Effectiveness of nasal irrigation with isotonic saline against interleukin-8 levels and quality of life in chronic rhinosinusitis patients

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ABSTRACT

Background: Chronic rhinosinusitis is a chronic inflammation of the nasal mucosa and paranasal sinuses that can occur due to multifactorial and affect the quality of life of the sufferer. IL-8 is a proinflammatory cytokine that can significantly increase in chronic rhinosinusitis. Standard therapy and nasal washing with saline isotonic can reduce symptoms that complained of the patient and as well as the effect on changes in interleukin-8 as a proinflammatory mediator. This study aimed to determine the effectiveness of nasal irrigation with NaCl 0.9% against IL-8 level and quality of life in chronic rhinosinusitis patients.

Methods: This study is an experimental study with a pre-post test control group design. The subject of the study was 30 people divided into two groups with simple randomisation, each group of 15 people in which the control group received standard therapy and treatment group received standard therapy and nasal irrigation with saline isotonic for two weeks. Quality of life assessment was conducted with SNOT-22 and interleukin-8 examination before and after therapy in each group.

Results: There was no significant difference in SNOT-22 (p=0.227) of both groups before and after therapy. There was a significant difference in the ear and facial symptoms (p=0.025) and psychological (p=0.043) of both groups before and after therapy.

Conclusion: Standard therapy and nasal washing with saline isotonic in patients with chronic rhinosinusitis give a better effect compared to standard therapy without nasal washing with saline isotonic in terms of inhibiting elevated interleukin-8 levels.

Keywords: Chronic rhinosinusitis, interleukin-8, quality of life

Cite This Article: Yuliyani, E.A., Sutanegara, S.W.D., Muliartha, I.M. 2019. Effectiveness of nasal irrigation with isotonic saline against interleukin-8 levels and quality of life in chronic rhinosinusitis patients. Bali Medical Journal 8(3): 750-754. DOI: 10.15562/bmj.v8i3.1582

INTRODUCTION

Rhinosinusitis is an inflammation of the mucosa of the nasal cavity and paranasal sinuses that can be acute or chronic. Rhinosinusitis may occur due to the multifactorial, thus facilitating the occurrence of respiratory infection by bacteria, viruses, allergens or other irritants.1,2 Chronic rhinosinusitis is still a health problem in the developing and developed countries with a high prevalence and impact in various aspects including the quality of life and socioeconomic.2-4 Data from National Ambulatory Medical Care Survey in 2001, 12.3 million doctor visits in the United States were caused by chronic rhinosinusitis.5 Data from the ENT Department of RSCM Rhinology Division from January to August 2005 approximately 435 patients (69%) were new cases of rhinosinusitis in adult patients.5 Based on recorded data throughout 2014 at the ENT Polyclinic of the Regional General Hospital Dr. Moewardi Surakarta, the number of chronic rhinosinusitis was 204 cases (13.01%) out of 1567 outpatients.6

Chronic rhinosinusitis can be divided into chronic rhinosinusitis without nasal polyps and chronic rhinosinusitis with nasal polyps. Interleukin-8 (IL-8) is a proinflammatory cytokine that is significantly elevated in chronic rhinosinusitis without polyps. However, an increase in neutrophils and IL-8 in moderation can also be found in chronic rhinosinusitis caused by allergic factors.5,7

In the study conducted by Suzuki et al. (1996) argued that IL-8 found in swab the nasal mucosa, nasal glands and epithelial cells in patients with chronic rhinosinusitis and concluded that the factors chemotactic fluid sinus including IL-8 derived from nasal glands and the epithelial cells that causes the release of neutrophils from the nasal mucosa and then piled the sine non-allergic chronic rhinosinusitis patients.5 Besides, IL-8 also has the chemotactic effect for eosinophils and pull it to the place of inflammation in chronic rhinosinusitis with polyps because the cause is allergies, so that IL-8 can be found elevated in tissues and nasal secretions of patients chronic rhinosinusitis with polyps.8

In conjunction with secreted proinflammatory cytokines (IL-8) in fluid sinus patients with chronic rhinosinusitis, appropriate treatment such as the provision of medical treatment and saline as an
adjunct therapy can help improve the function of the mucociliary nose and can reduce the inflammatory mediators that are formed so that the drainage of the sinuses become better.\textsuperscript{6,9} Washing the nose with saline solution is very effective to improve the symptoms complained of by patients with chronic rhinosinusitis and can be used as adjunctive therapy in chronic rhinosinusitis to improve the quality of life of patients with chronic rhinosinusitis.\textsuperscript{6,9,10} This study was conducted to determine the effectiveness of nasal irrigation with an isotonic saline solution of NaCl 0.9% against the levels of IL-8 and quality of life in patients with chronic rhinosinusitis considering there has never been particularly researched on the cytokine IL-8 in Sanglah General Hospital in Denpasar.

**METHODS**

This research uses experimental research design of pre-posttest control group design, by purposive sampling technique and performed in ENT Polyclinic, Rhinology Division, Medical Faculty of Universitas Udayana/Sanglah General Hospital, Denpasar, Bali in May-June 2018. This study requires a minimum sample of 30 patients with chronic rhinosinusitis, divided into 15 subjects who received medical therapy and nasal irrigation (treatment group) and 15 subjects that received only medical therapy (control group). Patients also met the inclusion criteria: age 15-60 years, cooperative and willing to participate in the study by signing informed consent. Patients suffered a mechanical obstruction from nasal polyp grade 3 or tumour sinonasal diagnosed by ENT specialist, history of surgery of the nose and sinuses parasanal <2 months, suffering from immunocompromised, asthma or allergies who are taking steroids are excluded from this study. IL-8 and SNOT (sino-nasal outcome test)-22 score were examined before and after treatment in each group within two weeks. Analysis of the data using a descriptive approach and analytical approach with the Wilcoxon test and Mann-Whitney test.

**RESULTS**

Based on the results of the descriptive analysis in Table 1, the treatment group mean age was 33.7 years and 30.2 years in the control group with the youngest is 17 years old, and the oldest was 56 years old. The treatment group (60.0%) and control group (73.3%) were dominated by male. Most subjects were private employees in both groups.

| Variables                          | Treatment (N = 15) | Control (N = 15) | p-value |
|-----------------------------------|-------------------|-----------------|--------|
| Age (years) mean ± SD             | 33.7 ± 11         | 30.2 ± 6.3      | 0.299  |
| Gender                            |                   |                 |        |
| Male                              | 9 (60.0)          | 11 (73.3)       | 0.439  |
| Female                            | 6 (40.0)          | 4 (26.7)        |        |
| Occupation                        |                   |                 |        |
| Private employees                 | 8 (53.3)          | 10 (66.7)       | 0.400  |
| Civil servant                     | 1 (6.7)           | 3 (20.0)        |        |
| College student                   | 2 (13.3)          | 1 (6.7)         |        |
| Entrepreneur                      | 1 (6.7)           | 1 (6.7)         |        |
| Housewife                         | 1 (6.7)           | 0 (0)           |        |
| Contract employees                | 2 (13.3)          | 0 (0)           |        |
| Main complaint                    |                   |                 |        |
| Rhinorrhea                        | 8 (53.3)          | 7 (46.7)        | 0.339  |
| Nasal congestion                  | 6 (40.0)          | 7 (46.7)        |        |
| Full ears                         | 1 (6.7)           | 1 (6.7)         |        |
| Accompanying complaints           |                   |                 |        |
| Post nasal drip                   | 7 (46.7)          | 9 (60.0)        | 0.821  |
| Nasal congestion                  | 4 (26.7)          | 2 (13.3)        |        |
| No smell (anosmia)                | 3 (20.0)          | 3 (20.0)        |        |
| Headache                          | 1 (6.7)           | 1 (6.7)         |        |
Patient’s main complaint in both the treatment and control group were rhinorrhea and nasal congestion. The most accompanying complaints in this study were post nasal drip as many as seven patients (46.7%) in the treatment group and nine patients (60.0%) in the control group.

In the treatment group, the IL-8 was not statistically significant between before therapy compared to the after therapy group (p=0.100), an otherwise significant result was found between after therapy compared to the before therapy group in the control group (p=0.003). The total score of SNOT-22 before and after treatment in both groups statistically significant with a value of p = 0.001 (*Table 2*).

Based on the results from the Mann-Whitney test in *Table 3*, the total score of SNOT-22 before and after treatment in both groups was not significant with p-value = 0.227 (p>0.05). Based on each symptom in the SNOT-22, there were significant results for symptoms of ear and face (p=0.025) and psychological (p=0.043) between treatment and control group.

**DISCUSSION**

In this study, the average age of the treatment group was 33.7 years, and the control group was 30.2 years. In the study conducted by Indah et al. (2014) found that the dominating age group was 20-29 years (36.0%). This suggests that rhinosinusitis patients are more common in productive young adults. Hoffmans (2010) as quoted by Savitri et al. (2014) that chronic rhinosinusitis often occurs in productive age due to frequent exposure to pollutants in the surrounding environment which can be an irritant and can damage the respiratory epithelium.

The results of this study dominated by male subjects. Similar results were obtained in a study conducted Kennedy et al. (2013), a total 104 patients with rhinosinusitis, about 60 people (58%) subjects...
are male.\textsuperscript{12} Likewise with the research carried out by Bubun et al. (2009) in Makassar Sudirohusodo Wahidin Hospital, the highest incidence was found are males were 28 people (52.8%). In various literature does not mention their relationship of sex relations with the incidence of rhinosinusitis.\textsuperscript{13}

The highest distribution of occupation in this study was private employees with 53.3% in the treatment group and 66.7% in the control group. Based on the patient's main complaint, rhinorrhea was the most complaint in both group while the majority of accompanying complaints in this study was post nasal drip. This is slightly different to the research conducted by Indah et al. (2014), the main complaint dominated with cephalgia (44.0%) followed by rhinorrhea (36.0%), and obstruction of nose (20.0%), while the most accompanying complaints were the nose obstruction (80.0%), postnasal drip (76.0%), and cephalgia (48.0%).\textsuperscript{5}

Overall symptoms that are experienced cause the tendency of chronic rhinosinusitis patients to visit health services more often and even visited a mental health professional due to influential on the psychological conditions of the patients.\textsuperscript{14}

Based on the results in Table 2, an increase in IL-8 levels was not statistically significant in the treatment group, while the opposite result found in the control group. It showed that in this study, the treatment given to the research subject are standard therapy, and the addition of nasal washing with saline isotonic in the treatment group could give a better effect in inhibiting elevated levels of IL-8 compared with the provision of standard therapy without nasal washing with isotonic saline. An increase in IL-8 in the control group might due to continuous exposure to allergens in patients with chronic rhinosinusitis causes ongoing inflammation that interleukin-8 continues to be produced despite having standard therapy. Prolonged inflammation increase the occurrence of secondary infection and interleukin-8 which is a proinflammatory mediator remains released.\textsuperscript{3,5}

According to research conducted by Harvey et al. (2007) at Oxford University in 1659 patients reported that nasal irrigation with isotonic saline may improve symptoms in chronic rhinosinusitis patients with persistent infection but can not substitute for standard therapy. As reported in this study that the provision of medical treatment and nasal irrigation with isotonic saline may help in inhibiting elevated levels of interleukin-8 in patients with chronic rhinosinusitis and provide improvements to the quality of life of patients with rhinosinusitis.\textsuperscript{15}

The total score of SNOT-22 between before and after two weeks of treatment in both groups was statistically significant, with p = 0.001 (p <0.05). This result in line with the research conducted by Savitri et al. (2014) that found the quality of life of 25 patients with chronic rhinosinusitis generally increased.\textsuperscript{11} Research by Rabago et al. (2009) also showed a significant increase in the quality of life in 76 research subjects after nasal irrigation.\textsuperscript{9}

Based on the results in Table 3, it was concluded that there was no significant difference between the total score of SNOT-22 before and after therapy in both groups. We found a statistically significant improvement in-ear and face symptoms with a value of p=0.025 (p<0.05) and psychological, with p=0.043 (p<0.05). These results indicate a clinical improvement as a result of medical therapy and nasal irrigation with isotonic saline given to patients with chronic rhinosinusitis, although not eliminate all of the symptoms experienced by the patient. According to Marambaia et al. (2013), evaluating the quality of life in patients with chronic rhinosinusitis is indispensable to assess the severity of the disease and assess the quality of patients care.\textsuperscript{14} Further research needs to be done to evaluate the effectiveness of nasal clearance with saline solution with larger samples and longer period.

CONCLUSION

Based on the results of the study it can be concluded that the provision of standard therapy with nasal irrigation using 0.9% NaCl isotonic saline in patients with chronic rhinosinusitis give better effect compared to standard therapy without nasal irrigation with isotonic sodium chloride 0.9% in terms of inhibiting increased levels of interleukin-8 and may provide improvements in the quality of life of patients with chronic rhinosinusitis were better than the control group for aspects of ear and facial symptoms and psychological.

ETHICAL CLEARANCE

The Ethics Committee had approved this research before the study conducted.

CONFLICT OF INTEREST

The authors declare that there was no conflict of interest in this research.

FUNDING

The authors are responsible for the study funding without the involvement of grant or any other resource of funding.
AUTHORS CONTRIBUTION

All authors have contributed to all process in this research, preparation, drafting, review, and approval of this manuscript.

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