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A Review on Contamination Crisis for Cough Syrup in Childs Toxic Effects

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ABSTRACT
Cough syrups are widely used in pediatric populations to manage symptoms of cough and upper respiratory tract infections. However, inappropriate use, overdose, and unsupervised administration can lead to significant toxic effects in children. Pediatric patients are particularly vulnerable due to immature metabolic pathways, lower body weight, and increased sensitivity to active ingredients such as dextromethorphan, codeine, antihistamines, and decongestants. Toxicity may present with symptoms ranging from drowsiness, irritability, vomiting, and tachycardia to severe complications such as respiratory depression, seizures, cardiac arrhythmias, and altered mental status. Accidental ingestion of flavored formulations, caregiver dosing errors, and use of multiple combination products further increase toxic risk. Early recognition and prompt management of toxicity are crucial to prevent morbidity and mortality. This abstract highlights the pharmacological basis, risk factors, clinical features, and preventive strategies associated with cough syrup toxicity in children, emphasizing the need for safe medication practices and strengthened public awareness.

Cough syrups are commonly administered to children for symptomatic relief of cough, cold, and other minor respiratory conditions; however, their misuse and overuse have become an important public-health concern. Many pediatric cough syrup formulations contain multiple active ingredients—including dextromethorphan, codeine, diphenhydramine, chlorpheniramine, pseudoephedrine, and paracetamol—each capable of producing toxic effects when ingested in excess or administered in inappropriate combinations. Children are physiologically more susceptible to toxicity due to immature hepatic enzyme systems, faster drug absorption, and difficulty in communicating early symptoms of adverse reactions. Toxic effects may range from mild gastrointestinal upset and excessive sedation to life-threatening complications such as respiratory depression, neurotoxicity, hepatic injury, arrhythmia, seizures, and coma. Accidental ingestion, caregiver dosing mistakes, simultaneous use of multiple OTC medications, and intentional misuse in adolescents further contribute to rising cases of toxicity. The lack of standardized pediatric dosing guidelines and the easy availability of over-the-counter cough syrups exacerbate these risks. Early identification of poisoning symptoms, rapid decontamination, supportive therapy, and timely use of antidotes such as naloxone for opioid-containing syrups are essential for successful recovery. This abstract underscores the need for enhanced caregiver education, stricter regulation of pediatric formulations, and heightened clinical vigilance to reduce toxicity-related morbidity in children.

Keyword:
1. Pediatric toxicity is a major risk with cough syrups.
2. Accidental ingestion commonly causes overdose in children.
3. Dextromethorphan toxicity leads to drowsiness and confusion.

I. INTRODUCTION

Cough syrups are among the most commonly used over-the-counter (OTC) medications for children, widely believed to provide quick relief from cough, cold, and upper respiratory discomfort. However, despite their popularity, the misuse, overuse, or inappropriate selection of cough syrups can lead to serious toxic effects in children, whose bodies are more sensitive and less capable of handling excessive drug concentrations. The immature liver and kidney functions in infants and young children make them particularly vulnerable to adverse reactions, accidental poisoning, and even life-threatening complications.

International Journal of Pharmaceutical Research and Applications
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Cough syrups often contain a combination of active ingredients such as dextromethorphan, antihistamines (e.g., diphenhydramine, chlorpheniramine), expectorants (guaifenesin), decongestants (pseudoephedrine or phenylephrine), and sometimes opioids or alcohol. While these may be safe in correct doses for adults, even a small overdose in children can cause harmful effects. Many reported toxicities arise due to wrong dosing, self-medication by parents, confusion between adult and pediatric formulations, or lack of awareness about drug interactions.

The risk becomes higher because cough and cold illnesses in children are usually viral and self-limiting, meaning they improve on their own without the need for medication. Yet, in many households, cough syrup is used as a "quick fix," leading to unnecessary exposure to chemicals that may harm the child more than help. Additionally, flavored syrups may be accidentally ingested by children in large amounts, resulting in acute poisoning.

Toxic effects can range from drowsiness, vomiting, and irritability to breathing difficulty, seizures, cardiac arrhythmias, and coma, depending on the ingredient and dose. In severe cases, delayed treatment can result in long-term organ damage or death. Because of these risks, many international health authorities, including the World Health Organization (WHO) and Food and Drug Administration (FDA), caution against the routine use of cough syrups in children under certain ages.

Therefore, understanding the toxic effects, safe dosage limits, mechanism of action of various ingredients, and the importance of parental awareness is essential for healthcare students, pharmacists, and caregivers. Studying these toxic effects not only helps in preventing accidental poisoning but also strengthens rational use of medicines in pediatric practice. This introduction forms the foundation for a deeper exploration into the pharmacology, toxicology, clinical symptoms, management strategies, and preventive measures related to cough syrup toxicity in children.

Cough syrups have become an integral part of household medicine cabinets, often used as a first response to manage cough and cold symptoms in children. Parents commonly assume that these formulations are harmless due to their over-the-counter availability, pleasant flavor, and widespread usage. However, the reality is far more complex. Children are not merely "small adults"; their bodies process medications differently due to developing physiological systems. This makes them particularly sensitive to the pharmacological properties and potential toxicities of cough syrups.

Most pediatric cough syrups are multi-ingredient formulations designed to provide symptomatic relief. They may include antitussives like dextromethorphan, antihistamines such as diphenhydramine and chlorpheniramine, expectorants like guaifenesin, and decongestants including pseudoephedrine or phenylephrine. Some syrups may also contain paracetamol, alcohol, sedatives, or herbal additives. While these ingredients may offer temporary comfort, they can also produce significant adverse effects when administered incorrectly. Even a slight overdose may disrupt the delicate balance of a child's metabolism, leading to toxic manifestations.

In many parts of the world, cough and cold symptoms in children are often treated at home without professional guidance. This practice has contributed to rising cases of accidental poisoning, dosing errors, and inappropriate mixing of different cough and cold products. Parents may unintentionally double-dose their children, especially when giving multiple medications containing the same active ingredient. Additionally, the attractive flavoring and colorful appearance of syrups may encourage children to consume them unsupervised, resulting in acute toxic ingestion.

Another contributing factor to toxicity is the misconception that cough syrups "cure" illness. In reality, most pediatric coughs are caused by viral infections that resolve naturally without medication. When unnecessary cough syrups are given repeatedly, the child not only receives no real therapeutic benefit but is also exposed to potentially harmful chemicals. International organizations such as the World Health Organization (WHO) and the American Academy of Pediatrics (AAP) strongly discourage the routine use of cough syrups in infants and young children because scientific evidence shows limited effectiveness and considerable risk.

Epidemiology of Cough Syrup Toxicity in Children

Cough syrup toxicity in children is an increasingly recognized public-health concern, especially in low- and middle-income countries. Accidental ingestion, dosing errors, and misuse are the primary contributors. Global data suggest that 5–10% of pediatric poisoning cases are linked to over-the-counter (OTC) cough and cold preparations.

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In India and many Asian countries, the prevalence is higher due to easy availability of OTC medications, lack of child-resistant packaging, and limited caregiver awareness. Children under 5 years of age are the most affected group, accounting for nearly 60–70% of accidental cough syrup poisoning cases. Adolescents are also vulnerable to intentional misuse, particularly products containing dextromethorphan, due to its psychoactive effects.

Seasonal peaks occur during winter and monsoon months when respiratory infections increase and cough syrups are more frequently used. Poor dosing practices, such as using household spoons instead of standardized measuring devices, contribute to overdose in 20–30% of cases.

Toxicity patterns differ based on active ingredients:
Dextromethorphan misuse is common in teenagers.
Antihistamines and decongestants cause most accidental poisonings in toddlers.
Paracetamol-containing syrups are responsible for a significant proportion of liver toxicity cases associated with cough preparations.
Despite widespread use, public awareness of pediatric dosing guidelines remains low, making cough syrup toxicity a persistent, preventable pediatric health issue.

II. CASE STUDIES:

Cough syrups pose significant toxic risks to children, primarily from overdose of active ingredients like dextromethorphan and chlorpheniramine or contamination with diethylene glycol (DEG), leading to neurological symptoms, acute kidney injury (AKI), and fatalities

Overdose Case: India(2024): A 6-year-old girl ingested dextromethorphan- and chlorpheniramine-containing over-the-counter (OTC) cough syrup for cough and runny nose, experiencing tonic-clonic seizures, eye uprolling, frothing, and unconsciousness . Investigations ruled out infection or neurological disease; symptoms resolved with supportive care including oxygen, IV fluids, and levetiracetam after 5 days . This highlights serotonergic and antimuscarinic toxicity risks, with guidelines advising against antitussives in children under 6

Contamination Cases: Gambia (2022):Around 66-70 children under 5 died from AKI after consuming four Indian-made syrups (e.g., Kofexmalin Baby Cough Syrup) contaminated with DEG and ethylene glycol, causing anuria and metabolic acidosis . Products from Maiden Pharmaceuticals were recalled globally after WHO alerts confirmed toxic levels . Gambia banned liquid paracetamol/promethazine syrups, shifting to tablets to curb further deaths

Contamination Cases: India (2025):In Madhya Pradesh's Chhindwara district, at least 16-23 children aged 1-6 died from kidney failure after taking Coldrif or Nextro-DS syrups laced with 48.6% DEG, prescribed for cough cold . Similar fatalities occurred in Rajasthan from dextromethorphan syrup . Authorities arrested manufacturers, exposing supply-chain testing gaps.

Madhya Pradesh: Coldrif (2025):In Chhindwara district, 16-25 children aged 1-6 died from kidney failure after consuming Coldrif syrup (Sresan Pharma, Tamil Nadu), which tested positive for 46-48.6% DEG, far exceeding safe limits . Symptoms included reduced urine output and rapid deterioration post-cough/cold treatment; states like Madhya Pradesh, Tamil Nadu, and Kerala banned the product, with the manufacturer arrested . An additional infant death in Bichua linked to ayurvedic cough syrup prompted shop sealing and lab testing.

Multi-State Cases (2025):Twelve children in Madhya Pradesh and Rajasthan died from cough syrup complications, with nine in Chhindwara showing AKI after routine dosing for colds; central advisory urged avoiding such meds in kids under 2 . Rajasthan reported three deaths from free-scheme syrups, amid initial negative DEG tests but ongoing probes . Nextro-DS and others faced scrutiny for similar renal failures .Overdose Case (2024)A 6-year-old girl suffered seizures, frothing, and unconsciousness from excessive OTC cough syrup (dextromethorphan chlorpheniramine), resolving after supportive care; no infection found, underscoring risks in young children . Guidelines recommend avoiding antitussives under age 6 . Systemic manufacturing gaps enable recurrent DEG issues.

Risk Factors for Toxic Effects of Cough Syrup in Children:

Toxicity from cough syrups in children does not occur randomly. Several identifiable risk factors increase a child’s chances of experiencing harmful effects. Understanding these factors helps pharmacists, parents, and healthcare workers prevent accidental or intentional overuse.

1. Incorrect Dosage

Children have smaller bodies and immature metabolic organs, making incorrect dosing the leading cause of cough syrup toxicity.

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Giving an adult dose to a child
Using household spoons instead of proper measuring devices
Misreading the label or misunderstanding dose frequency
Giving "extra" to make the cough stop faster
Even a slight overdose of ingredients like dextromethorphan or diphenhydramine can cause life-threatening toxicity in children.

2. Use in Very Young Children
Infants and toddlers (especially under 2–5 years) are at the highest risk because:
Liver enzymes are not fully developed
Kidneys are less efficient
Their nervous system is more sensitive
Small overdoses lead to large concentration spikes
This is why organizations like WHO, AAP, and FDA advise caution or avoidance of cough syrups in very young children.

3. Multi-Ingredient Formulations
Many cough syrups contain multiple active ingredients. This increases toxicity risk because:
Parents may not realize each ingredient has its own side effects
Combining multiple cough/cold products may cause double-dosing
Interactions between antihistamines, decongestants, and antitussives amplify toxicity
For example, mixing a paracetamol-based syrup with another cold medication containing paracetamol can cause liver toxicity.

4. Accidental Ingestion by Children
Cough syrups often have sweet flavors and bright colors, making them attractive to children. If stored within reach:
Children may drink large amounts unsupervised
Bottles without child-resistant caps increase the risk
Accidental poisoning is common in households where medicines are not properly stored.

5. Self-Medication by Parents
Parents often give cough syrups without consulting a doctor due to:
Habit and home remedies
Misbelief that cough medicines "cure" illness

BACKGROUND AND URGENCY

A cough syrup (batch SR-13, Coldrif) contaminatedwith diethylene glycol (DEG) was implicated inseveral child fatalities in India in October 2025. Thereare reports of large poisonings in other nations due toDEG/ethylene glycol contamination in liquidmedications, therefore this is not an isolated incident.The catastrophe highlights structural flaws in post- market surveillance, regulatory supervision, andpharmaceutical supply chains.

Risk	Consequence
Use of non-pharmaceutical grade glycols or adulteration	Introduction of toxic solvents into medicines
Inadequate testing of excipients & finished products	Failures to detect contamination before distribution
Weak traceability and recall capacity	Inability to isolate and remove harmful lots
Delayed adverse-event detection	Loss of critical time in initiating public health response
Regulatory gaps-fragmented lab capacity	Inconsistent enforcement and oversight

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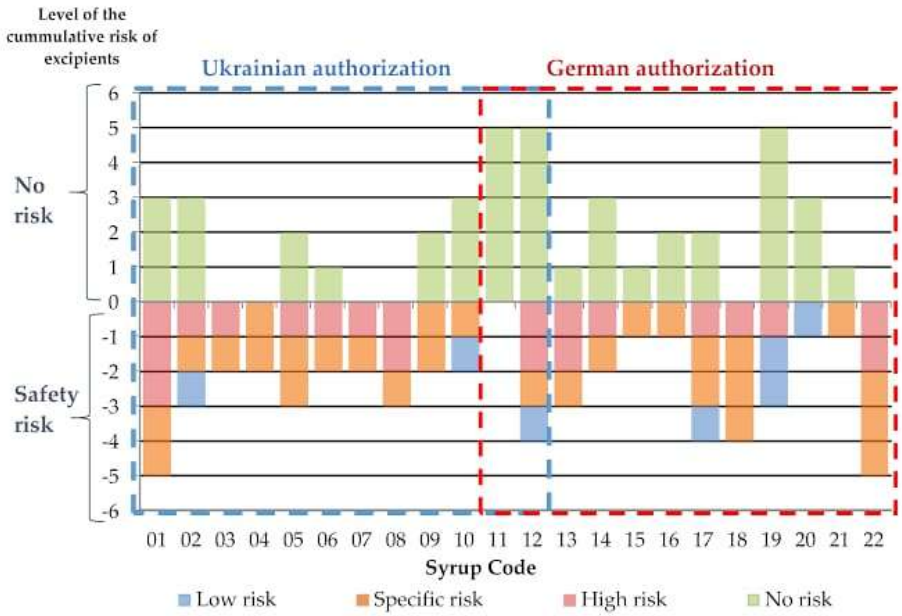

(Fig No. 01) Risk Factors

RECOMMENDED URGENT ACTIONS

A. Regulatory & Quality Assurance Measures

1 Mandatory DEG/EG examination Require allmanufacturers of oral liquid formulations, particularlythose for children, test their final products andexcipients (glycerine, propylene glycol) for DEG/EGusing approved chromatographic techniques (e.g. GC, LC-MS). Enforce certificates of analysis at the batch or lot levelthat specifically attest to the absence (or permissiblelimit) of industrial glycols.

2 Facilitate audits of good manufacturing procedures(GMP)Increase the regulatory inspection capabilities toexamine internal quality control records, the glycolsupply chain, and excipient suppliers. Cross-checksupplier certifications and implement "surprise audits"of liquid formulation facilities.

3 Establish centralised reference labs.Establish or assign regional chemical analysis andtoxicology labs with GC/MS or LC/MS capabilities.Require manufacturers to submit a sample of every lotfor independent testing on a regular basis.

4 Serialisation & traceabilityTo allow for accurate recalls, all bottles and pack unitsmust be serialised (have unique identifiers). Keepdigital records that trace the origins of final productlots to the suppliers of raw materials, production dates,shipping, and distribution networks.

5 Quick recall, alert, and compensation procedures Establish legal deadlines for sample testing, publicnotice, suspect lot recalls, and victim compensation.As soon as contaminated stock is discovered, giveauthorities the authority to confiscate, destroy, andstop its sale.

B. Surveillance, Reporting & Response

6. Constant monitoring of adverse eventsparticularly in nephrology and paediatrics: groups ofparticularly in nephrology and paediatrics: groups ofdeaths or unexplained AKI should prompt aninvestigation. Require doctors to notify the appropriateregulatory body right away if they suspect medication- associated poisoning.

7. Public & clinician communication systems

Provide a real-time recall/alert site with a list ofquestionable items and safe substitutes that is availableto pharmacies and clinicians Conduct periodic publicawareness efforts regarding the dangers of usingpaediatric syrups safely, for example, through themedia or drugstore notes.

C. Legal, Institutional & Cross-Border Controls

8. Criminal Responsibility and Liability

Establish laws that make business executives(manufacturers, importers, and suppliers) criminallyaccountable for deliberate carelessness or adulteration.To improve compliance capacity, however, combineenforcement with assistance

9. International coordination

Interact with WHO, international pharmaco-vigilancenetworks, and trade partners' drug regulatory bodies toexchange supplier intelligence, banned lotinformation, and alerts. Implement strict controls onthe import and export of liquid

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 6 Nov - Dec 2025, pp: 1223-1231 www.ijprajournal.com ISSN: 2456-4494

medications andexcipients; refuse or test shipments that seemquestionable.

10. Capacity building and funding

Provide funding to improve the infrastructure forchemical analysis at national regulatory laboratories.Teach inspection teams, QC chemists, and regulatorypersonnel how to identify adulterants in liquidformulations

Rethinking Rx: India's New Guidelines for Children's Cough:

For many years, parents reflexively offered cough syrup to children experiencing a cough. However, this practice is rapidly changing across India. There has been a significant shift in how doctors approach prescribing children cough syrup. This is due to emerging safety concerns and updated medical guidance. Recent advisories from the Union Health Ministry emphasize rational prescribing for genuine medical needs. They acknowledge that most childhood coughs are self-limiting, even when viral.

Understanding the Shift in Children Cough Syrup Prescribing:

Recent tragic incidents of children dying after consuming contaminated cough syrups have ignited a critical discussion about drug safety. Investigations revealed harmful substances, indicating severe failures in medicine quality control. Consequently, regulators have increased oversight on cough syrups. Some states even mandate prescriptions, especially for infants and young children. Furthermore, the Union Health Ministry issued advisories promoting judicious prescribing of cough syrups for children. They reminded states that most acute coughs in children resolve without medication. This heightened scrutiny significantly reshaped pediatricians' expectations regarding one of the most common symptoms in children. Understanding the complexities of pediatric care is crucial, and a dedicated International Post Graduate Program In Pediatrics can provide comprehensive knowledge.

Why Pediatricians are Rethinking Children Cough Syrup:

Pediatric coughs often stem from viral infections. These typically improve within 7 to 10 days without needing medication. Notably, cough syrups do not treat the underlying infection; instead, they only offer temporary symptom suppression. Moreover, some ingredients can trigger adverse effects. These include drowsiness, vomiting, or, in rare instances, breathing difficulties, particularly in children under two years of age. Misuse or combining various cold medications also elevates the risk of accidental overdosing. Considering these factors, national and international guidelines now advise against the routine use of cough syrups in young children. Specifically, the Central Drugs Standard Control Organization (CDSCO) and expert consensus statements clearly advise avoiding fixed-dose combinations in children under four years. They physician discretion for their use.

When to Avoid Giving Children Cough Syrup:

As pediatricians, specific scenarios lead us to explicitly avoid prescribing cough syrups: For children aged two years or younger, the associated risks generally outweigh any potential benefits. For mild, dry, short-duration coughs caused by viral infections where the child is already improving, medication is usually unnecessary. During nighttime coughs resulting from nasal drip or allergies, simple home remedies often prove more effective than pharmaceutical options. In these situations, supportive care provides patients with equal or greater relief compared to medication.

Specific Cases Where Cough Syrups May Be Considered:

While generally discouraged, there are exceptions where cough syrups might offer benefit. However, these instances remain uncommon. For ongoing coughs that cause lung dryness and disrupt sleep, after clinicians exclude serious underlying causes, medication could be considered. If coughs are linked to allergies or asthma, specific cough medications designed for these conditions may be appropriate. Yet, clinicians prioritize inhaled medications as the primary choice for asthma in children, both for acute relief and prevention. Additionally, if a bacterial infection causes the cough, antibiotics are the main treatment. Cough syrup might be added for a short duration to alleviate symptoms. Wet coughs with thick secretions, where an expectorant could help clear them, also represent a potential indication. Even in these situations, dosing is precisely calculated based on the child's age and weight, and parents receive thorough counseling on duration and avoiding self-medication.

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The Pediatrician's Assessment Checklist:

Before prescribing any medication, pediatricians follow a comprehensive checklist. They assess the child's age and weight. They also determine the type and duration of the cough, and identify any associated symptoms like fever, breathlessness, or chest pain. Furthermore, they evaluate underlying conditions such as asthma or allergies. Risk factors for complications are also considered. This meticulous approach helps determine whether medication is truly necessary or if watchful waiting and supportive home care are safer, more appropriate options.

What Parents Can Do at Home for Children's Cough:

Parental involvement is crucial for a child's recovery. Several safe and effective home measures can provide relief. Encourage your child to drink plenty of fluids, especially warm ones, for hydration. Saline nasal drops effectively relieve nasal congestion during recovery. Steam inhalation or humidified air can also be very helpful. For children older than one year, honey can soothe a sore throat. Most importantly, parents should avoid requesting over-the-counter cough syrups from pharmacists for their children. Consult a pediatrician immediately if your child experiences a persistently high temperature, difficulty breathing, blue lips, or refuses to feed. Also seek medical advice if the cough lasts more than a week or recurs frequently.

RECOMMENDATIONS
CLINICALLYACTIONABLE AND POLICY LEVEL:

Clinical / public health

High index of suspicion: Any group of paediatric AKIcases or unidentified fatalities should raise questionsabout recent medication use very away. Children withmetabolic acidosis or oligouria should receive triageand early dialysis; if fomepizole is available, give it tothem. Quick communication: Parents and physicianssshould receive clear instructions from local healthauthorities regarding suspect lots and safe substitutes.

Supply Chain and Manufacturing

All glycerine/propylene glycol lots and all completedoral liquids meant for children must undergomandatory DEG/EG screening (regulator-mandated,with batch certifications). Vendor qualification andtraceability: suppliers' chains and certificates ofanalysis must be recorded by manufacturers, and theserecords should be audited by regulators [20, 23].Periodic blind testing by government labs to confirmindustry conformity is known as independent third- party testing

International And Regulatory

Fast-track alerts and standardised testing procedures: establish cross-border rapid-alert systems and alignnational pharmacopoeia standards to mandate glycollimits. Analytical lab capacity building: Invest inregional reference labs' chromatography and massspectrometry capabilities. System reforms must be combined with legal andcriminal accountability; while criminal enquiries arejustified in cases of intentional neglect, systemicregulatory strengthening is necessary for prevention [3, 21].

Limitations Of Current Evidence

Rapid news reporting and early lab advisories providea large portion of the immediate information; in manycountries, definitive case counts and forensiclaboratory confirmations are still pending. There aren'tmany longitudinal studies that measure the actualglobal burden. Official WHO, national regulator, andmajor news agency sources are cited wherever
possible in this study; nevertheless, certain details maychange as a result of continuing investigations [18, 24]

PUBLIC-HEALTH AND REGULATORYRESPONSES (RECENT)

- Immediate action: stock seizures, product bans, targeted testing of additional lots andmanufacturers, and, if appropriate, the arrest ofresponsible company personnel [3, 21].
- Tighter regulations include centralised reporting,increased laboratory capacity, and required testingfor DEG/EG in excipients and final goods (announced by DCGI and echoed by internationalauthorities) [7, 20, 22].
- International coordination: Several nationalregulators, including the US FDA, have publiclymonitored the situation and releasedrecommendations for import/export surveillance;WHO has previously issued medical productalerts and asked member states to investigatesupply chains [23]

Children Toxic Syrups Report (Based on WHO &Govt Alerts

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Syrup Name	Published /Manufactured By	Country / Place	Problem/Cause
Coldrif	Sresan Pharmaceuticals	India (Madhya Pradesh)	DEG contamination(18 child Death)
Respifresh TR	Rednex Pharma	India	DEG Contamination. toxic
ReLife	Shape Pharma	India	Contaminated,recalled
Dextromethorphan HBr	Kayson Pharma	India(Rajasthan)	Deaths under investigation
Promethazine Oral Solution	Maiden Pharma	Gambia	70+ child deaths (DEG Poisoning)
Kofexmalin Baby Cough Syrup	Maiden Pharma	Gambia	Toxic syrup,kidney failure
Makoff Baby Cough Syrup	Maiden Pharma	Gambia	Toxic Contamination
Magrip N Cold Syrup	QP Pharma	Uzbekistan	20+child deathsm DEG Found
Ambronol Syrup	Marion Biotech	Uzbekistan/India	Contaminated with DEG
Dok-1 Max Syrup	Marion Biotech	Uzbekistan	65 Child deaths confirmed

Frequently Asked Questions:

Q1: Why are doctors prescribing fewer cough syrups for children now?

Doctors are prescribing fewer cough syrups due to safety concerns, updated guidelines from bodies like the Union Health Ministry and CDSCO, and the understanding that most childhood coughs are self-limiting viral infections. Many cough syrup ingredients offer temporary symptom relief but don't treat the underlying cause and can have side effects.

Q2: Are there any age restrictions for children cough syrup use?

Yes, cough and cold medications are generally not recommended for children below two years of age. They are often advised against for children under five years, and fixed-dose combinations should be avoided in children under four years.

Q3: What home remedies are safe and effective for a child's cough?

Safe and effective home remedies include encouraging fluid intake (especially warm fluids), using saline nasal drops for congestion, providing steam inhalation or humidified air, and giving honey (for children over one year) to soothe the throat. Always consult a pediatrician for severe or persistent symptoms.

III. CONCLUSION

The cough syrup poisonings in October 2025 serve asan alarming reminder that avoidable paediatricmedication contamination still results in a devastatingmortality rate. Technical solutions (lab capacity,traceability, and mandated DEG/EG testing) can beput into place, but they need to be combined withconsistent regulatory enforcement, open publicreporting, and international collaboration. Publichealth officials should give priority to removingproblematic lots and assisting affected families, andclinicians should continue to be on the lookout for thedistinctive clinical condition. Future tragedies can beavoided by taking urgent policy action now.Cough syrup toxicity in children remains a significant and preventable health concern, especially in low- and middle-income settings where over-the-counter access is widespread. Children are physiologically more vulnerable because of their immature liver enzymes, reduced metabolic capacity, and

heightened sensitivity to active ingredients such as dextromethorphan, codeine, antihistamines, decongestants, and alcohol-based formulations. Toxicity may occur due to inappropriate dosing, accidental ingestion, polypharmacy, or use of adult formulations, often leading to severe complications including respiratory depression, CNS excitation or depression, seizures, cardiac arrhythmias, hepatic injury, and in extreme cases, fatal outcomes.

The rising number of toxicity cases highlights the urgent need for parental education, strict regulatory control, and improved healthcare counseling at the community level. Pharmacists play a crucial role by promoting rational drug use, verifying weight-based dosing, and educating caregivers about the dangers of self-medication. Strengthening surveillance systems, enforcing child-safe packaging, and promoting non-pharmacological remedies for common cough and cold symptoms can further reduce the risk.

In conclusion, preventing cough syrup toxicity in children requires a multi-level approach involving caregivers, healthcare professionals, policy makers, and public health authorities. With proper awareness, responsible prescribing, and timely intervention, most toxicity incidents are entirely avoidable, ensuring the safety and well-being of children.

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