

**Assessment of parental knowledge, attitude and practices related to the use of pediatric liquid medications**

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**Abstract**

**Aim:** To assess the knowledge, attitude and practices followed by parents, in relation to the use of pediatric liquid medications, and their effect on the oral cavity.

**Methods:** A total of 150 parents of children up to 6 years of age, were included in the study. A structured questionnaire with multiple choice answers was formulated, with a suitable answer to be selected by the parent. Data were computed and analysed using IBM-SPSS 20.

**Results:** There was a lack of parental knowledge regarding the use of pediatric liquid medications and the oral hygiene practices followed post the intake of these medications.

**Conclusion:** Parents should be educated and made aware about the several risks associated with the use of these medications. They should be encouraged to take adequate oral hygiene measures following intake.

**Keywords:** Dental caries, Liquid Medication, Oral Hygiene Practices.

## **Introduction**

Dental caries is the most common and prevalent infectious condition in the oral cavity. It is a complex disease affecting the calcified tissues of the teeth which involves the dynamic action between bacterial plaque, dietary fermentable sugars and various host factors that results in acid production.<sup>1</sup> However, in spite of knowing the root cause of it, and the various advances in preventive dentistry, children still suffer from dental caries.

The most common mode of administering drugs is the oral route. Oral medicines come in various forms including oral solid dosage forms and oral liquid dosage forms. The oral liquid dosage forms are homogenous liquid preparations that usually contains a solution, an emulsion, or a suspension of one or more ingredients in a suitable liquid base and are prepared for oral administration, either as such or after dilution.<sup>2</sup> They are available in the form of suspension, solutions, syrups, and mixtures.

There are various advantages and benefits associated with this form of medication such as- the wide acceptance by infants, toddlers, pre-schoolers, and even school age children<sup>3</sup>, good absorption, the flexibility with dosage and ease of availability and ease of administration.<sup>4</sup>

Oral drugs include both active ingredients and a specific mixture of inactive ingredients which serves a variety of purposes, including improvement of the appearance, bioavailability, stability, and palatability of the product. Active ingredients are the compounds intended to provide the desired pharmaceutical effect. Conversely, inactive ingredients are any component of a drug product other than an active ingredient.<sup>5</sup> These components do not have a direct biological or therapeutic effect but instead are added to alter the physical properties of an oral solid dosage form, to facilitate absorption, to improve the appearance, bioavailability, stability, and palatability of the product.<sup>6,7</sup> Although, the active ingredients in these

medicines are necessary for the improvement or maintenance of health, some of the inactive ingredients may present a risk to the dental health.<sup>8</sup>

Oral medicines with low palatability can result in non-compliance, which may directly affect the efficacy and effectiveness of the treatment. To solve the problems of palatability, sweeteners and flavouring agents are added to mask the original taste and smell of the formulations.<sup>9</sup> High sugar content along with other factors such as low pH, duration and frequency of administration can increase the risk of caries development. Poor attitude of parents towards the oral health of children is also one of the reasons for the increase in caries prevalence.<sup>10</sup>

The current study was done to assess the knowledge attitude and practices followed by parents in the use of Pediatric Liquid Medications (PLM) and its impact on oral health.

## **Materials and Methods**

The present study was conducted in the Department of Pedodontics and Preventive Dentistry, at P.S.M College of Dental Science and Research, Akkikkavu, Thrissur. A total of 150 parents of children up to 6 years of age, who reported to the department were included in the study. A structured questionnaire with 13 questions in local language (Malayalam) with multiple choice answers was formulated, with a suitable answer to be selected by the parent. Assistance was provided for parents who required help reading. The questionnaire (Table 1) assessed the knowledge of the parents, regarding pediatric liquid medications and their attitude and practices followed in the administration of the same.

## **Statistical Analysis**

Data were computed and analysed using IBM-SPSS 20. Descriptive statistics were used and frequency distribution including number and percentage was calculated and inferences drawn.

**Results**

Sn.	Questions	Frequency (%)
1	What form of medication does your child prefer? <ul style="list-style-type: none"> <li>• Tablet</li> <li>• Syrup/Suspension/Dispersible tablet</li> </ul>	10% 90%
2	What form of medication would you prefer for your child? <ul style="list-style-type: none"> <li>• Tablet</li> <li>• Syrup/Suspension/Dispersible tablet</li> </ul>	12% 88%
3	Is your child on any long-term medication? <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	91.6% 8.4%
4	Liquid medicaments contain flavouring agents? <ul style="list-style-type: none"> <li>• Agree</li> <li>• Disagree</li> </ul>	87.1% 12.9%
5	Sugar is the major constituent present in them? <ul style="list-style-type: none"> <li>• Agree</li> <li>• Disagree</li> </ul>	35.5% 64.5%
6	Frequent use of sugar containing medicaments may lead to tooth decay. <ul style="list-style-type: none"> <li>• Agree</li> <li>• Disagree</li> </ul>	29% 71%
7	I only administer medications that are prescribed to my child by the doctor. <ul style="list-style-type: none"> <li>• Agree</li> <li>• Disagree</li> </ul>	59.4% 40.6%
8	How frequently do you administer medication to your child? <ul style="list-style-type: none"> <li>• Once a day</li> <li>• Twice a day</li> <li>• Thrice a day</li> <li>• As demanded by child</li> <li>• As per the doctor's prescription</li> </ul>	4% 16.7% 1.3% 14.8% 63.2%
9	The last dose of medication for the day is most frequently administered to my child right before bedtime. <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	71% 29%

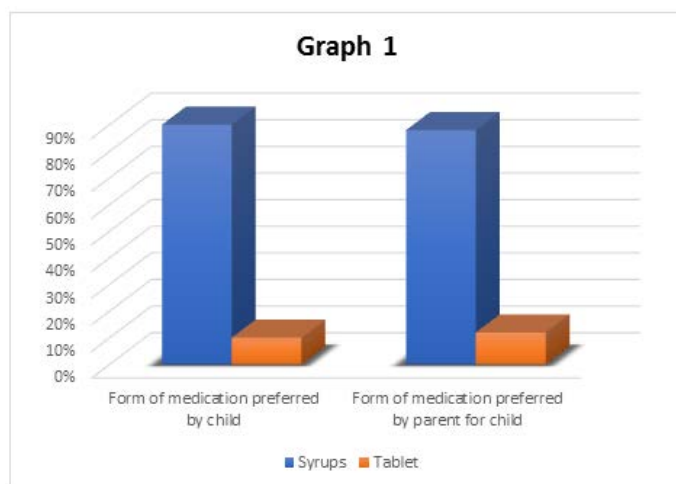
10	Do you encourage your child to perform oral hygiene measures following intake of liquid medicines? <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	31.6% 68.4%
11	If yes, how? <ul style="list-style-type: none"> <li>• Rinsing mouth</li> <li>• Brushing</li> <li>• Drinking water</li> </ul>	47.6% 34.4% 18%
12	Are you aware of the availability of sugar free substitutes of these medicaments? <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	18.7% 81.3%
13	Will you be willing to administer sugar free medicaments to your child, despite of its reduced palatability and acceptance compared to sugar containing medications. <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>	23.2% 76.8%

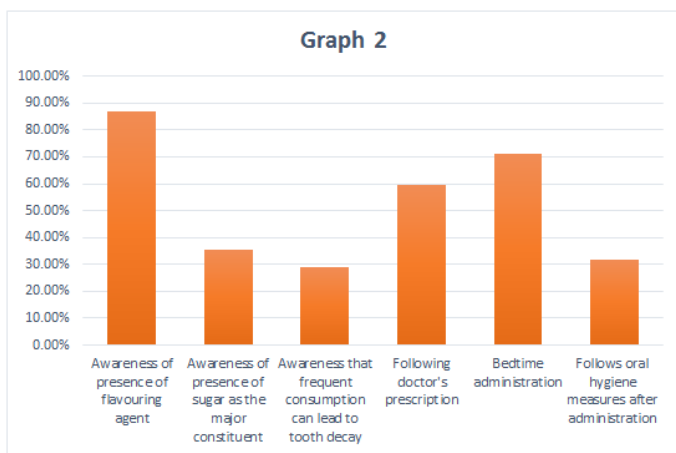
Out of 150 parents who participated, children of 90% (135) preferred liquid medicament for their child, while others preferred tablets, and 90% (Graph 1) said that their child preferred liquid medications over tablets. 87.1% of the parents were aware of the fact that these liquid medications contained flavouring agents, however only 12.9% knew that sugar was the main constituent in them (Graph 2). About 71% of the parents were not aware that frequent consumption of sugar containing medications may lead to tooth decay (Graph 2).

59.4% of the parents administered medicament only on the doctor's prescription, however frequency of administration was not very consistent (Graph 2). Bed-time consumption of the medications were reported by 71% of the parents (Graph 2). When asked if oral hygiene measures were practised following administration of these medications, only 31.6 % agreed to do so and 68.4% did not (Graph 2). Out of the 31.6% of the parents,

47.6% made their child rinse their mouth, 34.4% made their child brush their teeth and 18 % made them drink water following intake of medication.

About 76.8% parents were not aware of the availability of sugar-free pediatric liquid medicament, and when asked if they would be willing to administer these sugar free medicaments despite of the reduced palatability and acceptance 76.8% of parents answered 'No'.





## Discussion

Pediatric liquid medications are commonly available as drops, suspensions, and syrups, and are widely used and well tolerated by children. In recent years, the long-term use of prescribed medications for children has grown. On average, children take medication every eight hours or ten days a week<sup>11</sup>. The use of sugar-containing liquid medications on a regular basis has been linked to the development of dental caries in children.<sup>12</sup>

Pharmaceutical firms sweeten liquid preparation of drugs with sugars such as sucrose, fructose, and glucose to increase the palatability, add bulk, and supposedly to increase compliance. The readily fermentable carbohydrates in thick liquid preparations may add significantly to dental caries potential in young patients.<sup>9</sup> Sucrose is widely used due to its properties as a preservative, antioxidant, solvent, and thickening agent. It is also a low-cost, non-hygroscopic, easily processed substance, as well as a clinicians' helper in pediatric therapeutics, given that its pleasantly sweetish taste encourages medicine acceptance.<sup>13</sup>

Previously, the potential cariogenic effect of pediatric liquid medications was not given much consideration. However recently, many have expressed concerns about the role of liquid medications in the development of dental caries. Roberts and Roberts were the first to document the

harmful effects of sweetened medication on the oral health of a child.<sup>6</sup>

Hill et al conducted a study to assess the sweetener content of various commonly used pediatric liquid medications and found that the common antibiotics had the highest sucrose content ranging from 18% to 80%.<sup>14</sup> Sahgal et al<sup>15</sup> studied the difference in prevalence of dental caries in children on long term medication and children not on long term medication. They concluded that the severity of caries was proportional to the duration of intake of medication. Also, liquid medications taken for a duration greater than 3 months increased the caries. In the current study, 8.4% of the parents said that their child was on long term medication, mostly multi vitamins.

A study conducted by Walimbe et al<sup>16</sup> concluded that 50% of pediatricians prescribed liquid medications to their patients over tablets, also it was concluded that over 80% of the patients preferred syrups over other forms of medications. In the current study, 88% parents said that they preferred liquid medications for their children and 90% said that their children preferred syrups over tablets. In comparison to tablets, the palatability of liquid medications is critical in children. Medication acceptance in children ranges from 11% to 93%, and oral medicines with low palatability can lead to non-compliance, which can have a significant impact on the treatment's effectiveness and efficacy.<sup>9</sup>

The repeated administration, chronic illnesses, and cases of self-medication can all contribute to a high level of ingestion of these PLMs. They increase the amount of sugar exposures in the child's regular diet, increasing the likelihood of caries.<sup>4,17,18</sup>

Many parents are aware that sugar induces tooth decay, but they also associate it exclusively with sweets intake. They are also unaware of the secret sugar in a variety of foods and beverages, including liquid medications.<sup>19</sup> The

existence of sucrose and its availability to oral plaque bacteria, according to Lokken et al.<sup>20</sup> and Imfeld<sup>21</sup>, is responsible for the cariogenic potential of medicines. To form the cariogenic biofilm, only a 5% sucrose concentration is required.<sup>22</sup> In the current study about 64.5% of the parents were not aware that sugar was one of the major constituents in liquid medication. Other factors besides the sugar content and frequency of intake that could influence the cariogenic potential of these medications include their pH, viscosity, sugar content, bedtime consumption and reduced salivary flow caused by the use of certain drugs.<sup>11</sup>

Liquid medications are generally viscous and have the ability to penetrate into fissures and adhere to it and the proximal areas that are inaccessible to toothbrushes. Also, very often the last dose of medicine is usually given right before bedtime.<sup>19</sup> This fact was clearly seen in the present study, where 71% of the parents agreed to the same, out of which only 31.6% said that their child was asked to perform oral hygiene measures after the administration of liquid medications. Children aged 3-7 years have been shown to have greater differences in salivary sugar clearances, as well as lower salivary flow rates, than older children and adults.<sup>23</sup> Therefore, frequent use with prolonged oral clearance could increase the risk of caries.<sup>24</sup>

Liquid medications are usually maintained at an acidic pH to maintain their shelf life.<sup>25</sup> Acidic components are usually added to them as they act as buffering agents, that are responsible for maintaining chemical stability, controls the tonicity, and improves flavour, which makes the medicines more palatable to the child.<sup>26</sup> However they also act as erosive agents due to their ability to chelate calcium, thereby increasing the enamel dissolution rate.<sup>27</sup> Passos et al., reported that pediatric syrups with a low pH

may cause dental demineralization by acting directly on the enamel surface, without affecting the oral microflora.<sup>22</sup> Artificial sweeteners in medicines may be used as alternative to sugars and they include xylitol, saccharin, cyclamate, aspartame, and sucralose. Unlike the fermentable sugars, they are considered to be non-cariogenic, can only cause a minimal drop in the oral plaque pH and are not easily fermentable by the dental plaque microorganisms. Only 18.7% of the parents in the present study were aware of the availability of sugar free substitutes, and when asked if they were willing to administer these sugar free substitutes despite of its reduced palatability and acceptance, only 23.2% agreed to do so. According to Duggal et al., despite the fact that sucrose at 12% can be consumed up to five times a day, major hard tissue loss does not occur if the patient uses fluoride toothpaste twice a day.<sup>28</sup>

Pediatricians and Pedodontists play an important role in raising awareness among parents about the possible risks of inadvertent and inappropriate use of these drugs. It is essential to educate the parents regarding the cariogenic aspects of the medications and provide oral hygiene instructions along with each prescription of the medicine. It is recommended that pediatricians are educated to better understand the detrimental effects of long-term use of pediatric liquid medicaments on oral cavity and delivery of proper oral care instructions.<sup>29</sup>

- Parents should be informed about the presence of sugar content in these medications.
- Use of tablets must be encouraged.
- Advice brushing or rinsing of mouth after intake.
- Oral hygiene practices should include toothpaste with fluoride for preventing or controlling dental caries.<sup>28</sup>
- Chewing sugar free gum

- Medications should be administered at mealtimes and administration right before bedtime should be avoided.<sup>30,31</sup>

### Conclusion

The current study showed that parents had a very limited knowledge regarding the effects of pediatric liquid medications on the oral health. There is a need for improvement in the parent's attitude and practices pertaining to the administration of these medications.

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