

Potential Cost-saving for Liquid-to-Solid Medicines among Paediatric Patients

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Introduction

The World Health Organisation (WHO) recommends that children be treated with oral solid medicines for drugs, especially those require a precise dose titration.¹

Problem statement:

Factors that can affect a child's success in swallowing pills include developmental stage, fear, anxiety, intolerance of unpleasant flavors and failure to appreciate the risks associated with the non-compliance. Inadequate dosing flexibility without the need of tablet crushing explained the lack of usage of solid oral formulation in pediatrics.²

The current practices only based on preference of prescribers and patient's parent/care.

Justification of Study:

- There are still lack of evidence regarding the solid oral formulation suitability in Malaysia
- There is no published study in Malaysia that analyses the cost differences when oral liquid medications were changed to oral solid medications in a hospital outpatient setting.

Objective:

1. To examine the association of demographic and solid dosage suitability.
2. To investigate factors affecting prescribing of solid oral dosage forms.
3. To examine the potential cost savings if patient were prescribed with solid over liquid preparations.

Methods

This cross-sectional study conducted from October 2018 to March 2019 among patients visiting Paediatric Clinic, Hospital Tuanku Fauziah (HTF), Kangar, Malaysia.

Inclusion criteria	Exclusion criteria
All prescriptions prescribed by paediatric outpatients (acute and/or chronic diseases) aged 2 years old to 17 years old	Intravenous and external preparation and referral repeated prescriptions

Prescription collected and screened through PhIS system to eliminate duplicates

Suitability of solid dosage form based on prescribed dose

- Assuming tablets (except for coated tablets) were swallowed as quartered, halved or whole
- The size suitability of solid forms for children were determined based on the European Medicines Agency's (EMA) guideline²

Age (years old)	Tablet size suitability (mm)
2-5	3-5
6-11	5-10
12-17	10-15

Cost calculation

Data Analysis using the IBM SPSS Version 20.0

Sample size: Prior data indicate that the prevalence of potential substitution rate was 0.41⁴ calculated to 372 samples is needed.

Statistical Analysis:

1. The association between the patient's demographic and solid dosage suitability were analysed by using **chi-square** or **Fisher's exact test**.
2. **Logistic regressions** were used to study the association between factors and outcome of being prescribed solid dosage form.
3. **Potential cost-savings** were calculated by:
 Cost difference = Treatment cost of liquid formulations available in an acceptable solid form – Treatment cost of corresponding oral solid dosage forms

Results

Of 371 patients, majority of the pediatric patients aged 2 – 5 years old (60.6%), Malay (97%), male (55.3%) and under chronic disease treatment (88.1%). 313 (84.4%) patients were prescribed solid dosage forms, out of which prescribed solid mostly in size of 5 – 10 mm (62.5%) and the least prescribed on 10 – 16 mm (9.7%).

Table 1. Association between sociodemographics and Solid dosage suitability

Variable	Solid Dosage Suitability		p-value
	Yes	No	
Age (years)			
2-5	107 (47.6)	118 (52.4)	0.425*
6-11	50 (42.0)	69 (58.0)	
>12	10 (37.0)	17 (63.0)	
Weight (kg, adjusted by age)			
<13	97 (50.8)	94 (49.2)	0.021*
>13.01	70 (38.9)	110 (61.1)	
Race			
Malay	162 (45)	198 (55)	0.976**
Non-Malay	5 (45.5)	6 (54.5)	
Disease condition			
Acute	153 (46.8)	174 (53.2)	0.075**
Chronic	14 (31.8)	30 (68.2)	
Gender			
Male	96 (46.8)	109 (53.2)	0.463**
Female	71 (42.8)	95 (57.2)	

*Chi-square

**Fisher Exact Test

On factors affecting solid dosage prescribing, only weight emerged as the significant factor by both simple (Table 2) and multiple logistic regression.

Table 2. Simple logistic regression on factors affecting solid dosage prescribing.

Variable	Crude OR (95%CI)	p-value
Age (years)		
2-5	1.00(ref.)	
6-11	1.25(0.80,1.96)	0.327
>12	1.54(0.67,3.51)	0.303
Weight (kg)	1.04 (1.01,1.07)	0.004
Disease condition		
Acute	1.00 (ref.)	
Chronic	0.53 (0.27,1.04)	0.064
Gender		
Male	1.00 (ref.)	
Female	1.18(0.78, 1.78)	0.435

The potential cost saving of corresponding liquid formulation with desired volume and its availability solid dosage form for prescription collected during the 5-month period of study (by excluding overlapping prescriptions of the same patient) was MYR 6245.70, which averages as MYR1249.14/month

Discussions/Conclusions

- Most tablets prescribed were in the range of 5-10mm (62.5%) which are only suitable for 6-11 years old.³ However, there is no significance difference between age group and solid dosage suitability ($p>0.05$).
- Most of prescribed medication for paediatrics varied widely in size e.g. paracetamol 500mg tablets ranged from 5 to 22mm, with a median of 15mm. The common paediatric antibiotics were larger with a median diameter of 17mm).⁵
- Most of our paediatric patients were 2-5 years old (60.6%). However, only a fraction (15.1%) of tablet with size of 3-5mm were only suitable for this age group. Liquid formulation will still be suitable for this group of patients. In our setting, parents/carers may still be afraid for patients to take solid dosage medication in this age.
- Suitability of oral solid dosage forms based on size from the EMA³ may not be suitable for Asian population. To the best of our knowledge, there is no consensus or guideline to date published in Asia.
- From cost saving MYR6245.70 per month, we think cost saving will be more if take into consideration of usage in paediatric patient in HTF.
- Prescribed solid over liquid preparation proven to reduce medication cost expenditure.

In conclusion, conversion of liquid to suitable oral solid medications is cost-saving and feasible to be practised.

References

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