risk group	Children under 5 years	Young adults
Main toxic agents	Medications (e.g., paracetamol)	Pesticides and household chemicals
Common mode of poisoning	Accidental ingestion	Deliberate poisoning linked to hostility
Predominant circumstance	Accidental poisoning	Intentional poisoning (suicide or interpersonal violence)

Note: This table summarizes disparities in poisoning epidemiology by national income level based on findings from the reviewed literature.

Section Summary

Overall, poisoning patterns vary substantially according to national income level. High-income countries are characterized by predominantly accidental poisonings involving medications and affecting children under five years of age. In contrast, low-income countries experience a higher burden of pesticide-related poisonings affecting young adults, with a substantial proportion of cases being intentional and associated with suicide or interpersonal conflict. These differences highlight the importance of context-specific prevention strategies and strengthened toxicological surveillance systems, particularly in low-resource settings.

CONCLUSION

This narrative review highlights significant disparities in poisoning epidemiology between high-income and low-income countries. In high-income settings, children under five years constitute the most affected population group. Pharmaceuticals, particularly paracetamol and other commonly prescribed medications, represent the leading toxic agents. Poisoning in these contexts is predominantly accidental and most often occurs through unintentional ingestion within domestic environments.

In contrast, in low-income and developing countries, young adults represent the principal at-risk group. Pesticides and other household or agricultural toxic substances are the main agents involved. Poisoning in these settings is frequently intentional and commonly associated with suicide attempts and interpersonal conflict, including hostility and revenge. These patterns are amplified by weak regulatory systems, limited access to mental health services, and the widespread availability of highly toxic chemicals.

The review also demonstrates that evidence from low-income countries remains limited, resulting in substantial epidemiological data gaps. Intentional poisoning is particularly underreported due to inadequate diagnostic capacity, insufficient forensic investigation, and the absence of poison control centers and structured toxicovigilance systems.

To address these challenges, low-income countries should prioritize the establishment of poison control centers, strengthen toxicovigilance systems, and implement stricter regulation of pesticide availability and storage. Future research should focus on intentional poisoning in conflict-affected settings, with improved surveillance and laboratory capacity to support accurate diagnosis and reporting.

Ethical Approval: Nil required.

Conflicts of Interest: None declared.

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REFERENCES

Acherjya, G. K., Ali, M., Alam, A. B. M. S., Rahman, M. M., & Mowla, S. G. M. (2020). The scenario of acute poisoning in Jashore, Bangladesh. *Journal of Toxicology, 2020*, 1–7. https://doi.org/10.1155/2020/2109673

Aljalahma, N., Alabbasi, L., Alkoheji, H., Almahmood, H., Aldoseri, A., Husain, F., Abdul Jabbar, M., Aljasim, N., Dawood, S., & Hammad, R. (2025). Accidental ingestion of intoxications (drugs and nondrug

materials) among pediatric patients: A multicenter study in Bahrain Royal Medical Services hospitals. *Journal of Toxicology, 2025*(1), 2093893. https://doi.org/10.1155/jt/2093893

Boukhorb, S., Rhalem, N., Hmimou, S., Soulaymani, A., Mokhtari, A., Soulaymani-Bencheikh, R., Hmimou, R., & Hami, H. (2021). Empoisonnement criminel au Maroc: Données du Centre Antipoison et de Pharmacovigilance du Maroc, 1980–2014. *The Pan African Medical Journal, 38*(42). https://doi.org/10.11604/pamj.2021.38.42.27450

Diallo, T., Hami, H., Maiga, A., Coulibaly, B., Maiga, D., Mokhtari, A., Soulaymani, R., & Soulaymani, A. (2013). Épidémiologie et facteurs de risque des intoxications volontaires au Mali. *Santé Publique, 25*(3), 359–366. https://doi.org/10.3917/spub.253.0359

Fabresse, N., & Alvarez, J.-C. (2020). Épidémiologie des intoxications aiguës. *Toxicologie Analytique et Clinique, 32*(4), 291–300. https://doi.org/10.1016/j.toxac.2020.06.004

Gauthey, M., Capua, M., Brent, J., & Finkelstein, Y. (2019). Poisoning with malicious or criminal intent: Characteristics and outcome of patients presenting for emergency care. *Clinical Toxicology, 57*(7), 628–631. https://doi.org/10.1080/15563650.2018.1546009

Hauptman, M., & Woolf, A. D. (2017). Childhood ingestions of environmental toxins: What are the risks? *Pediatric Annals, 46*(12). https://doi.org/10.3928/19382359-20171116-01

Kyolo, S. K., Bbosa, G. S., Odda, J., Lubega, A. M., & Edmond, N. N. (2018). Toxicity profile of Karuho poison on the brain of Wistar albino rats. *Neuroscience and Medicine, 9*(2), 63–80. https://doi.org/10.4236/nm.2018.92008

Kyolo, S. K., Odda, J., Lubega, A., & Bbosa, G. S. (2019). Blood chemistry and major body organ induced toxicity by locally made traditional OMGKRP Karuho poison in Wistar albino rats. *Neuroscience and Medicine, 10*(3), 272–291. https://doi.org/10.4236/nm.2019.103021

Lam, A., Ly, M., Thiam, M. H., Diallo, M., Kane, A., Essoki, J. E. L., Cabral, M., Toure, A., Diouf, A., & Fall, M. (2024). Intoxications volontaires recensées au Centre Antipoison du Sénégal de 2009 à 2022. *Toxicologie Analytique et Clinique, 36*(4), 323–333. https://doi.org/10.1016/j.toxac.2023.12.003

Mbarouk, G., Sawe, H., Mfinanga, J., Stein, J., Levin, S., Mwafongo, V., Runyon, M., Reynolds, T., & Olson, K. (2017). Patients with acute poisoning presenting to an urban emergency department of a tertiary hospital in Tanzania. *BMC Research Notes, 10*(1). https://doi.org/10.1186/s13104-017-2807-2

Mwabi, N., Ntakarutimana, V., & Bisimwa, B. (2020). Poisoning Investigations in the City of Bukavu and the Effects of Antidotes Administered by Traditional Healers. *International Journal of Innovative Science and Research Technology, 5*(2), 2016-2222. Doi: https://www.ijisrt.com/assets/upload/files/IJISRT20FEB335_(1).pdf

Nassenstein, N. (2019). The linguistic taboo of poisoning in Kivu Swahili. https://www.academia.edu/39209581/The_linguistic_taboo_of_poisoning_in_Kivu_Swahili

Nsapu, E. (2014, December 16). Traditional healers in DRC treat suspected poisoning victims regardless of tribe. *Global Press Journal*. https://globalpressjournal.com/africa/democratic-republic-of-congo/traditional-healer-in-drc-treats-suspected-poisoning-victims-regardless-of-tribe/fr

Tagwireyi, D., Chingombe, P., Khoza, S., & Maredza, M. (2016). Pattern and epidemiology of poisoning in the East African region: A literature review. *Journal of Toxicology, 2016*. https://doi.org/10.1155/2016/8789624

Tan, M., Otake, Y., Tamming, T., Akuredusenge, V., Uwinama, B., & Hagenimana, F. (2021). Local experience of using traditional medicine in northern Rwanda: A qualitative study. *BMC Complementary Medicine and Therapies, 21*(1). https://doi.org/10.1186/s12906-021-03380-5

World Bank. (2020). *New World Bank country classifications by income level: 2020-2021.* World Bank Blogs. https://blogs.worldbank.org/en/opendata/new-world-bank-country-classifications-income-level-2020-2021.

World Bank. (n. d.). *World Bank Country and Lending Groups – World Bank Data Help Desk*. https://datahelpdesk.worldbank.org/knowledgeba

se/articles/906519-world-bank-country-and-lending-groups

World Health Organization. (2021). *Guidelines for establishing a poison control centre* (2nd ed.). WHO.