

Reproducibility and accuracy of measurement of oral liquid pharmaceutical forms, using a dosing spoon

Neves I.²; Proença L.¹; Auxtero D.^{1,2}

¹ CiiEM Centro de Investigação Interdisciplinar Egas Moniz; IUEM, Instituto Universitário Egas Moniz

² PharmSci Lab – Innovative Solutions in Pharmaceutical Sciences ; IUEM, Instituto Universitário Egas Moniz

Email contact of the corresponding author: mauxtero@egasmoniz.edu.pt

Introduction

- Dose measurement is a common cause of error in drug administration, especially in the case of liquid formulations, such as sticky, sugary syrups, which are hard to measure accurately. Our goal was to study the ability of pharmacy students to accurately measure syrup using a dosing spoon, over several days.

Materials and Methods

- This pilot study was conducted at IUEM with 26 randomly selected pharmacy students.
- Each participant measured 5 mL of 20% (w/v) chloral hydrate syrup using a metered dose spoon, as if they were to take it, during five days.
- Measured dose was compared with a reference weight (5 mL syrup = 6.2642 g), accurately measured with a volumetric pipette.
- Participants provided written, informed, consent and their visual problems were registered.
- Measurements were done in triplicate, using analytical balance (KERN ABJ, $d = 0.0001$ g).
- Data analysis was performed using IBM SPSS Statistics v. 24.0. The statistical analysis comprised descriptive measures of experimental outcomes, such as means and standard deviations.
- Inferential statistics were applied for group comparisons (*t*-Student's test) and time-dependent comparisons (repeated measures ANOVA).
- Level of significance was set at 5%.



Fig.1 – Dosing Spoon used (Capacity = 5 mL)

Results

- Average measured values ranged from 4.89 (± 0.55) g (5th measure) to 5.30 (± 0.66) g (2nd measure).
- All average daily values were significantly lower than the reference dose ($p < 0.001$).
- Time was shown to be a significant factor when comparing the average daily measurements ($p = 0.007$).
- Last average measured value was significantly lower than the first two (1st measure, $p = 0.050$) and (2nd measure, $p = 0.005$).
- Subject reported eyesight problems did not influence the measurement outcome ($p = 0.506$).

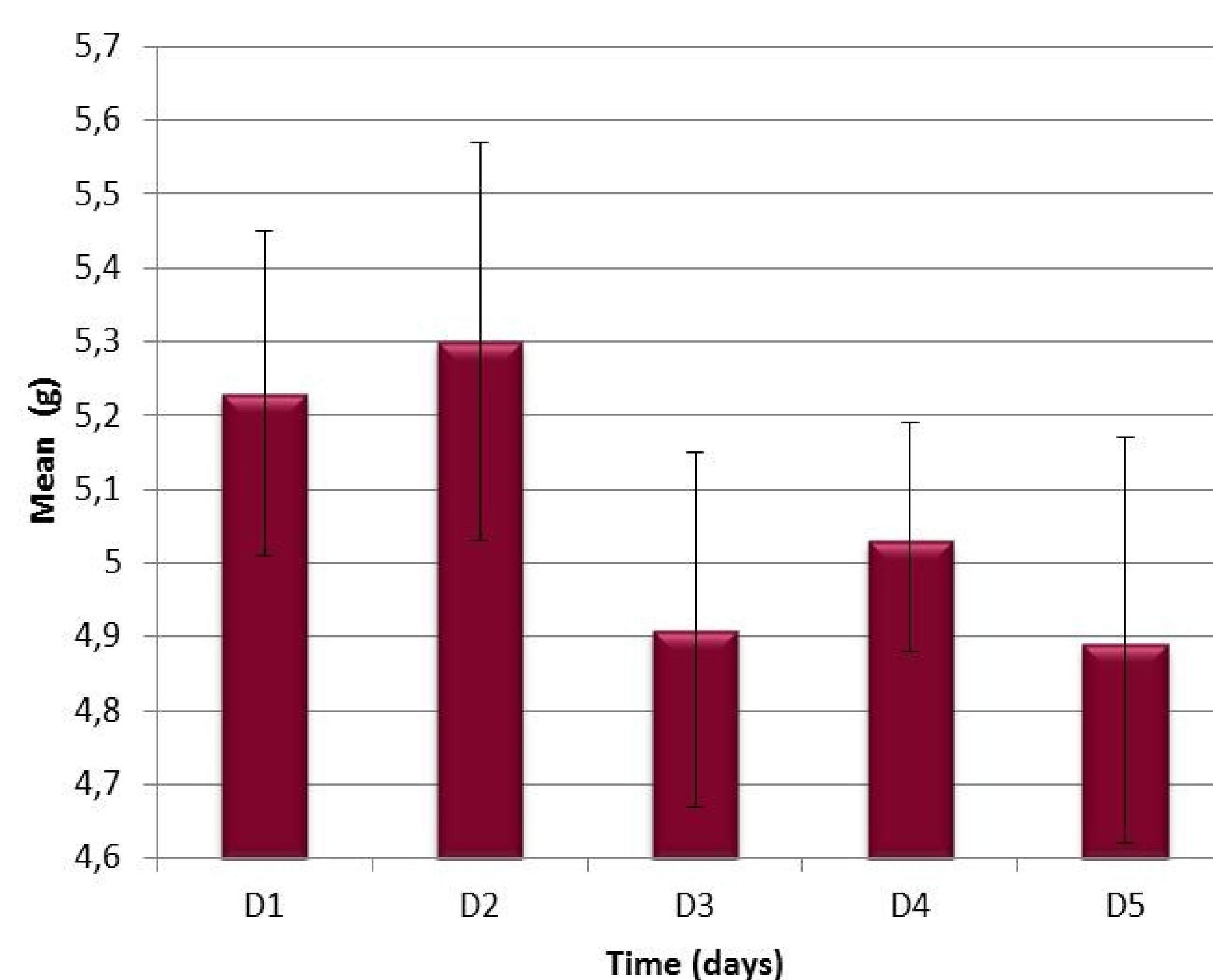


Fig.2 - Amount of syrup measured during 5 days ($n = 26$), presented as mean and 95% confidence intervals for mean

Conclusions

- Despite the use of a dosing spoon, the measurement accuracy of syrup doses, was poor, resulting in significant underdosing.
- Time affected the participant's ability to measure doses.
- This study shows that the use of dosing accessories accompanying liquid dosage forms does not guarantee their desirable dosage accuracy.
- Clinicians should always consider the possibility of a medication dosing error when faced with an apparent treatment failure.

Reference:

Yin, H. S., et al (2016). Liquid Medication Errors and Dosing Tools: A Randomized Controlled Experiment. *Pediatrics*, 138(4), e20160357. <http://doi.org/10.1542/peds.2016-0357>