

The Effects of *Mukbang* Watching on Enteral Feeding Intolerance Among Critically Ill Patients: Study Protocol for a Randomized Controlled Trial

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Purpose: With an estimated prevalence of 38%, enteral feeding intolerance (EFI) is common in critically ill patients receiving enteral nutrition (EN), and is associated with higher mortality and longer duration of mechanical ventilation. Various methods have been reported to decrease the incidence of EFI during EN, such as post-pyloric feeding, continuous EN delivery, abdominal massage, and probiotic supplementation. However, several studies reported conflicting results. Inappropriate interventions may cause gastrointestinal (GI) injury. This study aims to design a protocol based on *Mukbang* videos, which are widely watched online, to detect their effects on the incidence of EFI, nutritional status, incidence of infectious complications, and activities of daily living.

Patients and Methods: We will conduct a three-arm, parallel-design, randomized controlled trial that will be implemented in 273 patients from intensive care units. Participants will be randomized into one of the three intervention arms (1:1:1), which will be performed by a research assistant. Participants were allocated to three groups: (a) watching *mukbang* video, (b) watching a cooking show, and (c) watching a non-food content video. Prior to EN initiation, each participant will watch a ten-minute *mukbang* video, cookery show, or non-food content video.

Conclusion: *Mukbang* videos show food, expressions of *mukbangers* and eating sounds. If it effectively reduces the incidence of EFI, leads to greater nutritional status, lower incidence of infectious complications, and a higher level of independence among patients compared with watching cooking videos or non-food content videos, it has broad dissemination potential as a non-invasive, easily assessing, and using method.

Keywords: enteral feeding intolerance, *mukbang* videos, nursing, critical care

Introduction

Mukbang refers to online eating shows in which *mukbangers* eat large amounts of food. These videos show food, expressions of *mukbangers* and eating sounds. Watching *mukbang* has become popular among Internet users, who can engage individuals in online eating activities.

Enteral feeding intolerance (EFI) is common in critically ill patients receiving enteral nutrition (EN), with an estimated prevalence of 38% (95% confidence interval [CI], 31–46%).¹ EFI clinical manifestations were large gastric residual volumes (GRVs), gastrointestinal (GI) symptoms (such as vomiting, diarrhea, abdominal distension and pain/discomfort) and “inadequate” delivery of EN.¹ Underfeeding caused by EFI may not meet the increasing metabolic demands of critically ill patients. Large GRVs and vomiting increase the risk of aspiration and the consequent aspiration pneumonia. Thus, emerging evidence suggests that EFI is associated with increased mortality and a longer duration of mechanical ventilation.²

Mukbang has the potential to reduce the incidence of EFI in the following ways: (1) The visual and auditory stimulation of *mukbang* videos might lead viewers to consume more food than they normally had.³ Some viewers voiced that they gained appetite from watching *mukbang*.⁴ Critically ill patients usually suffered decreasing appetite.^{5,6} However, good appetite plays a key role in food intake, digestion, and absorption, which regulates the secretion of GI hormones and digestive juices. GI

hormonal pathways that regulate mechanisms underlying EFI has also been reported;⁷ (2) *Mukbang* viewers can obtain pleasure via autonomous sensory meridian response (ASMR) experience.^{8–10} Several studies have shown that ASMR can reduce depression and anxiety.^{11–13} fMRI scanning has implicated the neurophysiological mechanisms of ASMR effects in relation to depression and anxiety changes.¹⁴ The prevalence of depression and anxiety was 33% and 82% in critically ill patients, respectively.^{15,16} 16S rRNA sequencing showed that depression and anxiety altered the GI microbiota profile and cause bacteria dysbiosis.¹⁷ However, the GI microbiota is related to GI motility, which may consequently lead to EFI;^{18,19} (3) *Mukbang* watching makes viewers feel accompanied and alleviates loneliness and social isolation.⁸ Intensive care units (ICUs) are naturally isolated social centers. Social isolation can activate certain systems [sympathetic nervous system (SNS) and the hypothalamic-pituitary-adrenocortical axis (HPA)], which ultimately upregulates pro-inflammatory activity.²⁰ DNA microarray analysis provided that older individuals with high levels of social isolation (loneliness) showed upregulation of pro-inflammatory genes and down-regulation of antiviral and antibody-related genes.^{21,22} Pro-inflammatory cytokine release can affect smooth muscle function and impair the epithelial barrier of the GI tract.^{23,24}

However, these studies did not explore the direct/indirect relationship between *mukbang* watching and EFI incidence. In this study, we proposed a 10-minute *mukbang* watching strategy compared with watching a cooking show and watching a non-food content video, and evaluated their effects on the incidence of EFI, nutritional status, incidence of infectious complications, and activities of daily living.

Materials and Methods

Study Aims

This study aims to explore: (a) whether *mukbang* watching would decrease the incidence of EFI in critically ill patients compared with watching cooking shows or watching non-food content videos; and (b) the effects of *mukbang* watching on nutritional status, incidence of infectious complications, and activities of daily living.

Study Design

This study was designed as a three-arm, parallel-design, randomized controlled trial in an academic and teaching hospital in western China. Participants were allocated to three groups: (a) watching a *mukbang* video, (b) watching a cooking show, and (c) watching a non-food content video. None of the patients or investigators would be blinded to the grouping results. The study protocol was developed according to the SPIRIT checklist. This study reports will adhere to CONSORT guidelines.

Study Participants

Inclusion Criteria

Patients who meet the following criteria will be recruited: (1) aged ≥ 18 years; (2) expected to receive EN at ICUs ≥ 7 days; (3) receiving $\geq 70\%$ calculated caloric requirements by EN; (4) had been receiving EN ≤ 2 days before ICUs admission; (5) nutrition risk screening (NRS 2002) on admission ≥ 3 .

Exclusion Criteria

Patients will be excluded based on the following criteria: (1) hearing or visual impairment, (2) mental disorder or mental deficiency, (3) denial of signing consent to participate in this study, and (4) concomitant medical illness that would interfere with the outcome assessments and/or follow-up (such as GI surgery, advanced cancer, etc.).

Sample Size

The reported prevalence of EFI among critically ill patients ranged from 31% to 46% in the literature.¹ To detect a 20% absolute risk reduction in EFI for patients watching *mukbang* videos compared to watching cooking shows or watching non-food content videos, we used a 2-sided significance test with 5% type I error and provided 80% power. Furthermore, there will be 5% non-adherence to the intervention protocol and 5% overall loss to follow-up. The estimated sample size is 273.

Randomization

Each participant will receive a sealed envelope containing a random assignment after admission to the ICU. Participants will be randomized into one of three intervention arms (1:1:1). Randomization will be performed by a research assistant on the website (<https://www.randomizer.org/>). The research assistant will not be involved in the intervention and data analysis and will be blinded to the participants.

Study Procedure

All investigators will receive training in the purpose, design, and measurements of the study. The planned schedule of the intervention is presented in Table 1. During the screening phase, demographics, medical history, mental health, acute physiology and chronic health evaluation II (APACHE II), and NRS 2002 will be documented for eligible participants. The length of mechanical ventilation, sedation dosage, body mass index (BMI), physical examination results, nutrition-related laboratory data, Barthel Index, and infectious complications were assessed on day 1 and 7, EN-related information and the occurrence of EFI and EFI-related symptoms will be monitored daily from day 1 to 7.

EN will be initiated within 48h of admission. The standard EN protocol will be provided by a multidisciplinary team. The standard EN protocol was developed according to the related guidelines.^{25–27} All participants will watch the same *mukbang* video

Table 1 The Schedule of Enrollment, Interventions, and Assessments

Time Point	Study Period									
	Enrollment	Allocation	Post-Allocation							Close-Out
	-t0	t0 (Baseline)	t1*	t2*	t3*	t4*	t5*	t6*	t7*	t8
Enrollment										
Eligibility screen	X									
Informed consent	X									
Allocation		X								
Interventions										
Watching <i>mukbang</i> video										
Watching cooking show										
Watching non-food content video										
Assessments										
Demographics		X								
Medical history		X								
Mental health		X								
APACHE II		X								
NRS 2002		X								
The length of mechanical ventilation		X								X
Sedation dosage		X								X
BMI		X								X
Physical examination		X								X

(Continued)

Table 1 (Continued).

Time Point	Study Period									
	Enrollment	Allocation	Post-Allocation							Close-Out
	-t0	t0 (Baseline)	t1*	t2*	t3*	t4*	t5*	t6*	t7*	t8
Nutrition-related laboratory data: <ul style="list-style-type: none"> • Transferrin • Prealbumin • Albumin • Cholesterol • Triglyceride • HbA1C 		X								X
Barthel Index		X								X
Infectious complications: <ul style="list-style-type: none"> • Ventilator-associated pneumonia • Bacteraemia • CVC-related infection • Urinary tract infection • Soft-tissue infection • Other infection 		X								X
EN-related content: <ul style="list-style-type: none"> • Caloric and protein • Volume of enteral formula • Times of EN • EN route • EN temperature • EN delivery strategies 			X	X	X	X	X	X	X	
Occurrence of EFI			X	X	X	X	X	X	X	
EFI symptoms: <ul style="list-style-type: none"> • High GRVs/gastric retention • Nausea/vomiting • Diarrhea • Constipation • Increased abdominal girth /abdominal distention • Pain/ discomfort • IAP 			X	X	X	X	X	X	X	

Note: *Day 1 through day 7 following the intervention is denoted as t1~t7.

Abbreviations: APACHE II, Acute Physiology and Chronic Health Evaluation II; NRS 2002, Nutrition Risk Screening; BMI, Body Mass Index; CVC, Central Venous Catheter; EN, Enteral Nutrition; EFI, Enteral Feeding Intolerance; GRV, Gastric Residual Volume; IAP, Intra-abdominal pressure.

for ten-minute prior to EN starting, regardless of how many times will they receive EN. All data will be collected within the next 2h after EN completion each day. One supervisor will individually check the reality and integrity of the interventions and data. The other two-arm interventions will be conducted on the same schedule as *mukbang* watching arm.

Outcome Measurement

The primary outcome is the incidence of EFI in each intervention arm. EFI is defined as the interruption of enteral feeding due to GI complications (high GRVs, increased abdominal girth or abdominal distention, vomiting, emesis, diarrhea, or subjective abdominal discomfort).²⁸ The occurrence of each GI symptom will also be documented.

The secondary outcomes include nutritional status, incidence of infectious complications, and activities of daily living. Nutritional status is measured by BMI, physical examination and nutrition-related laboratory data. Nutrition-related laboratory data contain transferrin, prealbumin, albumin, cholesterol, triglyceride, and HbA1C. Infectious complications include ventilator-associated pneumonia, bacteremia, central venous catheter (CVC)-related infections, urinary tract infections, soft tissue infections, and others. Activities of daily living are measured using the Barthel Index. It is composed of 10 items and is widely used in critically ill patients. This scale measures the activities of feeding, moving from wheelchair to bed and return, doing personal toilet, getting on and off toilet, bathing self, walking on a level surface, propelling a wheelchair, ascending and descending stairs, dressing and undressing, continence of bowels, and bladder control. The total score ranges from 0 to 100. Higher scores reflect a higher degree of independence. The reliability and validity of the Chinese version of Barthel Index have been evaluated by Hou et al.²⁹

Data Monitoring

The current intervention is unlikely to have negative consequences because it is non-pharmacological and adheres to the ethical criteria of benefits and harmlessness. Thus, it is pointless to create a data-monitoring committee.

Ethical Consideration

Each participant will be informed a thorough explanation of the study aims and protocols and will provide written informed consent. No identifiable information regarding the patients will be disclosed during the course of this study. The study will be conducted in accordance with Good Clinical Practice guidelines and the Declaration of Helsinki. The protocol was approved by the West China Hospital of the Sichuan University Biomedical Research Ethics Committee (no.812[2022]). Ethical approval will be obtained again if the protocol is amended.

The researchers contacted the YouTubers who uploaded the videos. This study was authorized to use these videos for the intervention and to obtain informed consent. We will pay 50 yuan for each use.

Statistical and Analytical Plan

Statistical analysis will be performed using SPSS software (version 22.0; IBM Corp, Armonk, NY, USA). All variables will be described as frequency and percentage, median (interquartile range), or mean (\pm standard deviation). Differences in baseline characteristics, primary outcomes, and secondary outcomes among the three intervention arms will be detected using one-way analysis of variance (ANOVA) for continuous variables and the chi-square test for categorical variables. Furthermore, the results of BMI, physical examination, nutrition-related laboratory data, and Barthel Index will be analyzed using paired sample *t*-tests to see how each group's continuous variables change from baseline to day 7 post-EN. The chi-square test will be used to identify variations in infectious complications outcome, EFI occurrence, and EFI symptoms incidence. The volume of enteral formula changes over time, as well as calorie and protein intake, will be compared between groups using repeated-measures two-way ANOVA or generalized estimating equations. Differences will be considered statistically significant at two-sided *p* values < 0.05.

Discussion

To the best of our knowledge, this is the first study to explore the effect of *mukbang* videos on enteral feeding intolerance among critically ill patients. We are expecting to see a lower incidence of EFI among patients watching *mukbang* videos than among those watching cooking videos or non-food content videos, which may lead to greater nutritional status, lower incidence of infectious complications, and higher level of independence.

The attractiveness of the creator, the quantity of food eaten, the creator's eating ability, and eating style were considered important aspects that had an impact on viewers' motivations for *mukbang* watching.⁴ Therefore, it is not feasible for the research team to create *mukbang* videos. We contacted the YouTubers who uploaded the videos. The videos were popular among Internet users and had more than 1 million views. This study will be authorized to use these videos for intervention and obtain informed consent.

EFI plays a key role in the management of EN in critically ill patients. The researchers tried various methods have been used to decrease the incidence of EFI during EN, such as continuous EN delivery, acupuncture, abdominal massage, post-pyloric feeding,

and probiotic supplementation. However, some studies have reported conflicting results. Inappropriate interventions may cause GI injury. However, studies of the effects of external auditory stimulation are limited. Researchers have reported that audio recordings of voice and rhythm have the potential to promote GI motility in newborns.³⁰ *Mukbang* watching includes the auditory and visual stimulation of eating. We identified potential mechanisms that might reduce the incidence of EFI by watching *mukbang* videos, including gaining appetite from watching *mukbang*, reducing depression and anxiety associated with GI dysfunction, and downregulating pro-inflammatory activity because of social isolation in the ICU. *Mukbang* viewing is a noninvasive method that can be easily assessed and used. If *mukbang* watching is effective in reducing the incidence of EFI, it has broad dissemination potential.

Limitations

This study has some limitations. It is more scientific that researchers control the content of the interventions. However, the attractiveness of the creator, quantity of food consumed, the creator's eating ability, and eating style are considered important aspects that have an impact on viewers' motivations for *mukbang* watching.⁴ Thus, we need to verify the feasibility and patient preferences prior to the initiation of *mukbang* watching. Additionally, *mukbang* viewing was associated with eating disorder symptoms.³¹ However, it may be beneficial for critically ill patients to increase their appetite and resist catabolism. Researchers will supervise the entire course of the study and manage the adverse events.

Conclusion

Mukbang videos show food, expressions of *mukbangers* and eating sounds. If it effectively reduces the incidence of EFI, leads to greater nutritional status, lower incidence of infectious complications, and a higher level of independence among patients compared with watching cooking videos or non-food content videos, it has broad dissemination potential as a non-invasive, easily assessing, and using method.

Abbreviations

EFI, enteral feeding intolerance; EN, enteral nutrition; GRVs, gastric residual volumes; GI, gastrointestinal; ICUs, intensive care unit; SNS, sympathetic nervous system; HPA, hypothalamic-pituitary-adrenocortical axis; NRS 2002, nutrition risk screening; APACHE II, Acute Physiology and Chronic Health Evaluation II; BMI, body mass index; CVC, central venous catheter; IAP, Intra-abdominal pressure.

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Disclosure

The authors report no conflicts of interest in this work.

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