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Effect of Grape Vinegar and Rosewater versus Chlorhexidine on Oral Health-Related Quality of Life in Patients Undergoing Chemotherapy

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ABSTRACT

Aims IImproving oral hygiene is a part of the nursing care in oncology centers. Its maintenance can also play an important role in improving Oral Health-Related Quality of Life (OHRQOL). This study investigated the effect of natural grape vinegar and rosewater solution on oral health-related quality of life in chemotherapy patients.

Materials & Methods A randomized controlled trial was conducted on 60 chemotherapy patients. Patients were randomly assigned to one of two groups of intervention and control. The participants rinsed their mouths with grape vinegar and rosewater solution for one minute thrice daily for 14 days. An oral Health Impact Profile was used for data collection. Data were analyzed by SPSS 21, using descriptive statistics methods and inferential analysis tests, including an independent sample T-test.

Findings The global mean score of oral health-related quality of life in the chlorhexidine group was 31.8±4.8 and19.5±4.6 for one day before and 21 days after the intervention, respectively. These values for grape vinegar and rosewater group patients were 30.8±6.3 and 14.1±4.1, respectively. The independent sample T-test showed a significant difference between the two groups at 21 days after the intervention.

Conclusion Grape vinegar and rosewater combined solution improves OHRQOL in chemotherapy patients.

Keywords Chemotherapy; Oral Health-Related Quality of Life; Chlorhexidine Mouthwash; Grape Vinegar ; Rosewater

CITATION LINKS

[1] Cancer treatment and survivorship ... [2] Cancer chemotherapy: A critical analysis of its 60 years ... [3] Risk factors for complication following ERCP; results of a large-scale, prospective multicenter study MASCC/ISOO clinical practice guidelines for the management of ... [4] Psychopathological profile and quality of life of patients with oral ... [5] Evidence-based interventions for cancer treatment-related ... [6] Oral health and quality of life: Current ... [7] Impact of oral mucositis on oral-health-related quality of life of patients ... [8] Prevention and treatment of oral mucositis in patients ... [9] Definitions of quality of life: What has happened and ... [10] Health-related quality of ... [11] Oral health related quality of ... [12] Oral health in the elderly patient and its impact on ... [13] Health, health-related quality of life, and quality ... [14] Determinants of oral-health related quality of life ... [15] Systematic review of basic oral care for the management of oral ... [16] Anti-plaque efficacy of herbal mouthwashes compared to synthetic ... [17] Efficacy of chlorhexidine for the prevention and treatment of oral mucositis in cancer patients ... [18] Sumac-rose water mouthwash versus benzydamine to prevent ... [19] The most common herbs to cure the most common oral disease: Stomatitis ... [20] The effect of vinegar, rose water and ethanolic extract green tea against oral ... [21] In vitro assessment of antibacterial activity of pomegranate vinegar and rose water ... [22] Cross-cultural adaptation and psychometric evaluation ... [23] Validation of a Persian version of the oral health impact ... [24] Oral health related quality of life in patients with head and neck tumors ... [25] Impact of oral problems on the quality of life of women ... [26] Impact of periodontal disease and periodontal therapy ... [27] Effect of periodontal treatments on oral health related quality ... [28] Oral mucositis: examining the combined solution of grape vinegar and rose water versus ... [29] Vinegar functions on health: Constituents, sources, and formation ... [30] The anti-inflammatory and antioxidant effects of Rosa ... [31] Variability in chemical composition and antimicrobial activity of essential ... [32] Hypnotic effect of rosa damascena in ... [33] Therapeutic efficacy of rose oil: A comprehensive ... [34] A clinical study to know the effect of ... [35] Chlorhexidine to treat oral mucositis in patients ... [36] Prevention of oral mucositis in children receiving cancer therapy... [37] Efficacy of chlorhexidine and green tea mouthwashes ...

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Introduction

Various methods are used in the treatment of cancer. Surgery, radiation therapy, and systemic treatments, including chemotherapy, hormone therapy, and immunotherapy, are common treatments for cancer [1]. Chemotherapy has been widely influential in cancer treatment and has taken a special place in the current cancer treatment toolbox [2]. However, chemotherapy may cause side effects that disrupt patients' lives. One of these complications that can be observed is oral disorders. Quality of life (QOL) is a subjective and multidimensional concept that indicates a person's perception of his/her goals, expectations, and priorities in life [3]. Health-related quality of life (HRQOL) is a sub-domain of QOL. It indicates an individual's satisfaction with his/her physical, psychological, and social health throughout life, regardless of their health condition [4]. A dimension of HRQOL is oral health-related quality of life (OHRQOL) [5]. Oral and dental health affects a person's physiological, psychological, and social functioning, affecting their quality of life [6]. Oral health does not only mean the absence of oral diseases [7], but also the lack of negative consequences of oral problems for social life. [8] In other words, OHRQOL refers to the person's perception of the impact of oral disorders on his/her physiological and psychosocial performance [5].

Oral mucositis is one of the oral disorders that affect the oral health-related quality of life and is a common side effect of chemotherapy [9, 10] which can cause oral dysfunction [11], dysphagia [7], diminished QOL [12], OHRQOL [13], and diminished psychosocial performance [14]. There is no specific intervention and gold standard for treating or preventing oral mucositis; therefore, related scientific centers must make recommendations based on documented evidence [3]. According to the latest guideline of the multinational association of supportive care in cancer/international society of oral oncology (MASCC/ISOO), the use of oral cryotherapy, keratinocyte growth factor-1/palifermin, laser therapy, benzydamine mouthwash, and with less evidence, transdermal fentanyl and 2% morphine mouthwash, can be helpful in the prevention or treatment of oral mucositis [7].

One of the interventions used in treating these patients is mouthwashes [15]. However, mouthwashes contain chemical compounds and may not be welcomed by patients due to problems such as oral irritation [16].

In addition, studies conducted in this field have not reported definitive results in preventing and treating oral mucositis. For example, the results of Cardona *et al.*'s systematic review showed that chlorhexidine was not effective in improving oral and preventing the occurrence of oral mucositis caused by chemotherapy. However, they suggested that more information is needed in this area [17]. The results of Ameri *et al.*'s study showed that Gulab's sumac is effective in preventing oral mucositis [18]. Also, in their study, Hamedi *et al.* mentioned rose water and grape vinegar as standard treatments for oral diseases. However, they suggested conducting studies with a robust design and more samples for the results' strength and the evidence's certainty [19].

Therefore, natural solutions have been considered to treat chemotherapy-induced oral problems like OM. Grape vinegar and rose water are natural substances. Therapeutic properties of grape vinegar and rose water, such as antibacterial, anti-inflammatory, and palliative properties, as well as their effectiveness in curing anti-aphthous lesions, have been reported in Iranian traditional medicine [20, 21].

Improving oral hygiene is a part of the nursing care in oncology centers, and its maintenance can also play an essential role in improving OHRQOL, given the above-mentioned consequence of diminished OHRQOL resulting from chemotherapy and given the lack of studies about OHRQOL following the administration of natural mouthwashes. Therefore, this study evaluated the effect of natural grape vinegar and rose water solution on OHRQOL in chemotherapy patients.

Materials and Methods

Design and participants

In this clinical trial, 60 patients undergoing chemotherapy referring to the chemotherapy ward of Shahid Jalil Hospital affiliated with Yasuj University of Medical Sciences (YUMS) participated in 2019. Based on the Cochran formula, the sample size was estimated to be 30 patients for each group. However, 53 patients completed the study, and seven dropped out (Figure 1). Inclusion criteria were the final diagnosis of OM by an oncologist, informed consent to participate in the study, and scores of OHRQOL>28. Unwillingness to participate in the study and scores of OHRQOL≤28 were considered as exclusion criteria. Patients were selected through convenience sampling and assigned to two groups of natural solutions of grape vinegar and rose water or 0.2% chlorhexidine mouthwash using the block randomization method.

Tools

The short form of Oral Health Impact Profile-14 (OHIP-14) was adopted to assess OHRQOL. This scale has 14 items measured on a 5-point Likert scale (0=never, 1=hardly ever, 2=occasionally, 3=fairly often, and 4=very often). The OHIP-14 scores can range from 0 to 56 and are calculated by summing the ordinal values for the 14 items. Seven subscales of OHRQOL were functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap; each subscale had two questions. According to the original version of the scale, since all

items have negative values, the scores of all items are inversely correlated with satisfactory oral health conditions. In other words, lower scores indicate a higher level of OHRQOL [22]. It should be noted that the participants' responses to 14 items of OHIP-14 were also recorded as; the choices of never, hardly ever, and occasionally were considered as lack of oral problem, whereas the choices of reasonably often and very often were considered as the presence of oral problem(s). This recording was performed for further statistical analysis. The validity and reliability of the Persian version of OHIP-14 were checked, and a coefficient of Cronbach's alpha equal to 0.85 was reported [23]. We again checked its reliability for our study, and a coefficient of Cronbach's alpha for the OHIP-14 was observed to be 0.78.

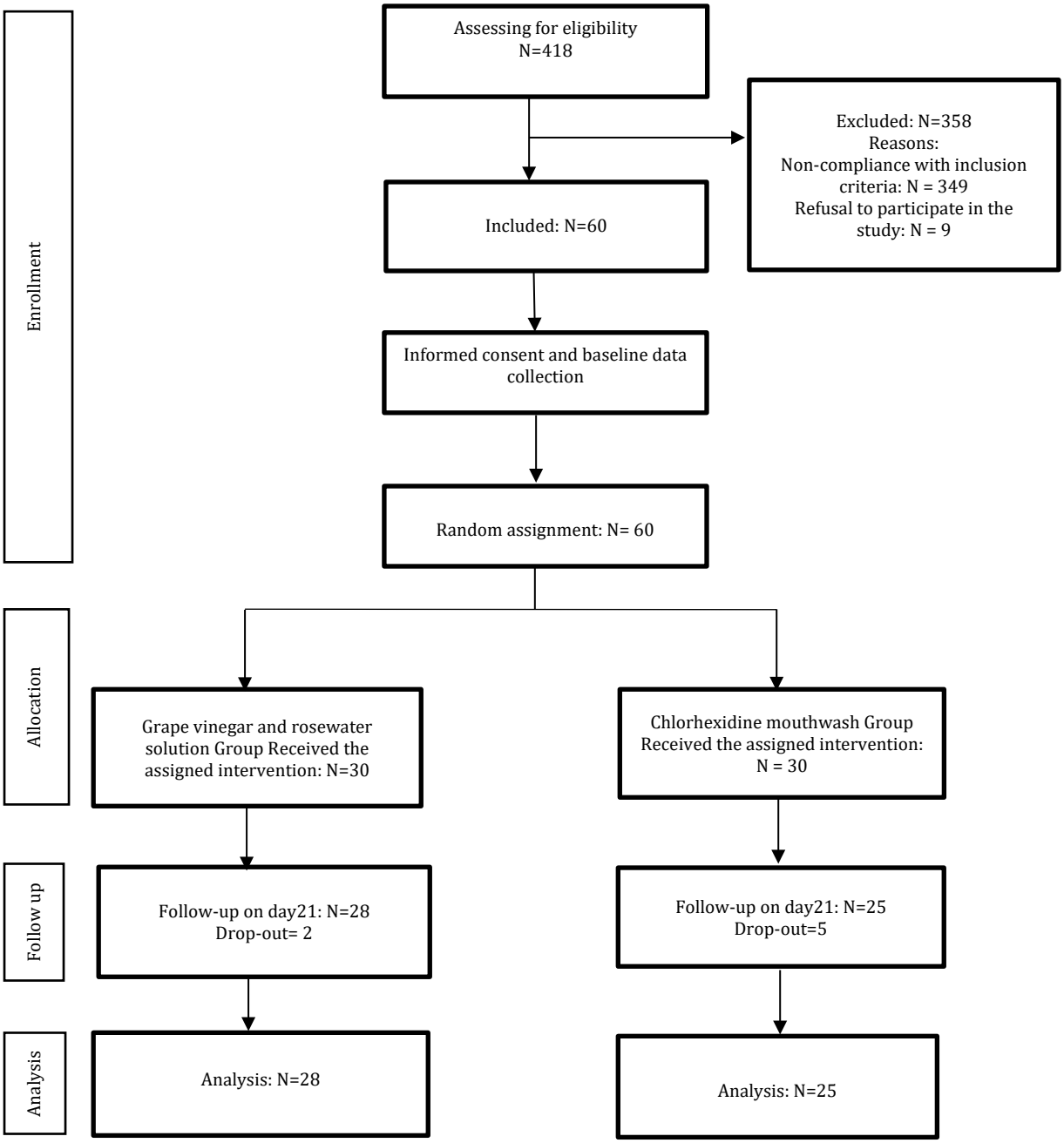

Figure 1. PRISMA chart

Intervention

At first, 5% grape vinegar manufactured by Traditional Medicine Pharmacy, Faculty of Traditional Medicine, Iran University of Medical Sciences, Iran, and 25% rose water with health license number 12306, manufactured by Feyz Kashan Herbal Products Complex, Iran, was prepared. Then, the natural solution of grape vinegar and rose water was combined in a ratio of 1 to 5 (One part of grape vinegar and five parts of rose water) according to the instructions provided by traditional medicine specialists. This solution was given to the patients in the intervention group in sterile capped containers. Necessary training was given to the patients

regarding how to use the solution at home. The patients rinsed their mouths with 15cc of mouthwashes for 1 minute thrice a day after every meal over two weeks. They were also instructed not to rinse their mouths with water for an hour and to refrain from eating or drinking. The patients in the control group were given 0.2% chlorhexidine mouthwash.

Necessary training on how to use it was also given to this group. The clinical examination was done by the oncologist, and the OHRQOL questionnaire was given to the patients and completed by them before the administration of mouthwashes and on the 21st day of mouthwashes administration.

Data Gathering

Patients completed the questionnaire two times before and on the 21st day post-intervention.

It should be noted that data collectors and data analysts were blind to the assignment of the patients to different groups. The patients of the two groups didn't know about each other's intervention. Still, there was no possibility of blinding to their intervention due to the specific taste and smell of the mouthwashes. The confidentiality of the collected information and full compliance with the principle of voluntariness to participate in the study were ensured. Patients participated in the study only after their informed consent was obtained.

Data Analysis

The data were analyzed by SPSS 16 software, using descriptive and inferential statistic tests. $p<0.05$ was considered statistically significant for all the analyses conducted. Before analyzing OHRQOL data, it was necessary to examine its distribution. Given that the normality test results indicated normal distribution, paired and independent sample T-tests were used within and between group comparisons. The collected data could be analyzed by calculating each item's frequency or measuring the mean score for each subscale.

Findings

Participants' mean age and duration of cancer were 56.39±11.75 years and 4.81±4.27 months, respectively. Twenty-five participants (47.16%) were female, and 28 (52.84%) were male. The average number of chemotherapy sessions was 1.4, and 28 pathological carcinoma diagnoses accounted for most (45.3% or n=24). In terms of organ type, the majority of patients had gastric/esophageal cancer (n=18 or 34%), followed by breast cancer (n=10 or 18.9%) and colon cancer (n=8 or 15.1%). In addition, 77.4% of the patients (n=41) had a triple-agent chemotherapy regimen. There was no significant difference between the two groups regarding demographic data ($p>0.05$; Table 1).

Table 1. Comparison of demographic data between the two groups

Parameter		Chlorhexidine	Rosewater-vinegar solution	p Value
Age (year)		60.3±13.5	53.0±19.4	0.1*
Duration of chemotherapy (Month)		4.5±3.8	5.0±4.6	0.6*
Level of education	Illiterate	10 (40)	9 (32.1)	0.5**
	Elementary	9 (36)	8 (28.6)	
	Junior high school and higher	6 (24)	11 (39.3	
Sex	Female	11 (44)	14 (50)	0.7**
	Male	14 (56)	14 (50)	

*Independent T test; **Chi-square test

Table 2. Between-group comparison for mean scores of OHRQOL by the two groups

Dimensions		Chlorhexidine			Rosewater-vinegar solution			Sig
		Mean	Lower	Upper	Mean	Lower	Upper	
Functional limitation	Baseline	4.1±1.1	3.6	4.5	4.6±1.3	4.1	5	0.1
	Post-intervention	2.8±0.5	2.6	3	2.1±0.7	1.8	2.3	0.001
Physical pain	Baseline	4.7±0.9	4.3	5.1	5.2±1.1	4.7	5.6	0.08
	Post-intervention	3.5±1.0	1.8	2.3	2.1±0.7	1.7	2.3	0.001
Psychological discomfort	Baseline	4.0±1.0	3.6	4.3	4.2±1.1	3.8	4.6	0.4
	Post-intervention	2.8±0.9	2.4	3.1	2.1±0.6	1.8	2.3	0.008
Physical disability	Baseline	4.7±0.9	4.3	5.1	4.6±1.3	4.2	5.2	0.9
	Post-intervention	3.2±1.0	2.8	3.6	2.3±0.7	2.1	2.6	0.001
Psychological disability	Baseline	3.8 ±1.1	3.4	4.2	4.4±1.3	3.9	4.9	0.052
	Post-intervention	2.7±0.9	2.3	3	1.8±0.8	1.5	2.1	0.001
Social disability	Baseline	3.4±1.1	2.9	3.8	4.2±1.7	3.5	4.8	0.05
	Post-intervention	2.2±0.8	1.8	2.5	1.8±0.9	1.5	2.1	0.12
Handicap	Baseline	3.2±0.7	2.9	3.5	3.6±0.9	3.2	3.9	0.12
	Post-intervention	2.4±0.8	2.1	2.7	1.9±0.8	1.5	2.2	0.02

The global mean score of oral health-related quality of life in the chlorhexidine group was 31.8±4.8 and 19.5±4.6 for one day before and 21 days after the intervention, respectively. These values for grape vinegar and rose water group patients were 30.8±6.3 and 14.1±4.1, respectively. The independent sample T-test showed a significant difference between the two groups 21 days after the intervention ($p=0.001$). However, between-group comparisons using an independent student's T-test showed that the patients who used a natural solution of grape vinegar and rose water had significantly ($p<0.05$) higher OHRQOL in comparison to the patients who used 0.2% chlorhexidine mouthwash (Table 2).

In addition, the difference between the scores of OHRQOL subscales after and before the intervention (i.e., scores of OHRQOL subscales after the intervention minus the scores before the intervention) was calculated for the patients in both groups. Subsequently, mean values of this difference were again calculated, which served as a basis for comparing the two groups. The results of such between-group comparisons also indicated higher scores of OHRQOL subscales for the patients who used a natural solution of grape vinegar and rosewater compared with those in the group of 0.2%chlorhexidine mouthwash (Table 3).

The number of patients who selected choices "never" or "hardly ever" (suggesting improvement in OHRQOL) on the 21st day of the administration of a natural solution of grape vinegar and rose water was significantly more than the patients who used the chlorhexidine mouthwash.

In other words, the natural solution of grape vinegar and rose water could improve symptoms and effectively reduce discomfort and disabilities related to oral problems in patients with chemotherapy (Table 4).

Table 3. Between-group comparison for the mean difference of OHRQOL dimensions

Dimension	Chlorhexidine	Vinegar and Rosewater	p Value
Functional Limitation	-1.3±0.9	-2.5±0.9	0.001
Physical Pain	-1.2±1.4	-3.1±1.1	0.001
Psychological Discomfort	-1.2±1.4	-2.1±1.1	0.01
Physical Disability	-1.5±1.3	-2.3±1.4	0.03
Psychological Disability	-1.1±1.4	-2.6±1.2	0.001
Social Disability	-1.2±1.2	-2.3±1.5	0.003
Handicap	-0.8±0.8	-1.7±1.3	0.006

Table 4. Between-group comparison by the patients' responses to OHIP-14L items

Dimensions		Chlorhexidine (N=25)				Grape vinegar and Rosewater (N=28)			
		Never/hardly ever/occasionally		Fairly often/ very often		Never/hardly ever/occasionally		Fairly often/ very often	
		N	(%)	N	(%)	N	(%)	N	(%)
Functional Limitation									
Trouble pronouncing any words	Baseline	23	92	2	8	21	75	7	25
	Post-intervention	25	100	0	0	28	100	0	0
Worsened sense of taste	Baseline	13	52	12	48	11	39.3	17	60.7
	Post-intervention	25	100	0	0	28	100	0	0
Physical Pain									
Painful aching in mouth	Baseline	18	72	7	28	14	50	14	50
	Post-intervention	24	96	1	4	28	100	0	0
uncomfortable to eat any food	Baseline	16	64	9	36	10	35.7	18	64.3
	Post-intervention	23	92	2	8	28	100	0	0
Psychological Discomfort									
Self-conscious	Baseline	24	96	1	4	16	57.2	12	42.8
	Post-intervention	24	96	1	4	28	100	0	0
Fell pressure	Baseline	14	56	11	44	12	42.9	16	57.1
	Post-intervention	24	96	1	4	28	100	0	0
Physical Disability									
Diet unsatisfactory	Baseline	18	72	7	28	11	39.3	17	60.7
	Post-intervention	24	96	1	4	28	100	0	0
Interrupted meals	Baseline	18	72	7	28	12	42.9	16	57.1
	Post-intervention	24	96	1	4	28	100	0	0
Psychological Disability									
Difficult to relax	Baseline	14	56	11	44	13	46.4	15	53.6
	Post-intervention	24	96	1	4	28	100	0	0
Embarrassed	Baseline	23	92	2	8	23	25	5	75
	Post-intervention	25	100	0	0	28	100	0	0
Social Disability									
Irritable with other people	Baseline	19	86	6	24	14	50	14	50
	Post-intervention	24	96	1	4	28	100	0	0
Difficulty doing usual jobs	Baseline	23	92	2	8	21	75	7	25
	Post-intervention	25	100	0	0	28	100	0	0
Handicap									
Fell less life dissatisfaction	Baseline	9	36	16	64	14	50	14	50
	Post-intervention	24	96	1	4	28	100	0	0
Unable to function	Baseline	25	100	0	0	25	89.3	3	10.7
	Post-intervention	25	100	0	0	28	100	0	0

Discussion

The current study investigated the OHRQOL of patients undergoing chemotherapy after administering a natural grape vinegar and rose water solution. The analyses suggest statistically significant improvement in the mean scores and the frequency of symptoms, discomfort, and disabilities related to the patients' OHRQOL after using the grape vinegar and rose water solution.

Based on research evidence gleaned so far, patients undergoing chemotherapy have a lower OHRQOL than healthy individuals [24]. In addition, initiating cancer treatments exacerbates this dimension of health-related quality of life [23]. Previous research

findings indicate that treating periodontal disorders can improve HRQOL [25, 26]. For example, the positive effect of the combined and natural solution of grape vinegar and rose water to treat OM induced by chemotherapy was reported by Afrasiabifar *et al.* [27]. To explain the effectiveness of the natural solution of grape vinegar and rose water in improving OHRQOL, grape vinegar has antibacterial properties due to components of organic acids, especially acetic acid and polyphenols [28]. Moreover, rose water has anti-inflammatory properties due to phenolic compounds [29], antimicrobial properties due to the components of Geraniol, Citronellol, and Nerol, and antifungal activity due to the component of geraniol [30]. Natural grape vinegar and rose water, whether used singly or in combination, could enhance the synergistic effects of their components in healing oral ulcers caused by chemotherapy, such as OM. Moreover, rose water can improve the physical, mental, and social functions related to OHRQOL due to sedative [31], hypnotic [32], anti-depressant, and anti-anxiety properties [33].

In addition, the findings of the study showed that, as compared with chlorhexidine mouthwash, the use of natural grape vinegar and rose water solution results in a higher level of OHRQOL. To explain this finding, it can be argued that despite chlorhexidine's anti-inflammatory and antibacterial properties, patients prefer the combined solution of grape vinegar and rose water because of its pleasant smell and taste. In the present study, an improvement in OHRQOL was also observed following the use of chlorhexidine mouthwash. Based on the published pieces of literature, no study has hitherto been carried out into the oral health status and OHRQOL following the use of chlorhexidine mouthwash, either prophylactically or therapeutically.

These findings of our study align with the research pieces of evidence suggesting the effectiveness of chlorhexidine mouthwash to treat OM induced by radiation [34] or its prophylactic use to prevent cancer-induced OM [35]. However, they are inconsistent with the results of some other studies suggesting the ineffectiveness of the treatment [3, 36] and the MASSC protocol, which does not recommend the therapeutic use of chlorhexidine mouthwash to control OM [13]. Gingivitis and oral plaque are two common oral problems in patients with chemotherapy; these patients do not have proper nutrition and satisfactory oral hygiene. However, the effectiveness of chlorhexidine in controlling gingivitis and oral plaque has been well-documented in some studies [37]. The use of mouthwashes, especially natural mouthwashes that cause no or few complications, can improve OHRQOL by treating oral problems caused by chemotherapy and improving the physical and psychosocial functions of the mouth. Even if the random assignment of the patients to the groups and the use of a valid scale could be cited as this study's strengths, there were limitations in conducting the study. Given this limitation, the study's findings should be generalized with caution. First, the sample size of the study was relatively small. The study was conducted in a single chemotherapy center, and only patients suffering from the complications of chemotherapy, especially OM, were included. Therefore, further studies are required to evaluate the clinical effectiveness of chemical and natural mouthwash solutions in improving OHRQOL. Second, we compared the therapeutic effects of two chemical and natural mouthwashes. In keeping with the principle that prevention is better than cure, further research is needed to evaluate the prophylactic and therapeutic effects of natural grape vinegar and rose water solution, compared with chemical mouthwashes, on improving OHRQOL of patients undergoing chemotherapy. The effectiveness of a natural combined solution of grape vinegar and rose water in improving OHRQOL could serve as a basis for further studies, especially meta-analytic ones. If the therapeutic properties of this solution are confirmed in subsequent research, it can be considered a natural mouthwash solution for improving the OHRQOL of patients undergoing chemotherapy.

Conclusion

Chlorhexidine mouthwash and the natural solution of grape vinegar and rose water improve the OHRQOL of chemotherapy patients without any side effects.

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Ethical Permissions: This clinical trial (IRCT IRCT20121208011692N3) was approved by the Research Ethics Committee of the Office of Vice-Chancellor for Research of Yasuj University of Medical Sciences, Yasuj, Iran (Ethic Code ID: IR.YUMS.REC1397.154).

Conflicts of Interests: The authors declare no conflicts of interest.

Authors' Contribution: Afrasiabifar A (First Author), Main Researcher/Methodologist/Discussion Writer/Statistical Analyst (35%); Jafari Dehkordi N (Second Author), Main Researcher/Methodologist/ Introduction Writer/ (35%); Mosavi A (Third Author), Assistant Researcher/Methodologist/Discussion Writer (30%)

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