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ORIGINAL RESEARCH

Medicine Science International Medical Journal

Medicine Science 2019;8(3):661-5

Effects of preoperative oral carbohydrate solution intake on Patients' anxiety

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Received 26 February 2019; Accepted 30 April 2019
Available online 11.09.2019 with doi:10.5455/medscience.2019.08.9080

Abstract

Despite being a routine practice, preoperative fasting was shown not to decrease the amount and acidity of gastric content. In fact, excessive hunger is associated with adverse outcomes and delayed recovery. Research demonstrating such efficacy of preoperative oral carbohydrates still remains controversial. In this study, we aimed to evaluate the effects of preoperative oral carbohydrate solution (OCS) intake on preoperative and postoperative anxiety levels of surgical patients. Sixty patients who would undergo surgical intervention with ASA I score were included to the study. Patients were randomized to receive either 400 ml OCS (Group I, n=30) or 400 ml water (Group II, n=30) each at the last night and two hours before surgery. Three groups of anxiety tests, including the State-Trait Anxiety Inventory (STAI), the Amsterdam Preoperative Anxiety and Information Scale (APAIS), and Visual Analog Scale for Anxiety (VAS-A), were performed at the night and two hours before and six hours after the operation. At t1, the mean VAS-A was significantly lower in Group I (43.2±20.9) compared to that in Group II (59.7±24.1; p=0.01). STAI at t1 was also significantly lower in Group I than that in Group II (44.7±12.6 and 51.9±13.0, respectively; p=0.032). The scores in the other time-points (t0 and t2) were found as similar. APAIS scores did not differ between the groups. Preoperative OSC intake seems to have a tendency of reducing anxiety in operated cancer patients.

Keywords: Oral carbohydrate solution, preoperative fasting, anxiety

Introduction

Long-term preoperative fasting has been a standard practice for elective surgery patients to avoid adverse events like aspiration during anesthesia [1]. However, in recent years, it has been reported that this routine practice does not have any scientific evidence, and systematic reviews and meta-analysis have shown that pre-operative fasting does not reduce the amount and acidity of gastric content [1]. Nevertheless, such practice is still widespread despite data indicating association of long-term fasting to delayed recovery and worse outcomes [2]. The American Society of Anesthesiologists (ASA) recommends intake of clear liquids till two hours before surgery, avoiding intake of solid foods for at least 6 hours' prior surgery [3]. ERAS (Enhanced Recovery After Surgery) is a term used to describe the concept of multimodal perioperative interventions to improve postoperative outcomes. In fact, the benefits of preoperative oral carbohydrate intake have also been reported in ERAS protocols [4,5]. Traditionally, preoperative fasting time is practiced as 8 hours. However, criteria for preoperative fasting have been changed in recent years, where oral intake of clear fluids up to 2 hours is recommended and further studies were published [3,6]. Oral carbohydrate solution (OCS) administered before surgery was reported to reduce rates of adverse events originating from dehydration and hunger, including headache, nausea, vomiting, postoperative thirst in all age groups [1,6]. Since gastric transit time of OCS is usually shorter than 2 hours, the oral intake of carbohydrate solutions up to 2 hours prior to surgery has been raised [3,7]. It was reported that OCS intake at the night before and two hours before the surgery not only reduces postoperative insulin resistance but also decreased perioperative disturbances such as thirst, hunger and anxiety with a shorter length of hospital stay [4,8]. However, some studies reported that preoperative carbohydrate intake does not reduce hospital stay and increases insulin resistance [9-11]. Standard preoperative fasting regimes is assumed to be associated with increased preoperative anxiety [8]. Relieving patients with a carbohydrate-rich fluid can reduce preoperative anxiety levels. In this study, we aimed to evaluate the effects of preoperative OCS intake on preoperative and postoperative anxiety levels of surgical patients with malignancy.

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Material and Method

This study was performed upon approval by our hospital's local ethics committee in accordance with the principles of the Declaration of Helsinki. A priori power analysis was performed to determine the sample size. It was calculated that at least 29 patients should be included for each group in total; with 0.48 effect size at 5% significance level for 80% power. Further inclusion criteria were ASA risk score of I, body mass index of <30 kg/m2, adequate sociocultural level, and absence of gastrointestinal motility disorder or psychiatric problems. Those who would be candidate for abdominal surgery, thoracic surgery, or neurosurgery were excluded from the study as well as those with endocrine or gastrointestinal motility disorder. Patients' written and verbal consent were obtained. The randomization of the patients into two groups was powered by a web application (http://www.randomizer.org). Patients in Group I (n=30) were given OCS 400 mL (Nutricia Preop) at 12 a.m. before surgery and two hours before the operation. The patients of Group II (n=30) ingested 400 mL of water at corresponding time-points. All patients included in the study were operated as the first patient on the day of surgery, where general anesthesia was performed by routine monitoring. Anesthesia was induced with propofol 1.5-2 mg/kg and rocuronium 0.6 mg/kg; and patients were intubated with endotracheal tube. Anesthesia maintenance was achieved by 35% oxygen, 65% nitrous oxide and 1% sevoflurane. Ventilation was mechanically controlled and the end-tidal PCO2 was adjusted to 35-40 mm Hg. Fentanyl 1 µg/kg was administered in case that mean arterial blood pressure or heart rate exceeded 20% of preoperative values. Additional fentanyl and rocuronium were given during surgery, if required. Neuromuscular blocks were reversed by neostigmine and atropine administration.

All patients in the study group were applied State-Trait Anxiety Inventory (STAI), the Amsterdam Preoperative Anxiety Information Scale (APAIS), and Visual Analog Scale for Anxiety (VAS-A). These three anxiety tests were performed at the night before the operation (t0), 120 minutes before the operation (t1), and 6 hours after the operation (t2). The most commonly used test for measuring anxiety is the STAI, which is a 20-item scale and was developed by Spielberg et al. in 1970 [12] to assess the level of anxiety. Developed in 1996, APAIS consists of six questions divided into three groups as anxiety for surgery, anesthesia, and information desire [13]. In the VAS-A test, the anxiety level of the patients was rated within a 100-cm scale.

Statistical Analysis

Demographic data and questionnaires were recorded using the Excel 2010 (Version 14.0.7224.5000, Microsoft Corporation) software. Statistical analyses were made with IBM SPSS Version 23 program. The normal distribution of categorical data was evaluated by Kolmogorov-Smirnov test. While the paired t-test was used for comparing STAI scores to previous scores, Wilcoxon-Sign test was used to compare the VAS and APAIS scores to previous scores. The comparison between control and OCS groups was analyzed by t-test. Categorical variables are given as numbers and percentages at the Tables.

Results

A total of 69 patients who met our criteria were enrolled in the study. Nine of the patients were excluded from the study because they had difficulty in understanding the questionnaires and declared that they could not fill in the form although they had an adequate level of education. Among the 60 patients of study population, 66.7% were female and the mean age was 35.5 ± 12.5 years. The mean BMI of all patients in the study was 24.3 ± 2.2 kg/m2. There were no statistically significant differences between the groups in terms of gender, mean age, gender, height, weight, BMI, and education levels (p> 0.005), (Table 1).

Table 1. Baseline characteristics of the study groups

		Group I	Group II		P-value
Gender, n (%)	**Male**	9 (30.0%)	11 (36.7%)	20 (33.3%)	0.584
	Female	21 (70.0%)	19 (63.3%)	40 (66.7%)	
Age (years)		33.7 ± 11.2	37.2 ± 13.6	35.5 ± 12.5	0.336
Height (cm)		165.9 ± 7.6	166.7 ± 8.3	166.3 ± 7.8	0.468
Weight (kg)	6 (min: 2 to max: 20)	67.0 ± 10.0	68.2 ± 10.4	67.4 ± 10.2	0.807
BMI (kg/m2)	9.15 (min: 7.3 to max: 14.5)	24.3 ± 2.4	24.4 ± 1.9	24.3 ± 2.2	0.982
Education	Primary school	9 (29.0%)	6 (18.8%)	15 (23.8%)	0.118
	Secondary school	21 (67.7%)	20 (62.5%)	41 (65.1%)	
	High school	1 (3.2%)	6 (18.8%)	7 (11.1%)	

BMI, body mass index. Values were presented as number (percentage) of cases or mean ± standard deviation. Comparisons were made through chi-square and t-test; where a p-value <0.05 was accepted as statistically significant.

At t1, the mean VAS-A was significantly lower in Group I (43.2±20.9) compared to that in Group II (59.7±24.1; p=0.01). STAI at t1 was also significantly lower in Group I than that in Group II (44.7±12.6 and 51.9±13.0, respectively; p=0.032). The scores in the other time-points (t0 and t2) were found as similar (Table 2).

Comparison of the baseline t0 scores to the measurements at t1 and t2 showed significant improvements of VAS-A and STAI scores in both groups. On the other hand, APAIS scores did not differ between the groups. When t0 and t2 scores were compared for all anxiety tests, t2 scores were detected as significantly lower than the t0 scores (Table 3).

Table 2. Comparison of preoperative and postoperative anxiety scores by study groups

	Time	Group I	Group II	Total	P-value
	t0	37.0 ± 19.1	37.2 ± 20.4	37.1 ± 19.6	0.770
	t1	43.2 ± 20.9	59.7 ± 24.1	51.4 ± 23.9	0.010
	t2	23.8 ± 13.7	24.8 ± 18.5	24.3 ± 16.1	0.856
	t0	39.4 ± 9.3	41.1 ± 12.8	40.3 ± 11.1	0.558
	t1	44.7 ± 12.6	51.9 ± 13.0	48.3 ± 13.2	0.032
	t2	32.9 ± 9.8	35.1 ± 10.4	34.0 ± 10.1	0.394
	t0	3.5 ± 1.7	4.2 ± 2.3	3.8 ± 2.0	0.209
APAIS Anesthesia	t1	3.9 ± 2.2	4.4 ± 2.5	4.1 ± 2.3	0.452
	t2	2.3 ± 0.7	2.6 ± 0.9	2.4 ± 0.8	0.057
	t0	6.3 ± 2.7	6.8 ± 2.9	6.6 ± 2.7	0.427
APAIS Information Desire	t1	5.8 ± 2.8	6.9 ± 2.6	6.4 ± 2.7	0.110
	t2	4.8 ± 2.8	4.7 ± 2.7	4.8 ± 2.7	0.933
	t0	4.2 ± 2.3	4.5 ± 2.7	4.4 ± 2.5	0.734
APAIS Surgery	t1	4.0 ± 2.1	5.0 ± 2.9	4.5 ± 2.6	0.213
	t2	2.9 ± 2.0	3.0 ± 1.5	2.9 ± 1.8	0.174
	t0	7.6 ± 3.4	8.7 ± 4.4	8.2 ± 3.9	0.417
APAIS Total	t1	7.9 ± 3.4	9.4 ± 5.0	8.6 ± 4.3	0.313
	t2	5.1 ± 2.4	5.6 ± 2.1	5.4 ± 2.2	0.073

VAS, Visual Analog Scale; STAI, State-Trait Anxiety Inventory; APAIS: The Amsterdam Preoperative Anxiety Information Scale; t0, the night before the surgery; t1, 120 min. before the surgery; t2, sixth hour after the surgery. Values were presented as mean ± standard deviation. Comparisons were made through Mann Whitney U test. * Comparison was made through t-test and a p-value <0.05 was accepted as statistically significant.

Table 2. Comparison of preoperative and postoperative anxiety scores by study groups

		Group I		Group II		Total	
Parameter	**Time**	**Outcome**	**P-value**	**Outcome**	**P-value**	**Outcome**	**P-value**
	t0	37.0 ± 19.1	0.018	37.2 ± 20.4	<0.001	37.1 ± 19.6	<0.001
VAS	**t1**	43.2 ± 20.9		59.7 ± 24.1		51.4 ± 23.9	
	t2	37.0 ± 19.1	0.001	37.2 ± 20.4	0.003	37.1 ± 19.6	<0.001
	t0	23.8 ± 13.7		24.8 ± 18.5		24.3 ± 16.1	
	t1	39.4 ± 9.3	0.017	41.1 ± 12.8	<0.001	40.3 ± 11.1	<0.001
STAI*	t2	44.7 ± 12.6		51.9 ± 13.0		48.3 ± 13.2	
	t0	39.4 ± 9.3	0.008	41.1 ± 12.8	0.016	40.3 ± 11.1	<0.001
	t1	32.9 ± 9.8		35.1 ± 10.4		34.0 ± 10.1	
	t2	3.5 ± 1.7	0.153	4.2 ± 2.3	0.779	3.8 ± 2.0	0.221
APAIS Information Desire	t0	3.9 ± 2.2		4.4 ± 2.5		4.1 ± 2.3	
	t1	3.5 ± 1.7	0.001	4.2 ± 2.3	<0.001	3.8 ± 2.0	<0.001
	t2	2.3 ± 0.7		2.6 ± 0.9		2.4 ± 0.8	
	t0	6.3 ± 2.7	0.180	6.8 ± 2.9	0.796	6.6 ± 2.7	0.433
APAIS Anesthesia	t1	5.8 ± 2.8		6.9 ± 2.6		6.4 ± 2.7	
	t2	6.3 ± 2.7	0.002	6.8 ± 2.9	0.003	6.6 ± 2.7	<0.001
	t0	4.8 ± 2.8		4.7 ± 2.7		4.8 ± 2.7	
	t0	4.2 ± 2.3	0.834	4.5 ± 2.7	0.193	4.4 ± 2.5	0.386
APAIS Surgery	t1	4.0 ± 2.1		5.0 ± 2.9		4.5 ± 2.6	
	t0	4.2 ± 2.3	0.006	4.5 ± 2.7	0.001	4.4 ± 2.5	<0.001
	t2	2.9 ± 2.0		3.0 ± 1.5		2.9 ± 1.8	
	t0	7.6 ± 3.4	0.254	8.7 ± 4.4	0.175	8.2 ± 3.9	0.087
APAIS Total	t1	7.9 ± 3.4		9.4 ± 5.0		8.6 ± 4.3	
	t0	7.6 ± 3.4	0.001	8.7 ± 4.4	<0.001	8.2 ± 3.9	<0.001
	t2	5.1 ± 2.4		5.6 ± 2.1		5.4 ± 2.2	

VAS, Visual Analog Scale; STAI, State-Trait Anxiety Inventory; APAIS: The Amsterdam Preoperative Anxiety Information Scale; t0, the night before the surgery; t1, 120 min. before the surgery; t2, sixth hour after the surgery. Values were presented as mean ± standard deviation. Comparison was made through Wilcoxon sign test. * Comparison was made through t-test and a p-value <0.05 was accepted as statistically significant. Significant values were expressed in italic and bold font.

Discussion

In our study, we showed that the preoperative VAS-A and STAI scores of the patients who received preoperative carbohydrate solution were lower than the patients with standard fasting. However, we found that OCS intake did not make a significant difference on postoperative scores.

Preoperative fasting of six to eight hours is a routine practice to prevent aspiration of gastric contents in the perioperative period [3,14]. However, the duration of preoperative fasting can usually be prolonged in clinical practice beyond the recommended fasting period due to some flaws. Patients remain fasted for 12 hours or more in the preoperative period due to unexpected delays and schedule changes in the operating room [14]. This in turn leads to dehydration, hypoglycemia, and electrolyte imbalance, as well as patient discomfort [15]. Besides, prolonged hunger causes deterioration of catabolic status such as insulin resistance, acute phase response, and loss of lean body mass [14,16,17]. OCS taken before surgery was reported to reduce adverse events originating from dehydration and fasting, including headache, nausea, vomiting, postoperative thirst in all age groups [1,6]. Since their gastric transit time are usually shorter than 2 hours, the oral intake of carbohydrate solutions up to 2 hours prior to surgery has been raised [3,7]. Several studies suggested use of preoperative OCS to be ingested at the last night before the surgery as 400 to 800 ml and two hours before the surgery as 400 ml [18-20]. In our study, OCS (Nutricia Preop) was given as 400 ml at each of the night before the surgery and two hours before the surgery in Group I. Three separate anxiety tests, including STAI, APAIS and VAS-A, were administered to patients in the OCS and control groups at the night before the surgery, and two hours before and six hours after the surgery. The STAI values in t1 before the operation were lower in the OCS group in our study. This is consistent with the study, where the effects of two hours of preoperative OCS on anxiety, gastric volume and acidity, nausea, and vomiting was evaluated in patients with laparoscopic cholecystectomy; which reported lower STAI scores in patients receiving OCS [21].

The APAIS test has demonstrated efficacy and reliability in a detailed comparison of the anxiety levels associated with surgery and anesthesia [22,23]. A study indicated that the Turkish version of the APAIS can be used to detect the presence and severity of symptoms of preoperative anxiety and the requirement for information [24]. There are many articles in the literature that used STAI test to measure preoperative anxiety. The APAIS test has also been reported to be a reliable test such as STAI [13,24]. In our study, there was a significant difference between STAI test scores but there was no difference between APAIS scores. While there are few questions in the APAIS test, there are a large number of questions in the STAI test. We concluded that the number of questions and the characteristics of the scores may be contributed to this difference. However, we could not find any study using APAIS test to assess the effect of preoperative OCS use on anxiety. Our study can be considered important in terms of being first.

In a study by Housel et al. [8], elective surgery patients were administered liquid carbohydrate 800 ml at the night before the operation and 400 ml two hours before the operation. The authors reported lower scores of VAS and improved patient comfort in the group receiving carbohydrate compared to that observed in the control group.

The studies investigating the efficacy of preoperative OCS on anxiety rather used VAS as a tool. Sada et al. [25] in their study gave their subjects undergoing abdominal surgery OCS as 800 ml at the night before the operation and as 400 ml two hours before anesthesia. Postoperative thirst, anxiety, hunger, mouth dryness, nausea, fatigue, and sleep quality was assessed using the VAS, which was reported to be significantly lower at postoperative hour 24 in OCS group than that in the control group ($p<0.05$). In another study conducted in patients given preoperative carbohydrate and amino acid solutions compared to water alone, VAS scores were higher in the control group for anxiety, hunger, and thirst [26]. Similar to these findings, mean VAS score two hours before the surgery was significantly lower in OCS group in our study.

Several studies reported no effect of preoperative OCS on postoperative anxiety. Mather et al [9] reported no benefit of preoperatively administered carbohydrates on anxiety in the double-blind placebo controlled study of 2009, where they investigated the effects of preoperative carbohydrates on clinical outcomes after colorectal surgery and hepatic resection. Another study performed in patients undergoing laparoscopic cholecystectomy reported no difference of VAS-assessed anxiety levels between those administered preoperative OCS or placebo [27]. In our study, we performed multiple anxiety tests. we have presented different results even between the tests performed for the same patients. Anxiety tests are non-objective tests. It shows variability with personal characteristics. At the same time the need for comprehension ability for questions of different anxiety tests is variable. therefore, the level of anxiety measured may be different. This issue is mentioned in the Limitations of the study section.

Limitations of Study

Preoperative anxiety of the patients may be related to the characteristic of the disease, surgery and hunger. anxiety is also associated with many factors such as family, social, economic etc. In our study, it was not possible to completely differentiate the causes of anxiety in patients. therefore, a comparison could be made between preoperative fasting protocols of patients with similar surgical procedures.

Since anxiety scores are obtained by the answers of the patient to the questions, the results are also subjective. The education levels of the patients and their ability to understand the questions have different effects on the results. Since we cannot measure comprehension abilities, it is assumed that all patients have equal understanding ability.

Conclusion

We found out that OCS lowered the anxiety of the patients preoperatively according to VAS and STAI values, but this effect could not be seen with APAIS scores. It is still unclear whether preoperative OCS intake is beneficial for patients due to the controversies in the studies investigating the effect of preoperatively given OCS on patients' anxiety. This suggests the need for further studies designated with larger sample sizes.

Conflict of interest

The authors declare that there are no conflicts of interest.

Financial Disclosure
All authors declare no financial support.

Ethical approval
The study protocol has approved from local ethic committee

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References

1. Ljungqvist O, Soreide E. Preoperative fasting. Br J Surg. 2003;90:400-6.
2. Lambert E, Carey S. Practice Guideline Recommendations on Perioperative Fasting: A Systematic Review. JPEN J Parenter Enteral Nutr. 2016;40:1158-65.
3. 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 Task Force on Preoperative Fasting and the Use of Pharmacologic Agents to Reduce the Risk of Pulmonary Aspiration. Anesthesiology. 2017;126:376-93.
4. Noblett SE, Watson DS, Huong H, et al. Pre-operative oral carbohydrate loading in colorectal surgery: a randomized controlled trial. Colorectal Dis. 2006;8:563-9.
5. Botella-Carretero JI, Iglesias B, Balsa JA, et al. Perioperative oral nutritional supplements in normally or mildly undernourished geriatric patients submitted to surgery for hip fracture: a randomized clinical trial. Clin Nutr. 2010;29:574-9.
6. de Aguilar-Nascimento JE, de Almeida Dias AL, Dock-Nascimento DB, et al. Actual preoperative fasting time in Brazilian hospitals: the BIGFAST multicenter study. Ther Clin Risk Manag. 2014;10:107-12.
7. Soreide E, Ljungqvist O. Modern preoperative fasting guidelines: a summary of the present recommendations and remaining questions. Best Pract Res Clin Anaesthesiol. 2006;20:483-91.
8. Hausel J, Nygren J, Lagerkranser M, et al. A carbohydrate-rich drink reduces preoperative discomfort in elective surgery patients. Anesth Analg. 2001;93:1344-50.
9. Mathur S, Plank LD, McCall JL, et al. Randomized controlled trial of preoperative oral carbohydrate treatment in major abdominal surgery. B J Surg. 2010;97:485-94.
10. Jarvela K, Maaranen P, Sisto T. Pre-operative oral carbohydrate treatment before coronary artery bypass surgery. Acta Anaesthesiol Scand. 2008;52:793-7.
11. Yuill KA, Richardson RA, Davidson HI, et al. The administration of an oral carbohydrate-containing fluid prior to major elective upper-gastrointestinal surgery preserves skeletal muscle mass postoperatively--a randomised clinical trial. Clin Nutr. 2005;24:32-7.
12. Spielberg C, Gorsuch R, Lushene R, et al. Manual for the state-trait anxiety inventory. Palo Alto. CA: Consulting psychologists press, 1970.
13. Moerman N, van Dam FS, Muller MJ, et al. The Amsterdam Preoperative Anxiety and Information Scale (APAIS). Anesth Analg. 1996;82:445-51.
14. Pimenta GP, de Aguilar-Nascimento JE. Prolonged preoperative fasting in elective surgical patients: why should we reduce it? Nutr Clin Pract. 2014;29:22-8
15. Falconer R, Skouras C, Carter T, et al. Preoperative fasting: current practice and areas for improvement. Updates Surg. 2014;66:31-9.
16. Smith I, Kranke P, Murat I, et al. Perioperative fasting in adults and children: guidelines from the European Society of Anaesthesiology. Eur J Anaesthesiol. 2011;28:556-69.
17. Jankowski CJ. Preparing the Patient for Enhanced Recovery After Surgery. Int Anesthesiol Clin. 2017;55:12-20.
18. Helminen H, Viitanen H and Sajanti J. Effect of preoperative intravenous carbohydrate loading on preoperative discomfort in elective surgery patients. Eur J Anaesthesiol. 2009;26:123-7.
19. Can MF, Yagci G, Dag B, et al. Preoperative administration of oral carbohydrate-rich solutions: Comparison of glucometabolic responses and tolerability between patients with and without insulin resistance. Nutrition. 2009;25:72-7.
20. Bilku DK, Dennison AR, Hall TC, et al. Role of preoperative carbohydrate loading: a systematic review. Ann R Coll Surg Engl. 2014;96:15-22.
21. Yilmaz N, Cekmen N, Bilgin F, et al. A. Preoperative carbohydrate nutrition reduces postoperative nausea and vomiting compared to preoperative fasting. J Res Med Sci. 2013;18:827-32.
22. Ganry L, Hersant B, Sidahmed-Mezi M, et al. Using virtual reality to control preoperative anxiety in ambulatory surgery patients: A pilot study in maxillofacial and plastic surgery. J Stomatol Oral Maxillofac Surg. 2018;119:257-61.
23. Aust H, Eberhart L, Sturm T, et al. A cross-sectional study on preoperative anxiety in adults. J Psychosom Res. 2018;111:133-9.
24. Çetinkaya F, Kavuran E, Ünal Aslan KS.Validity and reliability of the Amsterdam Preoperative Anxiety and Information Scale in the Turkish population. Turk J Med Sci. 2019;49:178-83.
25. Sada F, Krasniqi A, Hamza A, et al. A randomized trial of preoperative oral carbohydrates in abdominal surgery. BMC anesthesiol. 2014;14:93.
26. Tsutsumi R, Kakuta N, Kadota T, et al. Effects of oral carbohydrate with amino acid solution on the metabolic status of patients in the preoperative period: a randomized, prospective clinical trial. J Anesth. 2016;30:842-9.
27. Bisgaard T, Kristiansen VB, Hjortso NC, et al. Randomized clinical trial comparing an oral carbohydrate beverage with placebo before laparoscopic cholecystectomy. Br J Surg. 2004;91:151-8.