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The Effect of Nasal Irrigation on COVID-19 Patient's Mild Symptoms of Respiratory Tract

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Abstract

BACKGROUND: Severe Acute Respiratory Syndrome Coronavirus-2 is a virus that causes COVID-19. The initial symptoms put forward by the WHO since 2020 is fever accompanied by cough and shortness of breath. Currently, the loss of smell and taste, accompanied by other symptoms, tends to be a strong predictor of COVID-19. The nose is the entrance for air, that's why the nose has an important role in the breathing process. In addition to warming, humidifying, and filtering incoming air, the nose can also maintain respiratory tract homeostasis. The use of nasal irrigation with isotonic saline solution (NaCl 0.9%) is a way to improve mucociliary clearance function by activating cilia as an olfactory sensory system.

AIM: This study aims to evaluate the effect of nasal irrigation on COVID patients who have mild symptoms in the upper respiratory tract.

METHODS: The purpose of this study was to see the effectiveness of nasal irrigation using 0.9% NaCl in COVID-19 patients with mild symptoms by looking at the average duration of time complaints felt by patients compared to those without nasal irrigation intervention.

RESULTS: This study found a significant difference (p = 0.000) between the control group and the intervention group, where the mean duration of symptoms in the intervention group was shorter than the control group.

CONCLUSION: Anosmia is a symptom in COVID-19 which is almost always accompanied by symptoms of loss of taste, various theories on the cause of anosmia have been put forward since the COVID-19 pandemic broke out. Improvements in symptom duration were found to be shorter in COVID-19 patients who performed nasal irrigation using 0.9% NaCl independently for 10 days so that in the future, it is hoped that nasal irrigation will become part of the comprehensive management of COVID-19 patients who have mild symptoms, especially symptoms related to nasal and upper respiratory complaints.

Introduction

In December 2019, a mysterious pneumonia case was first found in Wuhan, Hubei, China, with clinical manifestations similar to the virus that causes pneumonia. A novel coronavirus was found from the lower respiratory system, known as the 2019 novel coronavirus (2019-nCoV). More than 800 cases, including health workers, have been identified in Wuhan. Several cases confirmed in other provinces in China have also been found in Thailand, Japan, South Korea, and the United States [1].

The spread of COVID-19 through droplets/aerosols or direct contact causes ear, nose, throat examination to have a significant risk of contracting it. According to the Chinese Center for Disease Control Prevention, from a series of cases totaling 72,314 cases, more than 80% of COVID-19 cases had mild symptoms. However, several studies stated that the symptoms of COVID-19 were cough and fever, but they could not describe the overall symptoms of COVID-19 [2].

From a case study, several works of literature conducted with less than 150 patients, Chen N *et al*., Wu J *et al*., and Wang D *et al*. in China got 5%, 11%, and 17.4% of complaints from COVID-19 patients, respectively is a sore throat. While Guan *et al*., with a larger sample size of 1099 COVID-19 patients, 13.9% complained of sore throats and nasal congestion by 4.8%, the same thing was also found by Chen *et al*. (4%). It makes perfect sense when looking at the COVID-19 travel cycle that passes through the nose and oropharynx as a place to enter the lower airway. The gold standard for detecting Severe Acute Respiratory Syndrome Coronavirus-2 is through (real-time polymerase chain reaction [RT-PCR]) examination. The material of RT-PCR came from a nasopharyngeal or oropharyngeal swab because that location has the highest viral load [2].

Chen *et al*. also mentioned in their research results that from a study conducted on 99 patients with COVID-19 cases, 4% of whom had a runny nose (rhinorrhea), and from research by Professor Jhon Hopkins conducted in South Korea, it was found

that hyposmia or anosmia is part of the symptoms of COVID-19 [3]. The nose is the air entrance, so the nose has a vital role in the breathing process. In addition to warming humidifying, and filtering incoming air, the nose can also maintain the respiratory tract's homeostasis [3]. The nose functions as an airway, air regulator, air humidity regulator (humidification), temperature control, air protection, filter, sense of smell, and sound resonator. The nose's function as protection and filter is carried out by vibrissa, mucus layer, and lysozyme enzymes. Vibrio is the hair on the rice's vestibule, which functions as a filter for dust and dirt (large particles). Small dust and dirt (tiny particles) that can still pass through the vibrissa will stick to the mucus layer and then be expelled by the sneeze reflex. If there were bacteria in the air (tiny particles), the lysozyme would destroy them [3].

The nasopharynx is the part of the pharynx that lies behind the nose above the soft palate. The nasopharynx is lined with a ciliated mucous membrane, a continuation of the nasal passages' membrane covered. The oropharynx is located behind the mouth under the soft palate, where the lateral walls are connected [3].

Nasal irrigation using either 0.9% NaCl (normal saline) or 3% NaCl (hypertonic saline) has long been recognized as a nonpharmacological therapy in managing sinus disease. It aims to cleanse the sinuses physiologically from thick mucus, allergens, and air pollution [4]. Besides, until now, there is no consensus on the purpose of irrigation. One study found that infusing 40 ml of radio-opaque fluid in healthy controls gave a positive image of irrigation pressure compared to the negative pressure generated by simply sniffing or nebulizing.

Saline formulations varied from study to study. The concentration ranges from 0.9% to as high as 75% (in hypertonic). Based on these formulations, a wide range of consensus has been developed using these principles and explaining how the saline mechanism can increase mucociliary sinus transport efficiency by reducing mucus viscosity and reducing edema or both.

Based on the explanation above, the authors consider that it is essential to study the effectiveness of nasal irrigation in COVID-19 patients with mild symptoms in the upper respiratory tract to improve their symptoms.

Methods

This study is a randomized controlled trial, a type of scientific experiment that aims to test treatment effectiveness. Study participants were randomized into two or more groups; the groups were treated differently, then compared with a measured assessment [4]. This study aimed to test the effectiveness of nasal irrigation in COVID-19 patients with mild upper respiratory tract symptoms. The number of groups in this study was two groups – the first group was a control group that was not given treatment, while the second group was given intervention in nasal irrigation with a 0.9% NaCl solution.

The population of this study was patients with confirmed positive COVID-19 in North Sumatera. The number of COVID-19 patients confirmed positive in North Sumatera on June 18, 2020, was 657 people spread across all referral hospitals in North Sumatera.

The sample in this study was taken using a simple random method. The randomized sample was a sample that met the inclusion and exclusion criteria as follows.

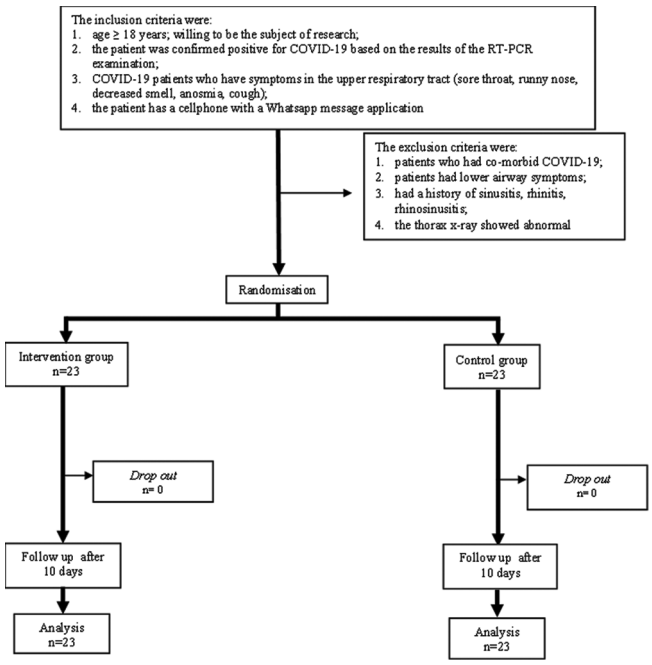
The inclusion criteria were: age ≥18 years; willing to be the subject of research; the patient was confirmed positive for COVID-19 based on the results of the RT-PCR examination; COVID-19 patients who have symptoms in the upper respiratory tract (sore throat, runny nose, decreased smell, anosmia, and cough); the patient has a cellphone with a WhatsApp message application. On the other hand, the exclusion criteria were: patients who had comorbid COVID-19; had lower airway symptoms; had a history of sinusitis, rhinitis, rhinosinusitis; the thorax X-ray showed abnormal interpretation. The subject included dropping out because the patient was declared cured and was discharged from the hospital; the patient does not perform routine nasal irrigation; the patient does not perform nasal irrigation with the correct technique; the patient passed away.

Researchers compiled a questionnaire to assess upper airway symptoms in COVID-19-positive patients based on the literature then validated the content of two ears, nose, throat (ENT) specialists. Furthermore, a questionnaire will assess upper airway symptoms before and after treatment in this study.

The treatment provided information on the correct nasal irrigation method through video media through the WhatsApp message application. After that, the participants were asked to send a nasal irrigation video, which was done every day through the same application to ensure they did nasal irrigation with the correct technique.

Results

The number of female participants in the intervention group was more than in the control group. In contrast, the male participants in the control group surpassed the intervention group. The adolescent was



the most number in the control group, and the early adults were in the intervention group. The participants in this study came from various ethnicities. Almost 50% of these study subjects were Batak ethnic, while the least number came from Sunda, Betawi, Banjar, China, and Aceh. Table 1 shows the subjects' occupations comprising healthcare or non-healthcare. More than 70% of the subjects were non-healthcare. The participants' education from the highest to the lowest was senior high school, bachelor, vocation, and master.

All subjects possessed various symptoms such as fever, runny nose, nasal congestion, cough, sore throat, dysphagia, anosmia, and hyposmia. Among all symptoms, anosmia was the most prevalent symptom among the two groups. The intervention group had the two most prevalent symptoms, i.e., anosmia and runny nose. In the control group, anosmia and fever were the most prevalent symptoms.

Table 1: Demographic features within intervention and control groups

Demographic data	Intervention group	Control Group
Sex		
Female	14	9
Male	9	14
Age		
Adolescent	2	13
Early adults	14	2
Late adults	6	4
Early elderly	0	2
Late elderly	1	1
Seniors	0	1
Ethnics		
Aceh	0	2
Melayu	5	0
Batak	8	11
Minang	3	1
Jawa	5	6
Sunda	0	1
Betawi	0	1
Banjar	1	0
China	1	0
Occupation		
Healthcare	8	3
Non-healthcare	15	20
Education		
Senior high school	8	13
Vocation	6	1
Bachelor	7	8
Master	2	1

The data about symptoms were collected before and after ten days of intervention. Data analysis in this study was using Mann–Whitney because the data were not distributed normally. The data analysis result showed a significant difference in the duration of symptoms between the intervention and control groups. The duration was longer in the control group compared to the intervention group.

Discussion

From the results of demographic data, it was found that the number of female treatment participants was more than males, and this was inversely proportional to that obtained in the controls. The number of research subjects based on gender is not relevant to any research that distinguishes the number of men and women. In the treatment group, the number of young adults was more than the control group, this is because when informed consent was made to perform nasal irrigation independently in the treatment group, young adults understood better to perform nasal irrigation independently compared to older adults or parents as well as the use of nasal irrigation. Social media technology such as WhatsApp requires treatment subjects to send videos of nasal irrigation every day to researchers, and this is more widely understood by research subjects who are young adults.

In tribal epidemiological data from various epidemiological studies of COVID-19 in Indonesia, there has not been a relationship between ethnicity and COVID-19 or the tendency of certain ethnic groups to the number of COVID-19. In this study, the largest ethnic group found was the Batak tribe in both the treatment group and the control group, in this case, the majority of COVID-19 patients who came to COVID referrals from various regions in North Sumatra and North Sumatra are the areas with the largest ethnic Batak tribe. At the risk of the group of workers, health workers are already equipped with level 3 personal protective equipment (PPE) when treating COVID patients, but nonhealth workers show a higher number than health workers (doctors, nurses, and paramedical staff). At the end of March 2020, the death rate in Indonesia due to COVID was 8.9%, at the beginning of the pandemic in Indonesia, health facilities in Indonesia were not ready for this, and at the same time, the government implemented Large-Scale Social Restrictions (Pembatasan Sosial Berskala Besar) in all cities and provinces. Including the regional quarantine of certain areas. The lockdown scenario that was prepared in the Jakarta and West Java areas, however, was canceled due to the refusal of the central government and the Jakarta Capital Transportation

Table 2: Variation of symptoms within intervention and control groups

Symptoms	Intervention group	Control group
Fever	14	11
Runny nose	11	16
Nasal congestion	11	14
Cough	9	5
Sore throat	7	9
Dysphagia	2	6
Anosmia	14	16
Hyposmia	11	14

Association [5]. Based on 16 studies, the application of quarantine for exposed patients is very effective in reducing transmission rates during an influenza pandemic [6]. The Indonesian government cooperates with religious leaders, traditional elders, the police, and the Transnational Institute in reducing the number of COVID-19 so that quarantine runs smoothly. The use of PPE and masks is also supervised by officers, but the high cost of screening PCR Tests so that the number of people who are screened is small, including a history of close contact accompanied by low community compliance with the use of masks and maintaining distance by avoiding crowds or holding certain events that invite crowded communities. It is still low, so it appears that a large number of sufferers is not actually from health workers who handle COVID patients but from the general public.

From this study, the most common mild symptoms found were fever and anosmia in the treatment group and runny nose and anosmia in the control group, according to the study that anosmia is one of the symptoms that appear on days 1–8 after the onset of infection (Table 2). Anosmia also has relevance to complaints of loss of taste (dysgeusia) where according to the Klopfenstein study in France, complaints of dysgeusia were found in 85% of patients with symptoms of anosmia. How smell can be lost in SARS-CoV-2 infection has not been fully explained, but as we know, various viruses and xenobiotics can damage the olfactory neuroepithelium. Although SARS-CoV-2 can enter epithelial cells bound to the protein angiotensin-converting enzyme 2 (ACE2) on the cell surface [7], Olfactory cell receptors do not express ACE2 as well as other genes involved in port-de-entry (TMPRSS2), such as stem cells and sustentacular epithelium [8]. However, damage to the olfactory receptors occurs mediated through the entry of SARS-CoV-2 into cell receptors. For example, “unsheathing” olfactory glial cells that are present on the entire surface of olfactory receptor axons and form the olfactory fila are one candidate where free ACE-2 can migrate into olfactory receptor neurons through the exosome. It is possible that at this stage, the olfactory receptor neurons initiate a rapid immune response in the patient resulting in olfactory dysfunction [9]. It has also been suggested that the olfactory neuroepithelium tends to regenerate if the stem cell surface is not severely damaged [10], [11], [12], it is this regeneration that causes a state of spontaneous improvement of olfactory function over time [13].

As shown in Table 3, the $p < 0.005$ was obtained where the intervention group who performed nasal irrigation had a shorter symptom time compared to the control group, where the average anosmia symptom occurred within 1–21 days. In the symptoms associated with ENT symptoms, anosmia was closely related to dysgeusia, wherein in the study, there were also other nasal symptoms such as rhinorrhea (57%) and nasal obstruction (30%).

Table 3: Difference of symptoms duration between intervention and control group

Groups	N	Mean rank	p-value
Intervention	23	16.59	0.000
Control	23	30.41	

The mucociliary clearance system in the nasal cavity has an important meaning in maintaining good mucociliary transport, this system consists of epithelial cilia and mucus from goblet cells, which is the most important non-specific defense mechanism of the upper respiratory system. Naturally, the mucociliary clearance mechanism contributes to two things, namely mucus production and mucus transport, where mucus will be secreted into the respiratory tract system, catch inhaled particles, and pass these particles to the lower respiratory system through the glottis or if it enters the pharynx it will enter the respiratory system digestion. In this case, mucociliary clearance protects the respiratory system and microorganisms. Ineffective ciliary activity will cause acute or chronic infection in both the upper and lower respiratory tract systems [14].

Conclusion

In this study, nasal irrigation was carried out on 23 research subjects of COVID patients with symptoms of anosmia, where these symptoms were assessed from a questionnaire given to COVID patients through social media WhatsApp and education provided through social media in the form of educational videos. From 23 research subjects, the average change in symptom duration was 16.59 days and in the control group as many as 23 people in the control group obtained a change in symptom duration for 30.41 days, this shows that nasal irrigation therapy affects reducing the duration of anosmia symptoms in COVID patients. -19 through the mechanism of ciliary repair in the mucociliary clearance system.

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