Original Article

Evaluation of the effect of pre-operative over-fasting on post-operative vomiting in children undergoing bone marrow aspiration at a tertiary care setting in Sri Lanka: A prospective cohort study

Address for correspondence:
Dr. Vidura Jayasinghe, Post-Graduate Institution of Medicine, University of Colombo, Colombo, Sri Lanka.
E-mail: jayasingheavk@gmail.com

Vidura Jayasinghe, PK Buddhika Mahesh[1], CMD Sooriaarachchi[2], Jimutha Jayalath[2], Weranga Karunarathne[2], SN Liyanage

Department of Community Medicine, Post-Graduate Institution of Medicine, University of Colombo, [1]Department of Medical Administration, Regional Director office of Colombo, Colombo, [2]Department of Anaesthesia, National Cancer Institute Maharagama, Maharagama, Sri Lanka

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ABSTRACT

Background and Aims: Non-adherence to standard fasting guidelines may result in perioperative complications. We aimed to determine the association between pre-operative over-fasting and post-operative vomiting amongst children undergoing bone marrow aspiration under general anaesthesia. **Methods:** A prospective cohort study was conducted from May 2015 to April 2016 in children undergoing bone marrow aspiration under general anaesthesia and their caregivers. Children fasted for ≥3 hours from last clear fluid intake constituted the exposed group (n = 202) while children fasting for <3 h constituted the non-exposed group (n = 202). The primary outcome was the development of post-operative vomiting during the 6 h following induction of anaesthesia. The awareness of the caregiver regarding the importance of keeping the child fasting before anaesthesia was evaluated. **Results:** The mean (standard deviation) duration time of fasting of the exposed and non-exposed groups were 7.2 (2.4) and 2.2 (0.3) h, respectively. Thirty-two (15.8%) children in the exposed group and 17 (8.4%) children in the non-exposed group developed post-operative vomiting. The relative risk of developing post-operative vomiting amongst over-fasting children was 1.9 (95% confidence interval [CI] = 1.1–3.3, P = 0.02), while adjusting to the age, it was 2.1 (95% CI = 1.1–4). Significantly more caregivers were clear about the fasting advice in the non-exposed group than in the exposed group (P < 0.001). **Conclusion:** Over-fasting is a significant risk factor to develop post-operative vomiting in paediatric anaesthetic practice.

Key words: Caregiver, fasting, general anaesthesia, paediatric, vomiting

INTRODUCTION

Patients are kept fasting before anaesthesia to prevent aspiration of the gastric contents. Patients have to be kept fasting for solid food for 6 h and clear fluid for 2 h. Furthermore, paediatric patients can be breastfed up to 4 h before induction of anaesthesia.[1,2]

However, fasting is more complicated in paediatric anaesthesia, as caregiver awareness of fasting guidelines and adherence to them play key roles.[3] Not only inadequate fasting but also prolonged fasting leads to problems in paediatric anaesthesia.[4,5] Post-operative vomiting is one complication of prolonged fasting[6,7] where documented literature was minimum in lower-middle-income setting such as Sri Lanka. The present study assessed the association between

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over-fasting and post-operative vomiting in children following general anaesthesia. Furthermore, we assessed the caregivers' awareness regarding fasting and whether they adhere to fasting advice.

METHODS

A prospective cohort study was conducted from 1st May 2015 to 30th April 2016. Approval was obtained from the Ethics Review Committee of Sri Lanka Medical Association. Informed written consent was obtained from the guardians of children following an explanation of the study and it objectives.

Children aged between 3 years and 12 years awaiting bone marrow aspiration under general anaesthesia and their caregivers were enrolled for the study. The study excluded children who had vomiting within 3 days before the bone marrow aspiration. The caregivers of the selected children had been advised to give clear fluid 2 h before the scheduled time for the bone marrow aspiration. All selected children were followed up from the time of last clear fluid intake up to 6 h following induction of anaesthesia. The exact duration of fasting was calculated from time between last clear fluid intake to induction of anaesthesia. Researchers observed the children without any interference with the fasting and induction time. The total sample was divided into exposed group and non-exposed group according to the fasting time. Exposed group included children who were kept fasting for more than 3 h following last clear fluid intake. Non-exposed group included children who were kept fasting for 3 h or less following last clear fluid intake. The outcome of interest of the study was the development of post-operative vomiting during the follow-up period. All selected children were anaesthetised in a similar pattern with halothane gaseous induction with spontaneous breathing and body weight appropriated anaesthetic circuit were used. Only bag-mask ventilation was done as duration of bone marrow aspiration was only 3–5 min. None of the participants were given positive pressure ventilation or opioids. Body weight appropriate pre-induction paracetamol was given to all participants. All children were allowed oral fluids 1 h after the procedure and after full recovery from anaesthesia. The children were monitored for vomiting up to 6 h following induction of anaesthesia.

A pre-tested judgmentally-validated questionnaire and a data-extraction sheet were used to obtain relevant data of the children and caregivers. Questionnaire contained three sections. First section included questions on sociodemographic details of the participants. Second section included the questions regarding the awareness on fasting. The third section covered the practice-related questions on the fasting status. The data extraction sheet included the clinical details related to vomiting which the child experienced. The variables in the questionnaire and the data-extraction sheet were selected through a literature review and with the experiences of the investigators. Then, the draft questionnaire was circulated with modified Delphi technique to a panel of five experts related to the field of anaesthesia for ensuring face, content and consensual validity. All caregivers had been routinely informed on fasting in both groups by the ward medical staff. The awareness of the caregiver regarding the importance of keeping the child fasting before anaesthesia was evaluated.

To detect a difference of 15% in the incidence of vomiting in the two groups (30% in exposed group and 15% in non-exposed group) with an alpha error of 5% with 80% power, a sample size of 202 patients in each group was calculated.

Hence, 202 children were enrolled in each group.

Data were analysed using SPSS 20 version statistical package (Post graduate Institute of Medicine, University of Colombo). Continuous data were presented as a mean and standard deviation and analysed with Student's *t*-test. The categorical data were presented as percentages and analysed with Chi-square test. The significance level was taken as 5%. Bivariate as well as age-adjusted relative risk was calculated for the association between over-fasting and post-operative vomiting. For the relative risks, 95% confident intervals and respective '*P*' values were described.

RESULTS

A total of 404 children were recruited for the study with equal number in the non-exposed and exposed groups. The children in exposed group were older than those in the non-exposed group, the gender distribution was not different in the two groups and the duration of fasting was longer in the exposed group compared to the non-exposed group [Table 1].

Table 2 shows the caregivers' details of both groups. Most of the caregivers in both groups were mothers. There was no significant difference between the ages of caregivers of two groups. Majority of caregivers

were educated up to ordinary level, which was not different in the two groups. Most of the caregivers were unemployed in both groups.

Significantly more caregivers were clear about the fasting advice in the non-exposed group than in the exposed group ($P < 0.001$). About two-thirds of the caregivers knew the reason for the fasting of their child. This did not show a significant difference between the exposed and non-exposed groups [Table 3].

The study further analysed the association between awareness of fasting and level of education of caregivers. However, it did not show a significant difference [Table 4].

The main outcome of interest of the study was post-operative vomiting. Amongst the children in the exposed group, 32 out of 202 developed post-operative vomiting, while 17 children out of 202 in the unexposed group developed post-operative vomiting. Relative risk of developing post-operative vomiting amongst exposed children was 1.9 (95% confidence interval [CI] = 1.1–3.3) in bivariate analysis [Table 5].

We performed multivariate analysis with multiple logistic regression to get the age-adjusted relative risk for developing post-operative vomiting. The adjusted relative risk was 2.1 (CI = 1.1–4.0; $P = 0.018$). The age did not show a significant association in the regression model ($P = 0.343$).

DISCUSSION

Over-fasting is a major problem in paediatric anaesthesia according to many global studies.[4,5,8,9] We tried to explore the association between over fasting and the occurrence of post-operative vomiting as the latter leads to more morbidity and mortality. Many global evidence show that children can be fed with clear fluid up to 2 h before induction of anaesthesia.[9,10] The current study shows that the risk of post-operative vomiting is higher amongst the children who were kept for a longer duration of fasting unnecessarily.

In this study, we considered the exposure status as children kept fasting more than 3 h following last clear fluid intake. The results showed that there was a significant age difference between exposure group and non-exposure group. This was expected in local clinical setting as younger children are given priority in the surgical lists and relatively older children have to wait for longer duration outside the theatre without any meal. This has been highlighted in our results as the duration of the fasting was significantly different between two groups. Fasting for a long period increases both children's and parental anxiety and psychological stress. However, proper theatre allocation time procedure would reduce this burden to some extent.

Table 1: Distribution of age, gender and fasting time in non-exposed and exposed groups

Patient characteristics	Non-exposed group	Exposed group	*P*
Age (years)	5.5 (2.0)	6.7 (5.8)	0.005
Gender			
Male:female	107 (53):95 (47)	99 (49):103 (51)	0.426
Duration of fasting (h)	2.2 (0.3)	7.2 (2.4)	<0.001

Age and duration of fasting are expressed as mean (SD) and analysed using Student's *t*-test. Gender is expressed as *n* (%) and analysed using Chi-square test. SD – Standard deviation

Table 2: Caregiver information

Caregivers' characteristics	Exposed group	Non-exposed group	*P*
Type of caregiver			
Mother	151 (74.8)	130 (64.4)	
Father	36 (17.8)	69 (34.2)	
Other	15 (7.4)	3 (1.4)	
Age of the caregiver (years)	37.6 (7.6)	37.5 (6.7)	0.95
Level of education ≤O/L	185 (91.6)	180 (89.1)	0.41
Unemployed	155 (51.8)	144 (48.2)	0.21

Age of caregivers is expressed as mean (SD) and analysed using Student's *t*-test. Rest of the data is expressed as *n* (%) and analysed using Chi-square test. SD – Standard deviation; O/L – Ordinary Level

Table 3: Awareness of caregiver on fasting

Caregivers' characteristics	Exposed group	Non-exposed group	*P*
Information clear	150 (74.3)	185 (91.6)	<0.001
Knew the reason for fasting	126 (62.4)	128 (63.4)	0.87

The data is expressed as *n* (%) and analysed using Chi-square test

Table 4: Association between awareness and level of education of caregivers

Level of education of caregiver	Knew the reason for fasting	Didn't know the reason	*P*
≤O/L	225 (88.6)	140 (93.3)	0.12
>O/L	29 (11.4)	10 (6.7)	

The data is expressed as *n* (%) and analysed using Chi-square test. O/L – Ordinary Level

Table 5: The association between over fasting and post-operative vomiting

Exposure status	Developed vomiting	Not develop vomiting	Relative risk (95% CI) *P*
Exposed group	32 (15.8)	170 (84.2)	1.88 (1.08-3.28)
Non-exposed group	17 (8.4)	185 (91.6)	0.02

The data are expressed as *n* (%). CI – Confidence interval

Most of the caregivers were mothers in both groups. This is similar to global literature which may be due to the fact that fathers are employed mostly and mothers have to stay with their children. Parental educational status is an important factor in understanding and complying with fasting advices. However, our study did not elicit any significant association between awareness and the level of education.

All caregivers in the study were informed regarding fasting. However, only 83% of them were aware about fasting instructions. Parental anxiety and psychological stress diminish capacity of understanding just before the surgery. Many studies have emphasised the importance of giving clear instructions – both verbal and written, in advance.[3,11,12]

Results showed that the exposed group has had 2.14 times higher risk to develop post-operative vomiting than the non-exposure group. This may be explained physiologically as prolonged fasting secretes more gastric fluid with more acidity which leads to gastric irritation and vomiting. Similar results have been documented by Smith *et al*., who showed a higher chance of developing vomiting amongst patients fasted for a longer time. However, they explained the phenomena as over-fasted patients drink more fluid after anaesthesia due to thirst and are more prone for vomiting postsurgically.[6] Brady *et al*. showed that children permitted clear fluids up to 2 h preoperatively were not found to experience higher gastric volumes or lower gastric pH values than those who fasted for prolong time. Further they said that children permitted fluids have a more comfortable pre-operative experience in terms of thirst and hunger.[13] Over-fasting and its complications can be minimised by multidisciplinary teamwork amongst anaesthesiologists, surgeons and nursing staff.[2] In addition to that, this can be done by education of caregivers.

The study did not assess other complications due to over-fasting such as hypoglycaemia, delay of recovery from anaesthesia, prolonged hospital staying and cost analysis. This is one of the limitations of the study. Further limitation of the study is that the enrolment of children was not consecutive towards the end. To include equal number of children in the two groups, the authors had to stop enrolment in one group which already had 202 children, while continue enrolment in the other group. Due to this, the prevalence of over-fasting in the cohort could not be determined. The investigators who collected the outcome data were not blind to the group, is another limitation.

CONCLUSION

Over-fasting was associated with increased post-operative vomiting. Paying more attention on fasting advices, better communication with patients and proper theatre allocation would prevent unnecessarily prolonging of fasting time and subsequently would minimise the risk of post-operative vomiting.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. American Society of Anesthesiologists Committee. Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: Application to healthy patients undergoing elective procedures: An updated report by the American Society of Anesthesiologists Committee on Standards and Practice Parameters. Anesthesiology 2011;114:495-511.
2. Arun BG, Korula G. Preoperative fasting in children: An audit and its implications in a tertiary care hospital. J Anaesthesiol Clin Pharmacol 2013;29:88-91.
3. Cantellow S, Lightfoot J, Bould H, Beringer R. Parents' understanding of and compliance with fasting instruction for pediatric day case surgery. Paediatr Anaesth 2012;22:897-900.
4. Engelhardt T, Wilson G, Horne L, Weiss M, Schmitz A. Are you hungry? Are you thirsty? – Fasting times in elective outpatient pediatric patients. Paediatr Anaesth 2011;21:964-8.
5. Dolgun E, Yavuz M, Eroğlu B, Islamoğlu A. Investigation of preoperative fasting times in children. J Perianesth Nurs 2017;32:121-4.
6. Smith AF, Vallance H, Slater RM. Shorter preoperative fluid fasts reduce postoperative emesis. BMJ 1997;314:1486.
7. Tudor G. Fasting: How long is too long? Aust Nurs J 2006;13:29-31.
8. Farooq M, Tan K, Crowe S. Fasting times in caregivers of children presenting for ambulatory surgery. Paediatr Anaesth 2008;18:820-2.
9. Emerson BM, Wrigley SR, Newton M. Pre-operative fasting for paediatric anaesthesia. A survey of current practice. Anaesthesia 1998;53:326-30.
10. Seyedhejazi M. Preoperative fasting guidelines and their importance for children's health. J Fasting Health 2014;2:106-8.
11. Velhote AB, Bohomol E, Velhote MC. Caregivers' reactions to preoperative procedures in outpatient pediatric surgery. Einstein (Sao Paulo) 2016;14:403-7.
12. Costello CM. Implementation of the American Society of Anesthesiology's guidelines to reduce prolonged fasting

times in pediatric preoperative patients: A best practice implementation project. JBI Database System Rev Implement Rep 2016;14:251-62.

13. Brady M, Kinn S, O'Rourke K, Randhawa N, Stuart P. Preoperative fasting for preventing perioperative complications in children. Cochrane Database Syst Rev 2005;CD005285.