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The Impact of Poor-Tasting Pediatric Medications on Acceptability, Adherence, and Treatment Outcomes

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ABSTRACT

There are various tablet formulations available such as sugar-coated, film-coated, and enteric-coated tablets, many of which are designed for different routes of administration including sublingual or buccal. While each formulation offers specific advantages, patient compliance often poses a challenge, particularly due to the bitter taste of numerous medications. Oro dispersible tablets (ODTs) that include taste-masking strategies are especially beneficial in addressing these issues. These formulations are not only effective in masking unpleasant Flavors but also enhance patient adherence—especially in elderly individuals dealing with chronic conditions like hypertension and diabetes, where long-term medication use is common. Furthermore, ODTs offer rapid pharmacological action by bypassing first-pass metabolism, making them ideal for patients with taste aversion toward medications.

Background:
Many pediatric medicines possess a distinctly bitter and unpleasant taste, which acts as a significant barrier to effective treatment. While the issue is commonly acknowledged in clinical settings, there is limited consolidated empirical evidence regarding the broader impact of unpleasant-tasting medicines. This scoping review aims to examine how poor taste in pediatric medications affects three critical factors: acceptability by patients, adherence to prescribed regimens, and overall treatment outcomes.

Keywords: Pediatric, medication, bitterness, palatability, taste masking, acceptability, adherence, treatment outcomes.

INTRODUCTION

Children, adolescents, and infants account for approximately 30% of the global population—equating to around 2.4 billion individuals under the age of 18.[1] Virtually all children require medication at some point in life, whether for short-term ailments or chronic conditions. Two major aspects to consider when designing or prescribing pediatric medicines are: [2,3]

Patient Acceptability – how willing and capable both the child and caregiver are to use the medication as intended. [4]

Medication Adherence – the extent to which a patient follows the prescribed treatment plan. [5]

Even the most effective medications are rendered useless if not taken properly. Palatability, or the sensory quality of a drug including taste, smell, texture, and aftertaste, plays a key role in ensuring children take their medicine. [6,7]

Developing pediatric formulations with acceptable taste is challenging because many active pharmaceutical ingredients (APIs) are inherently bitter or unpleasant. [8] These compounds are xenobiotics—foreign substances to the human body—and often naturally evoke a taste aversion as a protective mechanism against potential toxins. Despite this evolutionary defense, ensuring children can and will take necessary medications is vital for successful treatment. [9,10]

Although patients of all ages prefer medications with better sensory profiles, children are especially sensitive. Unlike adults, children may not grasp the importance of taking medicine and are more likely to reject treatments with poor taste. [11] Their taste perception, which starts developing in the womb, matures over time and is influenced by age, sex, genetics, ethnicity, and overall health. Children generally show a strong preference for sweet flavors and an inherent dislike for bitterness. [12]

Research confirms that children perceive bitter tastes more intensely than adults. Recognizing this, regulatory agencies like the European Medicines Agency (EMA) and the U.S. [13] Food and Drug Administration (FDA) have emphasized the importance of palatability in pediatric medicine. According to these agencies, better palatability improves acceptability, which in turn boosts adherence and ultimately leads to improved therapeutic outcomes. However, while this logic is sound and widely accepted, actual scientific studies quantifying this relationship remain limited and dispersed. [14,16]

Using the Population-Concept-Context (PCC) framework:

- Population- Children aged 0–18 years, as well as caregivers and healthcare providers involved in medication administration.

-Concept- Exposure to bitter or unpalatable oral medicines and their effects on acceptability, adherence, and treatment effectiveness.

Inclusion Criteria- Eligible studies included both observational and interventional research involving children (0–18 years) who were administered poorly tasting oral medicines, with reported impacts on medication acceptance, adherence, and treatment results. [17]

Figure 1. Medicines must be palatable to facilitate successful administration and support medication adherence, ensuring that therapeutic outcomes can be achieved.

Objective:

The goal of this review is to assess how poor taste in pediatric oral medications influences three interconnected aspects: acceptability by the patient, adherence to treatment, and final health outcomes. This scoping review consolidates available data to outline core concepts, identify research gaps, and offer insights into real-world challenges faced by children, caregivers, and healthcare professionals. It is accompanied by a separate study that delves into the perspectives of healthcare providers and caregivers.

Need for Taste-Masked Orodispersible Tablets (ODTs):

Fast-dissolving tablets rapidly transform into a soft paste or liquid upon contact with saliva, enabling easier swallowing and reducing the risk of choking. These are considered true orodispersible tablets as they dissolve within seconds without the need for water. This formulation technology offers several advantages: [18,19]

- Enhances patient compliance and convenience
- Eliminates the need for water or chewing
- Provides a pleasant taste and mouthfeel
- Ensures greater formulation stability
- Suitable for both immediate and controlled drug release
- Accommodates high drug loads
- Combines the benefits of liquid formulations in a solid form
- Compatible with conventional manufacturing and packaging methods
- Economical to produce

Characteristics of Taste-Masked ODTs:

Orodispersible tablets possess distinct features that set them apart from traditional oral solid dosage forms. While conventional tablets typically bypass the oral cavity before disintegration, [20] ODTs must dissolve quickly in the mouth and therefore require effective taste masking—especially for extremely bitter drugs. Sweeteners and flavoring agents are

commonly used, but in certain cases, advanced taste-masking techniques are necessary. Key characteristics of these formulations include: [21]

- Should not leave a lingering unpleasant taste in the mouth
- Must disintegrate within 15 seconds to 3 minutes without water
- Should possess adequate mechanical strength
- Require finely milled drug particles to maximize surface area and improve absorption
- Should ensure drug absorption throughout the gastrointestinal tract
- Must have good solubility for rapid dissolution

Rationale for Developing ODTs: The demand for non-invasive dosage forms remains strong due to poor patient compliance with conventional delivery systems, restricted market reach for pharmaceutical firms, and high disease management costs. [22]

Patient-Oriented Factors-
ODTs are particularly beneficial for patients who find it difficult or uncomfortable to swallow standard tablets or capsules. These include:
- Children and elderly patients who struggle with swallowing
- Individuals with a fear of choking who resist solid dosage forms
- Elderly patients unable to swallow daily medications like antidepressants
- Children with allergies seeking alternatives to syrup formulations
- Patients undergoing treatments like chemotherapy, experiencing nausea
- Institutionalized psychiatric patients who may avoid taking their medication
- Individuals suffering from persistent nausea or those lacking access to water

Limitations of ODTs-
- Despite their benefits, ODTs have some drawbacks:
- Use of soluble fillers may make them prone to absorbing moisture, affecting stability
- Improper formulation can leave an unpleasant taste or gritty feel in the mouth
- Drugs sensitive to light or moisture may need special packaging
- Should be consumed immediately after removal from the packaging
- May leave minimal or no residue in the oral cavity
- Must ensure a pleasant mouthfeel for better acceptability

Advantages of ODTs-
- Easy administration for those who resist swallowing pills, including pediatric, geriatric, disabled, or mentally uncooperative patients.
- Fast drug dissolution and absorption leading to quicker therapeutic effects.
- Offers the benefits of liquid dosage forms in a more stable, solid form.

Disadvantages of ODTs-
- ODTs tend to be hygroscopic and must be stored in controlled environments with regulated humidity and temperature. [23,24]
- Require specialized packaging to maintain stability and integrity.
- Typically lack strong mechanical properties and need careful handling. If poorly formulated, they may leave a bitter aftertaste or gritty texture in the mouth. [25]

Techniques for Manufacturing Orodispersible Tablets:

Freeze-Drying (Lyophilization) -
This process involves freezing the product and then removing water through sublimation. Freeze-dried formulations dissolve more rapidly than most other solid dosage forms. [26]

Molding -
Molded tablets are prepared by dispersing the drug in a water-soluble matrix, often using sugars. These tablets dissolve quickly and usually offer improved taste. The form in which the drug is incorporated—whether as particles or in a dissolved state—affects disintegration time, dissolution rate, and sensory perception. [27]

Sublimation Technique -
Compressed tablets often lack sufficient porosity, which can slow their dissolution in water. To address this, tablets have been engineered with improved porosity and mechanical strength for quicker dissolution. This involves blending volatile solid substances—such as urea, urethane, ammonium carbonate, camphor, or naphthalene—with other excipients before compression. The volatile materials are then removed through a sublimation process, leaving behind a porous matrix. [28,29]

Spray Drying Method -
Spray drying is another technique used to produce fast-dissolving tablets. This method involves creating a matrix by drying an aqueous solution containing a polymer base and additional ingredients. The result is a porous and fine powder that enhances the dissolution rate of the final dosage form. [30]

Mass Extrusion Process -
In this technique, the active pharmaceutical mixture is processed using a blend of water-soluble polyethylene glycol and solvents like methanol. The mixture is then extruded through a syringe or nozzle to form cylindrical shapes, which are cut using heated blades to produce uniform tablets. These extruded forms can also be used to coat granules of bitter drugs, effectively masking their taste.

Direct Compression Method -
Direct compression is one of the simplest and most efficient techniques for manufacturing or dispersible tablets. It utilizes traditional tablet production equipment and relies on specially designed excipients that enhance flow, compressibility, and disintegration. The formulation often includes effervescent agents and sugar-based carriers. One variation, known as flash tab technology, incorporates coated drug crystals or microgranules along with disintegrants to aid rapid tablet breakdown.

Tablet Molding Technique -
Molded tablets are solid dispersions where the physical form of the drug depends on its interaction with the molten carrier. The drug may remain as fine particles or dissolve completely or partially in the matrix. The tablet's disintegration rate, dissolution profile, and mouthfeel are influenced by the extent of drug dispersion within the carrier.

CONCLUSION

Orally disintegrating tablets (ODTs) have significantly enhanced patient adherence and comfort, particularly for individuals with difficulty swallowing traditional tablets, such as pediatric, elderly, and psychiatric patients. Initially developed for prescription use, ODTs are now widely available over the counter for treating allergies, colds, and flu symptoms. The growing popularity of ODTs reflects a broader patient preference for more convenient dosage forms.

This review draws attention to the major challenge of poor taste in pediatric medications, which can negatively affect treatment outcomes. Despite being a global issue across all pediatric age groups, the full impact is likely underrecognized. Reports from parents, caregivers, and medical professionals indicate that unpalatable drugs are a common concern in both clinical and home care environments.

Poor taste has been associated with 77 different medical conditions and 156 unpleasant-tasting medications. The most frequent consequence was reduced acceptance by patients, with 64% of reviewed studies noting rejection or resistance, often necessitating strategies such as rewards, coercion, or switching to non-preferred alternative medications. Additionally, 27% of studies reported that unpalatable taste negatively impacted medication adherence, particularly in chronic conditions or when complete dosing was critical in acute settings. A limited number of studies even linked the taste of medications to clinical outcomes, such as better viral suppression in HIV patients and improved seizure control in those with epilepsy.

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