Knowledge and practice of prescription and administration of correct dose of paracetamol to children among a selected group of doctors and nurses

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Submitted on 08.07.2021 and accepted for publication on 31.05.2022

ABSTRACT

Introduction: In children, paracetamol is the most common agent involved in drug toxicity. Therefore, accurate prescription of paracetamol in healthcare facilities is important in paediatric patients. This study aimed to explore the knowledge and practice of doctors and nurses on administration of correct dose of paracetamol.

Methods: A descriptive cross-sectional study was carried out recruiting doctors and nurses from paediatric units and Emergency Treatment Unit (ETU) at Teaching Hospital, Karapitiya, Galle. A self-administered pre-tested questionnaire and bed head tickets were used to collect data.

Results: There were 100 participants in the study. Majority (98%) knew correct single therapeutic dose of paracetamol. Ninety three percent of them did not know the maximum daily dose of paracetamol for children. Statistically significant association was seen being a doctor ($\chi^2 = 11.4, p = 0.004$) and a doctor in ETU ($\chi^2 = 9.02, p = 0.009$) on- the knowledge of maximum dose of paracetamol to a child/24 hours.

Half of the participants (56%) knew the acute toxic single dose of paracetamol. There was a significant association between work experience in paediatric unit/ ETU with the knowledge of acute single toxic dose of paracetamol ($\chi^2 = 14.8, p = 0.04$).

Almost all participants (99%) were aware that paracetamol dose calculation depends on the weight of the child.

Eighty three percent of prescriptions for inward patients were prescribed with therapeutic doses.

Conclusion: Even though paracetamol is a common drug there is a knowledge gap among nurses and doctors on prescription of paracetamol in the selected setting.

Keywords: *Acetaminophen, health personnel, knowledge, paediatrics, professional practice.*

Introduction

Paracetamol (acetamenophen) is a widely used antipyretic and analgesic drug with a good safety profile in all age groups (1). Paracetamol is an over-the-counter drug which is frequently used for self-medication hence widely misused. It is used to relive mild to moderate pain and fever (2). As an analgesic, preparations of paracetamol are available either alone or in combination with nonsteroidal anti-inflammatory drugs and opioids (3). It is

available as tablets, syrup, suppositories and intravenous formulations. Syrup is commonly used for the paediatric age group and it is recommended to use a standard measuring cup, measuring spoon or syringes to measure the dose (4).

The recommended dose of paracetamol is 10 - 15 mg/kg body weight every 4 - 6 hours up to a maximum of 75 mg/kg body weight per day which should not exceed 100 mg/kg body weight per day as it is toxic to liver (4, 5).

Paracetamol syrup is available in a concentration of 120 mg/5ml and the strength of a tablet of paracetamol is 500 mg (6). Paracetamol suppository is available as 25 mg, 100 mg, 125 mg and 250 mg. Paracetamol intravenous solution is available as 500 mg/50ml and 1000 mg/100 ml.

Paracetamol overdose can cause liver and renal damage when taken as a single overdose or multiple supra therapeutic doses (4). Single or repeated doses of paracetamol more than 200 mg/kg/24 hours may cause severe hepatocellular necrosis and, much less frequently, renal tubular necrosis (5).

In young children, paracetamol is the most common agent involved in drug toxicity (7). Therefore, accurate prescription of paracetamol in the healthcare facilities is of paramount importance in paediatric patients.

In Sri Lanka, there is no published literature which explores the knowledge and practices of administration of paracetamol to children among doctors and nurses. Therefore, the study aimed to explore knowledge and practice of administration of paracetamol to children among a selected group of doctors and nurses in paediatric units and Emergency Treatment Unit (ETU) at Teaching Hospital, Karapitiya.

Methods

A hospital-based descriptive cross-sectional study was conducted after obtaining ethical clearance from the Ethics Review Committee, Faculty of Allied Health Sciences, University of Ruhuna. Convenient sampling method was used to recruit the participants (doctors and nurses) who worked in all Paediatric Units and ETU at Teaching Hospital, Karapitiya, Galle. A total of one hundred doctors and nurses were recruited for the study. Informed written consent was obtained from the participants at the time of recruitment.

Data was collected using a pretested, self-administered questionnaire and bed head tickets.

The questionnaire was used to gather demographic characteristics, knowledge on therapeutic dose of paracetamol, calculation of the dose, practice and administration of correct dose of paracetamol. There were 05 questions of knowledge and 05 questions of practice in questionnaire.

Data were analysed by *SPSS*-Statistical Package for Social Sciences version 25. Apart from descriptive statistics Chi square test was performed to identify the association between categorical variables.

Results

There were 100 participants (50 doctors, 50 nurses). There were 16 and 34 doctors from ETU and paediatric units respectively whereas all 50 nurses were from paediatric units. The majority (78%) of the participants were females. The mean (SD) age of the participants was 36.5 (7.9) years. Characteristics of participants are shown in Table 1.

The majority of participants had a total work experience of more than 10 years (Table 2).

Knowledge on therapeutic dose of paracetamol

Of the total, 98% knew the correct therapeutic single dose of paracetamol. An intern house officer stated that the single therapeutic dose of paracetamol is 1.5 mg/kg body weight while a senior house officer did not answer to the question.

Most of the participants (93%) did not know the maximum dose of paracetamol that can be given to a child per day, that is 75 mg/kg body weight and four participants did not answer the question. Only three doctors gave the correct answer (two senior house officers and one registrar). None of the nurses knew the correct maximum dose of paracetamol which can be administered within 24 hours to a child (Figure 1).

There was a significant association between profession and the knowledge of maximum dose of paracetamol to be given within 24 hours (χ^2=11.4, p = 0.004).

There was an association between the total duration of work experience (χ^2=12.6, p = 0.09) or the work experience in paediatric unit (χ^2=9.4, p = 0.3) with the knowledge on maximum dose that can be given within 24 hours though the association is not significant.

There was a significant association between knowledge of doctors in paediatric units and ETU about the maximum dose of paracetamol that can be given within 24 hours (χ^2=9.02, p=0.009). Only three doctors (18.75%) in ETU gave the correct answer for maximum dose to a child per day (Table 3).

About half of the participants (56%) knew the acute single toxic dose of paracetamol (62% doctors and 50% nurses). Twelve participants did not respond to the question (9/50 nurses and 3/50 doctors) (Table 3).

There was a significant association between work experience in paediatric unit and the knowledge of acute single toxic dose of paracetamol (χ^2=14.8, p=0.04). The knowledge on acute single toxic dose of paracetamol is better among those who had more work experience in paediatric units than the others.

Furthermore, there was no significant difference in knowledge on single toxic dose of paracetamol between doctors and nurses (χ^2 = 3.6, p = 0.2), total duration of work experience (χ^2=10.1, p =0.08).

There was no significant association between knowledge of doctors in paediatric units and ETU with acute single toxic dose of paracetamol (χ^2 =1.8, p = 0.4). Twenty two out of 34 doctors in paediatric units and 9/16 doctors in ETU knew the correct acute single toxic dose of paracetamol (Table 3).

Practice of calculation of paracetamol dose

Almost all knew that paracetamol dose calculation depends on the weight of the child. Surprisingly, sixteen participants further stated that it depends on the disease condition.

Although majority of participants used dropper, measuring spoon or measuring cup to measure paracetamol syrup, eight participants (2 doctors and 6 nurses) said that teaspoon can be used for measuring paracetamol syrup. However, none of them stated that teaspoon is the best method to measure paracetamol syrup.

Table 1: Demographic characteristics of the participants

Characteristics	Number
Age (years)	
20-30	29
31-40	49
41-50	13
51-60	9
Level of Education	
Doctors	
Graduates	46
Post Graduates	4
Nurses	
Diploma holders	46
Graduates	3
Post Graduates	1
Designation	
Doctor	
Intern House Officers	11
Reserved House Officers	9
Senior House Officer/ Medical Officers	21
Registrar	9
Nurses	
Grade 3	13
Grade 2	17
Grade 1	13
Supra Grade	6
Nursing Sister/ Master	1

Practice on administration of correct dose of paracetamol

Of the total, 99% stated that paracetamol should be administered 4 - 6 hourly. Among all individuals, 90 knew the correct concentration of paracetamol syrup. The numbers of participants who gave incorrect answers and who did not answer were seven and three respectively.

Ninety-four participants stated that the strength of paracetamol tablet is 500 mg which is correct. However, six participants had written it as 500 g.

Seven participants (7 doctors and 0 nurses) believed that they should give another dose of paracetamol in-between two doses in case the child develops fever again.

Evaluation of the prescriptions to determine the dose of paracetamol administered

Altogether, 54 bed head tickets were evaluated from four paediatric wards in Teaching Hospital, Karapitiya. Weight of the child was not recorded in the bed head tickets of four children. Therapeutic dose was prescribed in 45 (83%) bed head tickets and there were five prescriptions of supra-therapeutic doses and sub therapeutic doses prescribed for four children.

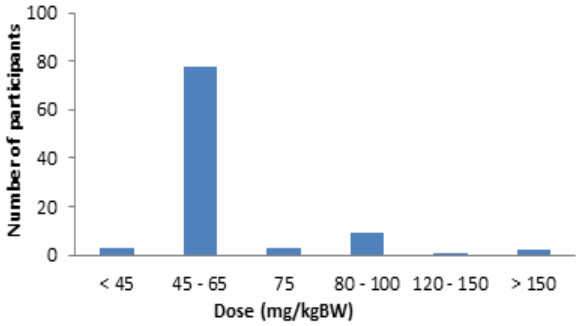

Figure 1: Knowledge on maximum dose of paracetamol per day.

Table 2: Work experience of doctors and nurses

Duration of work experience (years)	Number
Total work experience	
Doctors	
< 1	11
1 - 5	18
5 - 10	10
≥ 10	11
Nurses	
< 1	02
1 - 5	05
5 - 10	17
≥ 10	26
Work experience in a paediatric unit	
Doctors	
< 1	30
1 – 5	16
5 – 10	02
≥ 10	02
Nurses	
< 1	09
1 – 5	20
5 – 10	11
≥ 10	10

Table 3: The knowledge about therapeutic doses and acute single toxic dose of paracetamol among doctors and nurses

Dose	Profession	Unit	Accurate	Inaccurate	Not responded
Single therapeutic dose	Doctors	ETU (16)	16	00	00
		Paediatric wards (34)	32	01	01
	Nurses	Paediatric wards (50)	50	00	00
Maximum therapeutic dose/24 hours	Doctors	ETU (16)	03	11	02
		Paediatric wards (34)	00	33	01
	Nurses	Paediatric wards (50)	00	49	01
Acute single toxic dose	Doctors	ETU (16)	09	05	02
		Paediatric wards (34)	22	11	01
	Nurses	Paediatric wards (50)	25	16	09

Discussion

The current study highlights that the majority of doctors and nurses were aware of the correct single therapeutic dose of paracetamol. However, the knowledge on the maximum dose of paracetamol that can be given to a child per day and the single toxic dose of paracetamol was not satisfactory.

The finding of the knowledge on single therapeutic dose of paracetamol is compatible with the studies conducted in other countries in which majority of participants considered that 10-15mg/kg/dose was the correct single therapeutic dose (8). Another study had shown that, 36.7% of the care givers were unsure of the correct dose of paracetamol (9).

A previous study reported that 76% physicians were aware of the maximum daily dose of acetaminophen (10). Another study had shown that, only 70.6% pharmacists identified the maximum daily dose of acetaminophen correctly (11). According to a previous study, 56.9% of nurses correctly knew the single therapeutic dose of paracetamol (12). The findings in the current study is worse compared to the other literature due to the fact that except for three participants, all others did not know the maximum therapeutic dose that can be given for a child within 24 hours.

According to the guidelines given by the National Poisons Information Centre, a single overdose of more than 10 g (20 tablets) in adults or 200 mg/kg body weight can be potentially fatal and single or repeated doses of paracetamol more than 200 mg/kg/24hours may cause severe hepatocellular necrosis and much less frequently, renal tubular necrosis (5). In the current study, around half of the participants knew the acute single toxic dose of paracetamol. A study conducted in Australia and New Zealand has shown that 14 out of 54 cases of paediatric acute liver failure were due to paracetamol poisoning. The majority were secondary to medication errors (13). Literature on awareness of acute toxic dose of paracetamol among health care workers are scarce. A study has shown that a majority (85%) of care givers knew about paracetamol poisoning and 61% of them identified that poisoning can occur by administrating a single dose as well as giving the correct dose more frequently than recommended (14). According to Daifallah A*, et al*., (2021), only 50.9% of parents recognized that paracetamol overdose could result in serious harm (15).

Literature shows that the majority of participants considered giving an antipyretic drug to a child based on weight (58%), according to the age (49%), severity of fever (38%) and severity of illness (28%) (8). According to Fernandopulle M (2016), paracetamol was prescribed according to body weight rather than age especially in children (2).

Though majority of participants used dropper, measuring spoon or measuring cup to measure paracetamol syrup, a few healthcare workers still consider that teaspoon can be used for measuring paracetamol syrup. There was no study on knowledge about measuring equipment among healthcare workers. It was explored that majority (83%) of care givers used the standard measuring devices (measuring spoon or cup) and the rest used the teaspoon (14). Another study showed that commonly used measuring device was a measuring cup (83%), a few-participants used teaspoon (16).

In this study, response received on frequency of administration of paracetamol is better than that of previous studies. A study explored that 75% of pharmacists knew the correct frequency of administering paracetamol, that is 4-6 hours (11). Another study had shown that, only 3.7% of the care givers answered correctly for frequency of paracetamol use (9).

The current study shows that the majority of participants knew the correct concentration of paracetamol syrup and strength of paracetamol tablet. An electronic survey done in Saudi Arabia had shown that 31.2% of public were aware about correct strength of the paracetamol tablet (17).

The current study found that the therapeutic dose was prescribed to 83% of in-ward children. The rest were supra-therapeutic doses and sub therapeutic doses. Weight of the child was not recorded in the bed head tickets of some children. Kazouini *et al.,* (2011), has shown that 11.3% of all prescriptions were classified as under-dose, 2.9% as overdose and 15% had no dosage instructions and paracetamol off label prescribing was common in primary care, with relatively high levels of potential overdosing in young children and potential under-dosing in the older children (18). Study of overdosed paracetamol (acetaminophen) prescriptions and subsequent pharmacist interventions in French hospitals showed that a large number of adult patients in French hospitals are

potentially being exposed to supra therapeutic paracetamol doses (19).

Conclusion

Although paracetamol is a very common drug, there are gaps in knowledge among doctors and nurses at the selected study setting.

Limitations

The study was conducted in one hospital and the sample size was small. Convenient sampling method was used to collect data. It would have been better if small group discussions could be held to identify the factors influence for inadequate knowledge and incorrect practice, further that may enable us to identify the strategies to rectify the errors.

Acknowledgements

Director, Teaching Hospital, Karapitiya for permitting to carry out this research in Teaching Hospital, Karapitiya, doctors and nurses who volunteered to participate in the study and their cooperation given during the data collection period.

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