

Review Article

Evaluating the challenges of oral drug administration in children: a review

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ABSTRACT

Oral drug administration is the most preferred method for delivering medication to pediatric patients due to its convenience and non-invasive nature. However, this method presents several unique challenges that can impact the effectiveness and safety of pharmacological treatments. Among these challenges are formulation issues, dosing difficulties, potential adverse effects and complications with measuring tools. Children often refuse to take their medication for various reasons, such as unpleasant tastes or textures, making it difficult for caregivers to ensure consistent adherence to treatment. While liquid formulations are generally more suitable for younger children, they often face issues related to taste and volume, which can render them unpalatable and increase the risk of non-compliance. Addressing these challenges is essential for improving medication adherence, ensuring proper drug delivery and enhancing therapeutic outcomes in pediatric populations. The involvement of caregivers and healthcare providers is crucial in managing these difficulties. They must educate children and their families on proper medication administration techniques and adherence to individualized dosing regimens. Furthermore, the lack of standardized pediatric formulations and dosage forms remains a significant barrier, often leading to the use of adult medications that may not be appropriate for children. This review highlights the urgent need for more child-friendly drug formulations, alternative drug delivery systems and additional research into the effects of developmental pharmacokinetics.

Keywords: Children, Challenges, Oral drug administration, Strategies

INTRODUCTION

The oral route is the most frequently utilized method due to its ease and convenience. However, this approach presents substantial challenges in developing age-appropriate drug formulations for pediatric patients. The absence of suitable formulations often compels healthcare providers or caregivers to modify drug forms, including splitting or crushing tablets, opening capsules or mixing medications with food.¹

The pediatric population presents significant differences from adults due to their unique physiology and ongoing development. As children are still maturing, they tend to be more sensitive to medications and less tolerant of medical errors. This heightened sensitivity poses specific

challenges for caregivers when administering drugs to young patients. Moreover, the absence of suitable medication formulations for children complicates effective care delivery. Accurate medication administration requires careful calculation of the appropriate doses based on the child's weight, the use of precise instruments, slow administration of the medication and consideration of the weight of powdered drugs.

Ensuring the safe preparation and administration of medications to children is a critical and high-risk component of healthcare that necessitates precision and attention to detail. Caregivers and healthcare providers frequently face difficulties related to drug preparation, accurate dosing, adherence to timing and the child's

acceptance of the medication. These challenges tend to be more pronounced in toddlers than in infants.²

CHALLENGES IN ADMINISTERING ORAL MEDICATIONS TO CHILDREN

Difficulties in reading medication prescription

Health literacy is closely linked to caregivers' challenges in understanding medication prescriptions. Research indicates that a limited number of parents fully comprehend the entire prescription. At the same time, the majority possess only a partial or incomplete understanding of the pediatric prescription, whether it pertains to the name of the medication, its dosage or the frequency of administration. Parents often did not know the role of a child's medications in treating diseases, medication name and dosage, "expected side effect."³

Several factors significantly influence a parent's understanding of medication, including the parents' age, the child's age, occupation, level of education, experience in administering medication, the number of medications prescribed and the type of dosage form.⁴ Caregivers often seek advice from healthcare professionals, the internet and close relatives to understand the medication prescription.⁵ Caregivers often seek advice from doctors, but they rarely receive information from the Internet. Additionally, verbal information is more common than written information, with pharmacies being the most frequently cited source.⁶

Unsuitable dosage form

Pediatric formulations must be designed with age-specific considerations in mind. This means that medications need to be tailored differently for neonates, infants and adolescents. Many oral medications on the market lack specific dosages for pediatric patients. Since children typically need smaller doses than adults, this absence of tailored formulations creates challenges in providing safe and effective treatment for younger patients.¹ Often, medications must be cut, crushed or substituted with alternative dosage forms. Particularly, depot tablets or capsules cannot be divided into smaller doses without altering the medication's pharmacokinetics. Furthermore, the size of the tablet may be too large for a child to swallow comfortably in some cases.⁷

Difficulty in measuring dosing accurately

Medication administration often depends on parents or caregivers who may lack proper knowledge or tools for accurate dosing. The accuracy of dosing by parents using both the cup with printed markings and the cup with etched markings was found to be inadequate. Notably, more than 99% of dosing errors involved instances of overdosing.⁸ Many caregivers were not aware of innovative medication devices but indicated they would use them if recommended by a doctor or pharmacist.

Some parents preferred devices that came packaged with the medication. However, many reported lacking proper instructions on how to use these devices.

The primary challenges reported included device design, measuring small doses, cleaning the devices and reading graduation marks because of poor contrast. Additionally, the right device was unavailable, prompting parents to use household spoons to give medication.⁹ Health literacy was found to have a significant correlation with dosing errors when using both cups and dosing spoons. Parents demonstrated inaccuracies in dosing with both the cup that had printed markings and the one with etched markings. More than 99% of the errors involved overdosing.¹⁰ Participants measured more than the intended dose when using the dosing cup but measured less than the intended dose when using the dropper. The education level of the participants had an impact on dosing accuracy, the accuracy for each type of instrument varied significantly based on the education of Saudi mothers.¹¹

Difficulty with time or frequency of medication

Caregivers frequently face challenges related to the timing and frequency of medication doses. Following a regimen that requires taking medication four times a day proves to be especially difficult due to the demands of daily activities. Often, there is a need to extend the day, schedule doses with meals and other medications and ensure precise intervals between doses.¹² A study revealed that the majority of parents administered medication incorrectly when a drug was prescribed to be given three times daily.¹³

Acceptance behaviour of children

One of the most common challenges is children's refusal to take medication.¹⁴ Most caregivers report that they never administer tablets to their children and those who do often experience refusals from them.^{13,15,16} Young children typically prefer liquid medication over solid medication.¹⁷ This resistance is mostly experienced due to the taste of the medication.

Taste and texture: In children, palatability plays a key role in both acceptance and rejection.¹⁸ Children are more sensitive to bitterness.¹⁹ Many medications are naturally unappealing, often due to bitterness, which can make it difficult for children to accept them. Children often dislike medication and vomit it out.²⁰ If the child vomits the medication, most caregivers skip the current dose and feed the next dose as scheduled. While others wait for some time and then try again.²¹ While children who preferred sweet flavors had a median age of 10 years.²² Tablets were dissolved in water, milk, other liquid medications and other liquids.^{21,23} The most common foodstuffs used for coadministration or mixing were vanilla pudding, quark, yoghurt, porridge and fruit sauce.²⁴

Medication non-adherence

Patient adherence to prescribed oral medication regimens is a critical concern in pediatric care. Many parents noted that their primary challenge was remembering to administer their child's medication and unawareness about the importance of the medicines.²⁵ To decrease the chances of forgetting, they adopted various strategies, including setting mobile phone alarms, placing the medication in a conspicuous location, creating homemade charts to track doses and checklists and relying on verbal reminders.¹²

Medication adherence is significantly associated with place of residence as medication adherence is more in urban areas than rural areas.²⁶ Poor communication between caregivers and healthcare providers, lack of pediatric medication educational resources or places to get reliable answers and personal attitudes and beliefs are described as a factor leading to medication error or non-compliance.³

Swallowing difficulty

One of the challenges in giving oral medications, specifically to children, is difficulty in swallowing tablets. Young children often lack the necessary motor skills to swallow whole tablets, so these medications are typically split or crushed to make them easier to take.²³ As a result, liquid medications are more commonly prescribed for children rather than tablets.^{17,27} During the administration of oral medications, many children experienced swallowing difficulties, with vomiting being the most frequent issue. In many cases, when children report problems with swallowing, doctors often change the medication to address the issue.¹³

Adverse drug effects

Differences in metabolism and physiology between children and adults may affect how drugs are absorbed and processed. A small proportion of children experienced adverse drug events (ADEs) following medication use. However, most parents reported not receiving guidance from their doctor or pharmacist about potential ADEs or warning signs to monitor.

Moreover, many parents did not follow prescriptions as directed. 85.5% stopped the medication once symptoms improved, 26.8% gave the medication to other children and 26.3% used leftover medication when similar symptoms appeared in the same child. Parents with a college degree or higher showed a better understanding of ADEs than those with lower educational levels.²⁸ Most parents did not seek medical attention when a potential adverse drug reaction (ADR) occurred. Instead, some parents either took their children to the hospital or stopped administering the medication altogether.²⁹

Table 1: Representing the challenges faced by caregivers and the strategies used by them to overcome the challenges.

Challenges encountered	Strategies used to overcome challenges
Difficulty in reading medication prescription	Seeking advice from healthcare professionals, internet, close relatives.
Unsuitable dosage formulation	Cutting, crushing
Difficulty in measuring dosing accurately	Household spoons
Difficulty with time or frequency of medication	Extending duration of day, schedule doses with meals and other medications and ensure precise intervals between doses
Acceptance behaviour of children	Mixing with milk, water, vanilla pudding, quark, yoghurt, porridge and fruit sauce
Medication adherence	Setting mobile phone alarms, placing the medication in a conspicuous location, creating homemade charts to track doses, checklist
Swallowing Difficulty	Liquid medications are prescribed
Adverse drug effects	Took the child to the hospital Stopped giving the medicine

CONCLUSION

Caregivers face considerable challenges when administering oral medications to children, which can significantly influence treatment effectiveness and overall health outcomes. The primary difficulties include ensuring accurate dosing, particularly for younger children who may have trouble swallowing pills or liquid medications. Taste aversion and medication refusal are prevalent issues that further complicate adherence to treatment.

Additionally, the lack of clear guidance and support from healthcare professionals regarding proper medication administration and the use of dosing devices often results in mistakes and noncompliance. Although some solutions, such as flavoured medications and more user-friendly dosing devices, show potential, there is a pressing need for more comprehensive education and resources for caregivers. Providing clear instructions, age-appropriate drug formulations and effective communication about possible side effects can help address these challenges.

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