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Original Article

Effect of Warm Saline Solution Gargling on Patients' Sore Throat and Mouth Dryness Post Upper Gastrointestinal Endoscopy

Rokaia Fathi Mohamed[1], Aml Ali Mohamed[2], Heba Abdel-Azem Mostafa[3], Hend Elham Mohammed[4]

1. Assistant Professor of Gerontological Nursing, Faculty of Nursing, Minia University. Egypt.
2. Lecturer of Gerontological Nursing, Faculty of Nursing, Minia University. Egypt.
3. Assistant Professor of Medical Surgical nursing, Al- Azhar University. Egypt
4. Assistant Professor of Medical Surgical Nursing, Faculty of Nursing, Minia University. Egypt.

ABSTRACT

Background: Sore throat with mouth dryness is a public adverse consequence of upper gastrointestinal endoscopy several days after the procedure, which can negatively affect patients' comfort, swallowing, and oral nutrition. **Aim:** To evaluate the effect of warm saline solution gargling on patients' sore throat and mouth dryness post upper gastrointestinal endoscopy. **Design:** A quasi-experimental research design (study/control) was used. **Sample:** A purposive sample of 120 patients undergoing upper gastrointestinal endoscopy. **Setting**: This study was applied in the gastric endoscopic unit and the department of gastrointestinal and hepatic disorders at Minia University Hospital, Egypt. **Methods:** Three validated tools were utilized. **1)** A structured interview questionnaire involved personal and medical profiles, **2)** the Prince Henry pain scale, and **3)** the Xerostomia Inventory (XI) scale**. Results:** The mean ages were 54.8±12.5 and 58.2±9.4 for the study and control groups respectively; 51.7% and 60% of both groups were males, respectively. The mean score of sore throat declined among the intervention group after gargling with warm normal saline solution at follow-up phases against the control group, with statistically significant differences (P-value =0.001**). Added to this, 48.3% and 41.7% of the study and control groups respectively, suffered from moderate mouth dryness at the pretest and then this ratio lessened to 20% and 11.7% for the intervention group after 24 hours and after two weeks respectively, versus 38.3% and 33.3 % for the control group respectively, with a statistically significant difference among the two groups. **Conclusion and recommendations:** Warm saline solution gargling is an effective and simple approach to alleviate sore throat and mouth dryness for both adults and elderly patients after upper gastrointestinal endoscopy. Hence, **it is recommended** to use this beneficial procedure as a routine part of care for all patients getting gastric endoscopy.

Keywords: Warm saline solution gargling, Sore throat, Mouth dryness, Upper gastrointestinal endoscopy**.**

Introduction

Nowadays, endoscopy of the upper gastrointestinal (GI) has become a widely and safe procedure for early diagnosis as well as managing upper gastrointestinal problems in different age groups **(Yhim et al 2020)**. Around 1-1.5% of the population needs an upper endoscopic investigation of the gastrointestinal tract, with an estimation that 6.1 million upper endoscopies are performed each year worldwide **(Fateh et al., 2022).**

In Egypt, it was stated that the average number of endoscopic procedures is 15 million

procedures each year, the upper GI endoscopy represents 55% of them **(Gomaa et al., 2022).**

An upper endoscopy, also called esophagogastroduodenoscopy that performed by a specialist in the diseases of the digestive system (gastroenterologist) in health care settings, an outpatient surgery center, or hospitals **(Yhim et al., 2020)**.

An upper endoscopy is an invasive maneuver in which a specialist uses an endoscope—a flexible, narrow tube with a lighted camera on the end—to monitor, assess, and treat conditions pertaining to the upper gastrointestinal tract. The tract's photographs are sent from the camera to a video screen (Pascu., 2019).

Gastrointestinal endoscopy has grown in significance during the past forty years as a diagnostic, therapeutic, and prophylactic tool for disorders of the digestive system. It was first introduced and developed in 1865 by Adolf Kussmaul, who was considered an early innovator of the open-tube gastroscope in Germany **(Gado et al., 2016).**

Sore throat and mouth dryness are common side effects of upper digestive endoscopic procedures. The main cause of its occurrence is the irritation and/or the damage to the mucosa by the inserted endoscopy. Actually, according to **(Sahbaz and Khorshid 2020),** the prevalence of postoperative sore throat varies widely and is determined by numerous circumstances. Its severity ranges from 30 to 75 percent worldwide. According to a number of studies, pain can begin after the removal of endoscopy closely, or can be late several hours or days due to the effect of sedation **(Fateh et al., 2022**).

Poor management of this sore throat dryness problem can lead to; nausea, vomiting, restlessness, and decreased patient satisfaction. Additionally, it negatively affects patients' oral nutrition, hemodynamic stability, and length of stay. On the other hand, mucosal dryness can lead to the progression of stomatitis. Several pharmacological and non-pharmacological approaches have been announced to diminish these problems. One of these methods is the use of normal saline for gargling during the postoperative period **(Yhim et al., 2020)**.

Normal Saline is a hypertonic solution, and when the persons gargle with saline water, osmosis occurs. Gargling with a higher percentage of salt draws the liquid or moisture out of the swollen throat tissues and bacterial pathogens. This can result in the lysis of bacterial pathogens, reduction of throat inflammation, and irritation **(Aravinth, 2017).** Furthermore, normal saline can reduce inflammatory mediators and thin the mucus, as well as warmth acts to release pain and stimulate the damaged tissues healing **(Hinkle et al., 2014 &Hadavi and Rezaeian 2011)**.

Digestive Endoscopic nurses play an important role during the postoperative period for patients undergoing upper endoscopic procedures, through the assessment and management of adverse side effects and potential complications **(Lui et al., 2022)**. As sore throat and mouth

dryness commonly occur as minor complications of upper GI endoscopy, training the patients about warm saline gargling is an essential role of the nurses to be performed after the procedure to keep patients comforted and maintain oral health as early as possible **(Hinkle et al., 2014).**

Significance of the study

Several related studies indicated a high incidence of sore throat and mouth dryness post upper gastric endoscopy, one of them was by **(Gomaa et al., 2022)** who found a prevalence of postoperative sore throat within 48 hours after upper endoscopic procedure was 59.6%. On the other hand, the related literature reported that gargling with a warm normal saline is the cheapest, easiest, and an effective method for solving sore throat and mucosal dryness post upper gastric endoscopic procedures, with a success rate of more than 83.5% **(Iiu et al., 2022).**

However, the widespread use of upper GI endoscopy in different health care settings at Minia Governorate with a possible sore throat and mouth dryness during the postoperative period, there have been no previous studies focusing on this health issue, from this point this study was applied to investigate the effect of warm saline solution gargling on sore throat and mouth dryness post upper gastrointestinal endoscopic procedure.

Aim of the study

To evaluate the effect of warm saline solution gargling on patients' sore throat and mouth dryness post upper gastrointestinal endoscopy.

Operation definitions

Sore throat: Unpleasant sensation of pain and discomfort, scratchy or dry throat that may hurt the swallowing.

Mouth dryness**:** Also called xerostomia and refers to the condition of not having enough saliva to keep the mouth wet.

Gargling with normal saline: In the current study, the intervention group gargled their oral cavities with 30 ml of normal saline solution which was warmed at 40 °C after three hours from the performance of upper gastrointestinal endoscopy and continued that gargling every four hours for 24 hours with a total gargling of 6 times for first 24 hours post gastric endoscopy.

Hypothesis

H0: The gargling with warm normal saline solution will not reduce patients' sore throat and mouth dryness after upper gastric endoscopy in the study group compared with the control group.

H1: The gargling with warm normal saline solution will reduce patients' sore throat and mouth dryness post upper gastric endoscopy for the study group in comparison with the control group**.**

Subjects and methods

Research design:

A quasi-experimental research design (study/control) was used to complete the current study. This design occurred when a comparison group and often utilized when it was impossible

to randomize subjects to intervention and control groups **(Iwahori et al., 2022).**

Setting:

This proposal was achieved in the gastric endoscopic unit (located on the grounded floor and consisting of the endoscopy operation room and three recovery rooms) and the gastrointestinal and hepatic disorders department (located on the fourth floor and involved six rooms, each room contained 5 beds) of the new gastrointestinal and hepatic disorders on Minia University hospital that is affiliated to Minia City, Egypt.

Subjects:

A purposive sample of 120 patients will be utilized in the current study. The sample size was estimated centered on **(Isaac and Michael 1995)** formulation which is calculated as (N=nx30/100) in which:

N= Sample size

An overall number of 400 patients underwent upper gastric endoscopy at Minia University Hospital during the last year.

N=400x30/100=120 patients.

60 patients for the Study group and +60 patients for the control group.

Inclusion Criteria:

- Patients who are aged ≥18.
- Patients who are undergoing upper gastric endoscopy for the first time.
- Patients who are capable of communicating.
- Patients approve of sharing.

Exclusion criteria:

- Patients who have a sore throat in the past two weeks before endoscopy.
- Patients who have insertion complications during gastric endoscopy.

Tools for data collection:

Three tools were used to gather the data for the present study.

Tool 1: A structured interview questionnaire: The researchers designed it following a thorough examination of the literature **(Gado et al., 2016 & Gomaa et al., 2022 and Fateh et al., 2022)** to gather the demographic and medical parameters. It was obtained just once at the first interview. It split into two primary sections:

Section 1: Demographic data of the patients that included their age, gender, marital status, education, occupation, and place of residence.

Section 2: Included the medical and upper gastrointestinal endoscopy data: The medical data included; (the presence of chronic disease, body math index (BMI), and smoking habits). While upper gastrointestinal endoscopy data covered; (indication and outcomes of upper gastrointestinal endoscopy, duration of endoscopy, and the type of sedation used).

Tool II: Prince Henry"pain scale:

It was developed by **(Pybus and Torda, 1982)** and used for examining the intensity of sore throat post-removal of upper endoscopy. It's composed of five degrees of pain ranging from

zero which refers to no pain to four which indicates severe pain.

Scoring system

The score of the Prince Henry Pain Scale varies from 0 to four degrees as follows; zero indicates no pain when coughing, 1 represents pain when coughing but not when deep breathing, 2 denotes pain during deep breathing but not during rest, 3 signifies mild discomfort during rest, and 4 represents severe pain during rest.

Tool III:- Xerostomia Inventory (XI) scale: It was adopted from (Thomson et al, 1999) and used to assess mouth dryness postoperatively. It included 11 items regarding the patients' mouth hydration and oral health. The presence of oral dryness is specified by the patients' alternative responses for each item over the previous two weeks.

Scoring system

The questionnaire comprised eleven points on a 5-point Likert scale; the patients' potential responses were never (1), hardly ever (2), occasionally (3), fairly often (4), or very often (5). The total XI score varies from 11 which means (no xerostomia) to 55 which indicates (severe xerostomia). The degrees of dryness were classified according to **(Thomson et al, 1999)** as the following:

Degree of dryness	score
No dryness	1-11
Minimal dryness	12-22
A mild degree of dryness	23-33
Moderate	34-44
Severe dryness	45-55

Tools validity and reliability:

Tools validity: A panel of three Minia University specialists in the domains of gerontological nursing and medical and surgical nursing assessed the instruments' content validity. The information coverage, clarity, wording length, format, and overall appearance of the tools were evaluated by the jury. Based on their recommendation, all jury members agree that the current study tools were valid and relevant to the study's goals.

Tools Reliability: The Cronbach's alpha coefficient was used to evaluate the questionnaire's internal consistency. A Cronbach's alpha coefficient of 1.00 denotes perfect reliability, whereas a score of 0.00 denotes no dependability at all. A dependability coefficient of 0.70 is suitable, nevertheless. The reliability of each instrument was assessed using Cronbach's alpha, and the findings are shown in the following table:

Cronbach's alpha for each study Scale:

Tool title	Cronbach's alpha
Xerostomia Inventory Questionnaires	0.84
Prince Henry's "pain scale	0.84

Pilot study:

Ten percent of the sample was used for a pilot study to assess the tools' applicability and clarity as well as to estimate the time needed to complete it. The trial sample was incorporated into the basic sample because no modifications were performed.

Ethical Consideration:

Firstly, the faculty of the nursing ethical committee accepted a research proposal, every participant gave their oral informed consent to participate in the study, and they were all free to decline participation or leave at any moment. Researches ensured that the study subjects were not at risk while the research was being conducted. Also, anonymity and secrecy were guaranteed and the confidentiality of the data gathered was maintained.

Study Procedure (Fieldwork)

The data collection for the current study took place over a period of 6 months, starting in November 2023 and ending in April 2024. The researchers scheduled two days a week for data collection. The study was conducted through 3 stages: preparatory, implementation, and evaluation.

I- Administrative design and Preparatory phase:

- The most recent, pertinent research on the subject problem from around the globe was located by searching books, journals, and the internet. Added to this, a review of the literature regarding the available related literature was done to prepare the educational brochure.
- The directors of the Minia University Hospital and the gastric endoscopic unit received formal approval to conduct the study from the dean of the Faculty of Nursing. Permission to conduct the study was granted, and the letter provided an explanation of the project's objectives and design.
- A pilot study was carried out on 10% of all participants in order to test and assess the applicability of the instruments that were used in the study after receiving ethical approval from the Nursing Faculty's ethics committee to access the setting zones.
- Patients gave their oral agreement, and participants were told that their data would be kept private and that they might withdraw at any moment.

Implementation phase:

- The researchers gathered the needed data by using the three study tools over a face-to-face interview. All patients undergoing upper endoscopy were admitted to the gastrointestinal and hepatic Minia University hospital the day prior to the procedure as a routine of the hospital. The researchers collected the initial data from the participants while they were in the department prior to transferring to the endoscopy unit by using the two parts of tool I. Firstly, data was collected from the control group who had routine hospital care after the endoscopy procedure and then the data was gathered from the study group.
- For the intervention group, the researcher provided 10 minutes of training for each patient on how to perform gargling with a warm saline solution and demonstrated saline gargling for each one who underwent upper

digestive endoscopy to ensure good understanding. We warmed the saline solution bags safely by warping them in a wet heated towel or putting them directly in a container filled with warm water and instruct each patient these techniques of warmth at discharge.

- After performing the upper endoscopy, the patients were transferred to a post-anesthesia care room within the endoscopy unit. When the hemodynamic condition stabilized, the intensity of the sore throat and mouth dryness was assessed for both groups as baseline data (pre-test) using Prince Henry's pain scale and Xerostomia Inventory (XI) scale. Next, the intervention group gargled (30 ml of the warmed saline solution at 40 °C) every 4 hours for 24 hours, while the control group was exposed to the hospital routine care.
- The first saline gargling for the intervention group was performed 3 hours after the procedure when the patients were in the recovery room of the endoscopic unit based on the previous studies by **(Cho 2014, Eri et al., 2022)** to inhibit the risk of aspiration and to ensure that the pain isn't masked as a result of sedation/anesthesia, and then it was performed every 4 hours as recommended by (**Choi and Kim 2004 & Kim and Park (2020)** after arrival to the department if the case was inpatient, or at home if the case was outpatient, with a total of 7 times of gargling was done followed by telephone for discharged cases. The participants were instructed to note on a checklist the time of each gargling session.

Evaluation phase

The researchers used Prince Henry's pain scale and the Xerostomia Inventory (XI) scale as evaluation tools at follow-up phases for both groups to examine the effect of warm saline solution gargling on the intensity of sore throat and mouth dryness, respectively as follows:

- ☒ The sore throat was re-assessed using Prince Henry's pain scale after 16 hours and 24 hours for both groups.
- ☒ The mouth dryness was re-examined using the Xerostomia Inventory Questionnaires after 24 hours and after two weeks of saline gargling. For patients who were discharged from the hospital, the mouth dryness and sore throat were assessed by calling them.

Statistical analysis:

Version 22 of the Statistical Package for the Social Sciences (SPSS) was used to analyze the data that had been gathered. Numerical data were summarized using descriptive statistics like mean and standard deviation (SD), while qualitative data were shown as frequency and percentage. The chi-square test was used to evaluate the relationship between the categorical variables. In cases where any cell in the table had less than 5 (but not zero), the Fisher exact test was employed. To compare means across multiple variables based on repeated observations, repeated measures ANOVA were employed. The Friedman test was utilized to determine significant differences among three or more

variables. Additionally, a Pearson correlation test was conducted to assess correlation coefficients between variables. A significance less than 0.05 (P value) was deemed statistically significant, while values below 0.001 were considered highly significant.

Results

Table (1): Clarifies that the mean ages for the study and control groups were 54.8±12.5 and 58.2±9.4, respectively. Concerning gender, 51.7% and 60% of both groups were male, respectively. Moreover, 60% and 66.7% of both groups were married respectively. It was noticed that 56.7% and 53.3% of both groups were living in rural areas. Also, 41.7% and 40% of both groups had secondary education. Finally, 36.7% and 33.3% of both groups respectively were housewives. When comparing the demographic information of the two groups, there was no statistical difference.

Table (2): Displays that liver disease was the most observed chronic disorder among both groups which affects 33.3% and 36.7% of the two groups, respectively, followed by hypertension and diabetes. According to body mass index, the majority of the study and control groups 76.7% and 66.7% respectively fall within the normal range. Lastly, around 76.7% and 65 % of both groups were not smokers respectively.

Table (3): Describes that the mean duration time of the endoscope was 21.5 ± 6.54& 25.3 ± 8.22 minutes, respectively for both groups. It is evident from the above table that abdominal pain took the highest percentage for both groups as an indication for endoscopy. Concerning the outcomes of endoscopy, it was reported that 38.3% and 30% of both groups had normal outcomes followed by 15% and 16.7% of the study and control groups had esophageal varices respectively.

Figure (1): Represents a marked reduction in the intervention group's mean score for sore throat following gargling with warm normal saline solution during follow-up phases (after 16 and 12 hours of endoscopy), compared to the control group, with strong statistically significant differences between the two groups (P value = 0.001**). This figure validated our study's hypothesis.

Table (4): Demonstrates that 48.3% and 41.7% of the study and control groups, respectively, suffered from moderate mouth dryness as a baseline data after 3 hours of upper GI endoscopy; however, after applying warm saline gargling for the study group, this percentage decreased to be 20% and 11.7% after 24 hours and after two weeks respectively versus 38.3% and 33.3 % for the control group respectively with a statistical significant difference among the two groups in relation to their mouth dryness. This table supported our research hypothesis.

Figure (2): The above figure represents a marked gradual decline in the total mean score of the Xerostomia Inventory (XI) scale for the study group at post-tests after the application of warm saline gargling solution in comparison with the

control group which still had a high score of dryness after 24 hours and after two weeks with highly statistically significant differences P value (0.001**).

Table (5): Showed a positive and statistically significant correlation between pain level and mouth dryness after 24 hours of applying warm saline gargling among the intervention group.

Table (1): Percentage Distribution of the Study and Control Groups according to their demographic Characteristics (n=120)

Characteristics	Study Group (n=60)		Control Group (n=60)		Sig. test	p-value
	No	%	No	%		
Age						
18 ≤ 40 years	23	38.3	18	30	X^2 = 6.32	0.176
41 ≤ 60 years	20	33.3	22	36.7		
61≤70 years	17	28.3	20	33.3		
Mean ± SD	54.8±12.5		58.2±9.4		t=1.08	0.279
Gender						
Male	31	51.7	36	60	X^2 = 0.845	0.358
Female	29	48.3	24	40		
Marital Status						
Single	10	16.7	11	18.3	X^2 = 2.41	0.299
Married	36	60	40	66.7		
Separated	3	5	2	3.3		
Widow	11	18.3	7	11.7		
Place of Residence						
Rural	34	56.7	32	53.3	X^2 = 0.300	0.584
Urban	26	43.3	28	46.7		
Educational Level						
Illiterate	19	31.7	22	36.7	X^2 = 0.805	0.848
Preparatory	5	8.3	6	10		
Secondary	25	41.7	24	40		
University or higher	11	18.3	8	13.3		
Occupation						
Student	4	6.7	3	5	X^2 = 4.49	0.632
Retired	4	6.7	6	10		
Office work	10	16.7	6	10		
Employ	10	16.7	10	16.7		
Farmer	5	8.3	8	13.3		
Housewife	22	36.7	20	33.3		
No working	5	8.3	7	10		

Table (2): Percentage Distribution of the Study and Control Groups according to their Medical Data (n=120)

Medical Data	Study Group (n=60)		Control Group (n=60)		X^2	p-value
	No	%	No	%		
Presence of chronic diseases ≠						
Diabetes mellitus	16	26.7	16	26.7	0.000	1.000
Hypertension	18	30	20	33.3	0.574	0.449
Liver disease	20	33.3	22	36.7	0.536	0.464
Renal disease	4	6.7	3	5	1.48	0.224
Cardiovascular disease.	10	16.7	10	10.7	0.000	1.000
Musculoskeletal disease	14	23.3	14	23.3	0.000	1.000
Respiratory diseases	6	10	8	13.3	0.261	0.609
Cancer	3	5	2	3.3	2.91	0.088
Body Mass Index (BMI)						
Normal BMI ranges from 18.5-24.9 kg/m2.	46	76.7	40	66.7	3.74	0.278
Overweight (kg/m2) = 25.0- 29.9	5	8.3	10	16.7		
BMI for obesity = 30.0-39.9 kg/M2	9	15	8	13.3		
BMI for severe obesity is 40.0 kg/m2.	0	0	2	3.3		
Smoking habit						
Yes	21	35	14	23.3	1.97	0.160
No	39	65	46	76.7		

*** p = ≤ .05 (statistical significance)** **** p = ≤.01 (highly statistical significance)**

Table (3): Percentage Distribution of the Study and Control Groups Regarding their upper GI Endoscopy Data (n=120)

Upper GI Endoscopy Data	Study Group (n=60)		Control Group (n=60)			p-value
	No	%	No	%		
Duration of endoscope **(minutes)**						
Mean ± SD	21.5 ± 6.54		25.3 ± 8.22		2.76	0.007**
Types of sedition						
1- Moderate sedation	37	61.7	32	53.3	0.873	0.646
2- Deep sedation	16	26.7	20	33.3		
3- General anesthesia	7	11.7	8	13.3		
Indication of upper GIT endoscopy (n=60) ≠						
A) Diagnostic						
1- Dyspepsia	7	11.7	6	10	0.086	0.769
2- Abdominal pain	16	26.7	18	30	1.19	0.274
3- Reflux symptoms	7	11.7	10	16.7	0.617	0.432
4- Dysphagia	5	8.3	5	8.3	0.000	0.1000
5- Suspected varices	7	11.7	6	10	0.086	0.769
6- Suspected GIT bleeding	3	5	6	10	1.08	0.298
7- GIT obstruction	6	10	3	5	1.74	0.186
b) Therapeutic						
1- Dilatation of stricture	4	6.7	5	8.3	1.36	0.243
2- Esophageal varices ligation	7	11.7	5	8.3	0.536	0.464
3- Bleeding control	6	10	8	13.3	0.323	0.570
Outcomes of upper gastrointestinal endoscopy (n=60)						
Normal	23	38.3	18	30	7.09	0.735
1. Non erosive gastritis	3	5	1	1.7		
2. Erosive duodenitis	3	5	2	3.3		
3. Esophagitis	2	3.3	4	6.7		
4. Duodenal ulcer	4	6.7	3	5		
5. Gastric ulcer	5	8.3	4	6.7		
6. Esophageal varices	9	15	10	16.7		
7. Carcinoma of esophagus	2	3.3	6	10		
8. Carcinoma of stomach	2	3.3	1	1.7		
9. Pressure mass	5	8.3	6	10		
10. Pancreatic mass	2	3.3	3	5		
11. Hiatal hernia	0	0	2	3.3		

≠ means more than one answer *** p = ≤ .05 (statistical significance)**

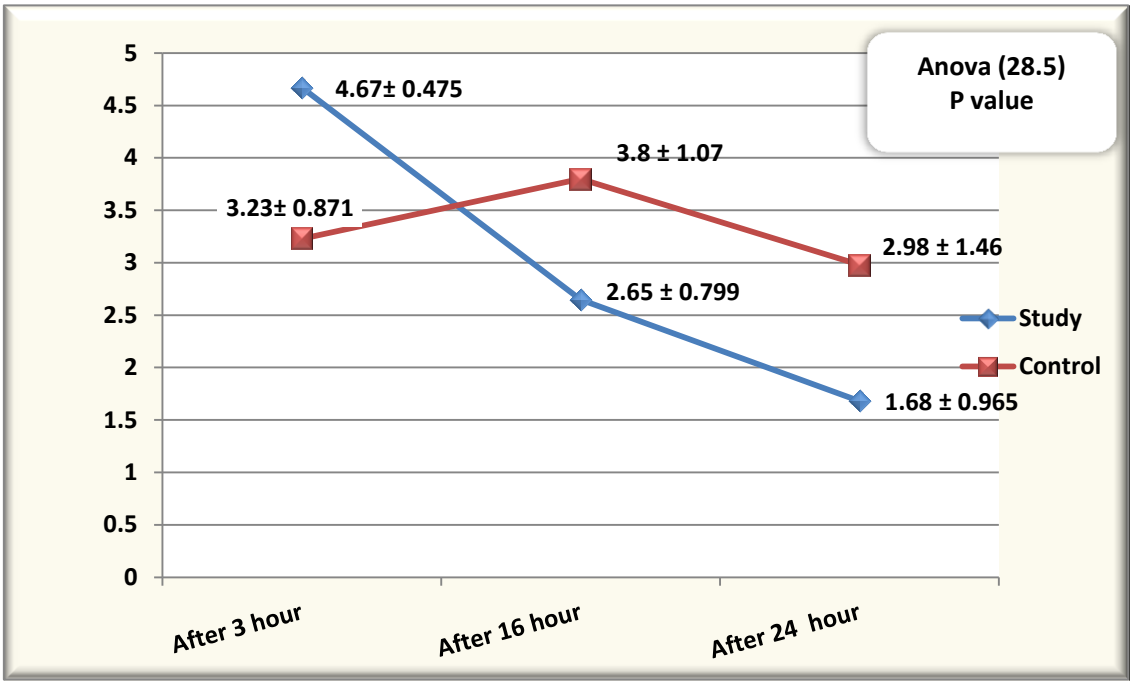

Figure (1): Comparison between the study and control groups regarding their total mean score of sore throat using Prince Henry Pain Scale (n=120)

Table (4): Comparison between the Study and Control Groups according to their degrees of mouth dryness using Xerostomia Inventory (XI) scale (n=120)

Xerostomia Inventory scale degrees	After 3 hours		After 24 hours		After 2 weeks		Sig test P value
	Study (n=60)	Control (n=60)	Study (n=60)	Control (n=60)	Study (n=60)	Control (n=60)	
1. No dryness (score of 1-11)	2 (3.3)	4 (6.7)	12 (20)	6 (10)	18 (30)	11 (18.3)	
2. Minimal dryness (score 12 – 22)	12 (20)	10 (16.7)	18 (30)	10 (16.7)	22 (36.7)	14 (23.3)	
3. Mild dryness (score 23 – 33)	10 (16.7)	9 (15)	16 (26.7)	5 (8.3)	10 (16.6)	3 (5)	
4. Moderate dryness (Score 34 – 44)	29 (48.3)	25 (41.7)	12 (20)	23 (38.3)	7 (11.7)	20 (33.3)	
5. Severe (45 – 55)	7 (11.7)	12 (20)	2 (3.3)	16 (26.7)	3 (5)	12 (20)	
X^2 (p value)	1.84 (0.625)		85.9 (0.001**)		77.9 (0.001**)		39.4 (0.001**)

*** p = ≤ .05 (statistical significance)** **** p = ≤.01 (highly statistical significance)**

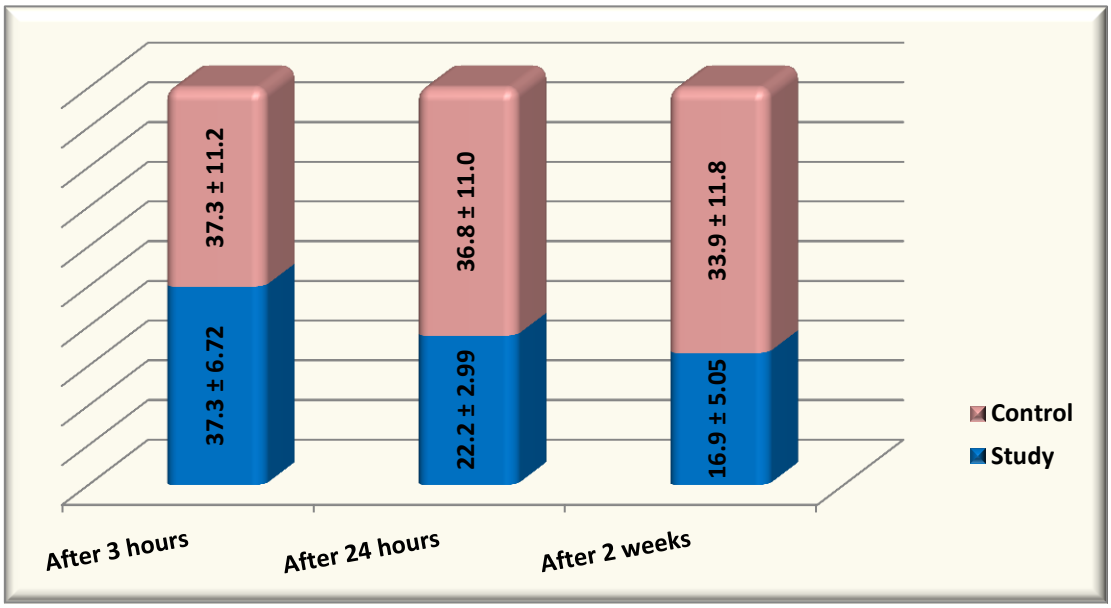

Figure (2): Comparison between the Study and Control Groups Regarding their total mean score of mouth dryness using the Xerostomia Inventory (XI) scale (n=120)

Table (5): Correlation between sore throat and mouth dryness for both groups at pre and posttests (n=120)

	Mouth dryness using Xerostomia Scale							
	Pre-test (3 hours after endoscopy)				Posttests (24 hrs. after saline gargling)			
	Study (n=60)		Control (n=60)		Study (n=60)		Control (n=60)	
	r	p	R	p	R	p	R	p
Pain Level	0.019	0.888	0.049	0.707	0.363	0.004**	0.141	0.238

*** p = ≤ .05 (statistical significance)**

Discussion

Although upper gastrointestinal endoscopy has become an integral tool to evaluate and manage many upper GIT and hepatobiliary disorders in all age groups, it is associated with numerous adverse side effects and potential complications. Sore throat and mouth dryness are common negative consequences that affect patients' comfort and oral intake several days post-procedure **(Gomaa et al., 2022)**.

On the other hand, recent related literature reported that gargling with warm normal saline is new easily, and an effective method for solving these problems with a successful rate exceeding 83.5% (**Kim and Park, 2020**). So, this study was conducted to evaluate the influence of gargling

with a warm saline solution on patients' sore throat and mouth dryness after an upper gastrointestinal endoscopic procedure.

Our findings showed that 49.60±13.535 and 50.28±12.986 were the mean age for the study and control groups, respectively. It was greatly supported by **(Kartal et al., 2023)** who stated that the majority of the studied sample undergoing upper GIT endoscopy was in adults and older adult age groups and stated that it is an extremely safe method for screening, evaluation, and management of GIT and hepatobiliary disorders among the age range of forty-five to seventy years.

This can be explained as the problems of upper GI being more prevalent with aging associated with age-related changes of the GIT (motility, enzyme and hormone secretion, digestion, and absorption) and the increase of risk for chronic disorders like; hepatic disease, cancer, diabetes, cardiovascular disorders, and neurodegenerative diseases with age that require investigation and management.

Concerning gender, results reflected that more than half of both groups who experienced upper GIT endoscopy were men, and this was in the same line with **(Puttaraju and Sreramaseshadri., 2019).** While it was against **(Amin et al., 2022)** who found female gender took the highest percentage in their proposal. In dissimilarity, **(Bharucha et al., 2016)** told that the influence of sex on the prevalence of GIT pathologies is poorly understood and both genders are affected equally.

Concerning the medical data, hepatic disorders had the highest percentage among the studied sample undergoing upper GIT endoscopy. It was in the same line with (**Amin et al., 2022**) who discussed that upper endoscopy is considered the modality of choice for diagnosing and controlling chronic liver disease-related complications. Also, several related literature supported our findings and stated that upper GIT endoscopy is helpful for patients either through taking a biopsy that assisted in the diversity of pathology nature of upper gastrointestinal bleeding (UGIB) or by band or injection sclerotherapy to control variceal bleeding. In addition, it helps some cases by dilatation of esophageal stricture **(Kartal et al., 2023)**.

The commonest indication of upper GIT endoscopy in our proposal was abdominal pain, and the most common endoscopic finding was esophageal varices, which may be attributed to the great popularity of the Hepatitis C virus in Upper Egypt, as mentioned by **(Kouyoumjian et al., 2018),** followed by pressure mass and gastric ulcers.

A sore throat is a negative consequence that commonly occurs after the removal of the upper endoscopy at least two hours **(Liu et al., 2022).** It was reported that it can begin immediately after endoscopy removal due to the damage to the mucosa during the insertion or it can be delayed for three hours due to the effects of anesthesia **(Eri et al., 2022 & Kim and Park, 2020)**. In our study, we started to evaluate the intensity of the sore throat using the Prince Henry pain scale after

three hours for both groups as baseline data, and then the intervention group started to apply the gargling with a warm normal saline solution every 4 hours for 24 hours.

Based on our clinical trial, there was a significant reduction in the intensity of sore throat after gargling with warm saline among the intervention group at follow-up phases (after sixteen and after twenty-four hours) compared with the control group with a high statistically significant difference. This was in agreement with **(Eri et al., 2022 & Kim and Park, 2020)** who reported that the use of warm saline gargling reflected a continuous decline in the mean pain score in the study group versus the control group.

Our opinion is that the hypertonic properties of a normal saline solution can be helpful in relieving pain and inflammation. When it warms and is used for gargling post insertion of an upper endoscopy, it acts as a lubricant that moistens the throat, increases blood flow in the throat, helps the immune system, and consequently leads to faster healing. Scientific evidence by **(Huynh et al., 2016)** supported our findings and described this practice as more effective in alleviating postoperative sore throats, as warm saline gargling can reduce discomfort, enhance mucosal healing, decline mouth pathogens, and maintain oral health.

Concerning mouth dryness, it was revealed that there was no significant difference in the total score of mouth dryness between the experimental group and the control group at baseline data (pretest), but the subjective dry mouth score of the experimental group who did warm saline gargling was considerably lesser than the control group at follow up phases (after twenty-four hours and two weeks) with highly statistically significant differences.

It is common for patients undergoing upper GI endoscopy to experience dry lips and a dry mouth due to the effects of sedation and the insertion that trigger patients' discomfort and cause nutritional problems, especially for elderly people who have already declined in hydration status as a result of the aging process **(Yhim et al 2020)**.

Our study considering the first one in our geographical area, reflected that gargling with warm normal saline was a very effective, easy, and cheapest method for solving sore throat and mouth dryness post upper GI endoscopy. We can discuss that normal saline is a hypertonic solution, when the patient gargles with a warm saline solution; osmosis occurs and causes moisture of the swollen throat tissues. Added to this, it reduces inflammatory mediators and thins the mucus **(Hinkle et al., 2014 & Aravinth, 2017)**. As well as warmth can diminish pain and enhance the healing of damaged tissues. This was greatly supported by related literature of **(Kim and Park 2020&Eri et al., 2022).**

Conclusion

Based on concurrent results, warm saline solution gargling was an effective method to alleviate the subjective sore throat and dry mouth among both adults and elderly patients post upper GI endoscopy.

Recommendations

- Constant teaching and training sessions should be provided on a regular basis for all cases undergoing upper GI endoscopy about gargling with warm normal saline solution post the procedure, with the availability of related posters or brochures given for them that include its benefits and technique.
- As the endoscopy nurse is responsible for ensuring patients' comfort and outcomes after the GI endoscopic procedure, training for them about this procedure should be provided as a routine part of care for all cases following upper gastrointestinal endoscopy.
- To enable results and conclusions to be more broadly applied, the current study should be replicated with a bigger sample from various geographic regions.

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