

# Prevalence of Angular Cheilitis in the Elderly: A Rapid Review

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## ARTICLE INFO

### Article history:

Received 20 August 2022

Revised 21 march 2023

Accepted 21 march 2023

Available online 26 June 2023

E-ISSN: [2615-854X](#)

P-ISSN: [1693-671X](#)

### How to cite:

Clarín G, Herawati E, Hidayat W. Prevalence of Angular Cheilitis in the Elderly: A Rapid Review. Dentika Dental Journal 2023; 26(1): 1-11

## ABSTRACT

The elderly commonly experiences decreased function in various organs, which can impact the immune and digestive systems, as well as increase susceptibility to angular cheilitis (ICD-10 code: K13.0). Furthermore, the high prevalence of malnutrition and the increase in the elderly yearly can affect the incidence of this inflammation. Therefore, this study aimed to evaluate the prevalence of angular cheilitis in the elderly. The rapid review method was employed to accomplish this using the Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) guidelines for screening and search procedures. The search was performed through the Google Scholar, PubMed, and ScienceDirect databases using specific keywords and inclusion criteria. A total of 30 observational study articles from 16 countries focusing on several elderly populations were included in this study. The lowest and highest prevalence value was 1% and 46.66%, respectively, with 1,347 out of 14,927 elderly experiencing angular cheilitis. Of the 30 articles reviewed, 23 showed a value below 10%, while the remaining 7 were above 10%. The differences in prevalence could be attributed to the limitations of the articles utilized in this study, which vary widely in terms of sample population characteristics, location, gender allocation, as well as study and data collection methods. This review showed that the prevalence of angular cheilitis in most countries is low. However, the two studies conducted in Indonesia have a high and low prevalence, respectively.

**Keywords:** elderly, angular cheilitis, prevalence

## ABSTRAK

Lansia umumnya mengalami penurunan fungsi pada berbagai organ tubuhnya yang dapat berdampak pada sistem kekebalan tubuh dan sistem pencernaan, sehingga menyebabkan lansia lebih rentan mengalami angular cheilitis (kode ICD-10: K13.0). Tingginya prevalensi malnutrisi lansia dan peningkatan jumlah lansia di dunia setiap tahunnya dapat memengaruhi jumlah lansia penderita angular cheilitis. Tujuan dari penelitian ini untuk mengevaluasi tinggi rendahnya prevalensi angular cheilitis pada lansia. Penelitian ini dilakukan dengan menggunakan metode rapid review dengan penapisan dan pencarian artikel dilakukan mengacu pada pedoman Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA). Pencarian artikel dilakukan menggunakan kata kunci dan kriteria inklusi pada database Google Scholar, PubMed, dan ScienceDirect. Sebanyak 30 artikel dengan metode penelitian observasional dari 16 negara pada beberapa populasi lansia diinklusi dalam penelitian ini. Nilai prevalensi angular cheilitis didapatkan terendah adalah 1% dan tertinggi adalah 46,66% dengan jumlah keseluruhan lansia yang mengalami angular cheilitis adalah 1.347 dari 14.927 lansia. Sejumlah 23 dari 30 artikel menunjukkan nilai prevalensi dibawah 10% sedangkan 7 lainnya menunjukkan hasil prevalensi diatas 10%. Perbedaan hasil prevalensi tersebut disebabkan karena adanya keterbatasan artikel penelitian yang digunakan sangat bervariasi sehingga terdapat perbedaan karakteristik populasi sampel penelitian, lokasi dilakukannya penelitian, distribusi jenis kelamin, serta metode penelitian dan pengambilan data. Rapid review ini menunjukkan bahwa prevalensi angular cheilitis pada sebagian besar negara di Dunia termasuk rendah, sedangkan di Indonesia hanya terdapat 2 penelitian dengan prevalensi pada 1 penelitian tergolong rendah dan 1 penelitian lainnya lebih tinggi

**Kata kunci:** lansia, angular cheilitis, prevalence



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<http://doi.org/10.32734/dentika.v26i1.9507>

## 1. Introduction

The World Health Organization (WHO) estimates that by 2030, 1 in 6 people worldwide will be 60 or older. In 2021, the population aged over 60 will increase from 1 billion in 2020 to 1.4 billion, and this is expected to double to 2.1 billion by 2050. Therefore, in the next 40 to 60 years, the elderly in almost every country will exceed young people.[1],[2] The Law Number 13 of 1998 concerning Elderly Welfare considers individuals above 60 as the elderly.[3].

The elderly usually experiences a decrease in the function of several organs due to cell damage. This can adversely affect the immune and digestive system, including hormone production, enzyme activity, decreased gastric acid secretion, and changes in cell permeability, disrupting food absorption, and reducing the substances needed by the body.[4],[5] Several other changes occurring in the elderly are changes in the oral mucosa, facial elasticity, and vertical dimensions, making them susceptible to oral cavity problems, such as angular cheilitis.[6],[7]

Angular cheilitis (ICD-10 code: K13.0) is an inflammation of the commissures that affects the skin and mucosa. It is characterized by a fissure surrounded by erythema, maceration, and ulceration with or without a crust.[8]-[10] Angular cheilitis usually occurs due to the accumulation of saliva containing microbes in the commissures, leading to the area's erythematous appearance and causing pain, itching, burning, and bleeding, specifically during talking and chewing.[11],[12] Furthermore, it is caused by infection from *Candida albicans* and *Staphylococcus aureus*, along with predisposing factors including low vertical dimension and reduced lip support, denture stomatitis, as well as vitamin and iron deficiency.[9],[10] These factors can accelerate yeast growth, particularly when nutritional deficiencies can decrease the body's immune response, such as oral mucosa, and facilitate the invasion of candida.[9],[13]

Angular cheilitis associated with malnutrition can have a detrimental impact on nutritional intake and worsen the nutritional status of the patient. Consequently, it serves as one of the early signs of nutritional deficiency.[14],[15] In this context, dentists can be the first to help identify abnormalities in a patient, specifically the elderly.16 Studies on the prevalence of malnutrition showed that 23% and 31% of the elderly in the world and Indonesia, respectively, are malnourished.[17-19]

At the Federal University of Rio Grande do Norte (UFRN), a study was conducted on 25 persons diagnosed with angular cheilitis. The patients' ages ranged from 10 to over 60 years, with 1 between the ages of 10 and 19, while 10 over the age of 60.20 Another study conducted at the Rumah Sakit Gigi Dan Mulut Universitas Sumatera Utara (RSGM USU) showed that the ages of 159 patients with angular cheilitis range between 1 to 64. Among them, 141 people were between 5-14 years, and 2 were within the range of 55-64 years.[21]

Studies showed that the prevalence of angular cheilitis varies and is not specific among the elderly. High malnutrition and the increasing number of elderly worldwide can affect the incidence of this inflammation.[1],[2] This review is crucial to raise awareness regarding the prevalence of angular cheilitis among the elderly population, both worldwide and in Indonesia. It can broaden knowledge in dentistry, serve as a reference for further research, and aid in public health planning to prevent and decrease the likelihood of an increase in the prevalence of this inflammation.

## 2. Materials and Methods

This study was conducted using a rapid review method and referred to the Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) guidelines for the article screening process.[22] The questions for this review were structured based on the PICO framework of Population: angular cheilitis in the elderly, Intervention: -, Comparison: elderly in the World and Indonesia, Outcome: prevalence. The screening process was conducted through Google Scholar, PubMed, and ScienceDirect databases by combining Boolean Operators, and the keywords used are prevalence, *prevalensi*, angular cheilitis, *lanjut usia*, and elderly.

### 2.1. The Inclusion Criteria

There were articles published between 2007 and 2021 that focused on angular cheilitis in the elderly ( $\geq 60$  years based on Law no. 13 of 1998 on Elderly Welfare and WHO). They need to be available in English and Indonesian, in full text and accredited as an observational study, such as cross-sectional method, retrospective study, prospective study, statistical analysis, and descriptive analysis. Meanwhile, the exclusion criteria were articles in literature reviews, experimental studies, and case reports.

### 2.2. Descriptive Data

Descriptive data were collected from the included articles. These include the author's name, year of publication, study title, study design, study location, data collection method, study sample, and prevalence of angular cheilitis. Descriptive analysis was used to assess the incidence of angular cheilitis. As a result, the prevalence is considered low when the value is below 10%. This conclusion was made based on the book Quantitative Methods for Health Research written by Bruce et al.[23]

## 3. Results

Table 1. Study Characteristics and Methodology in General

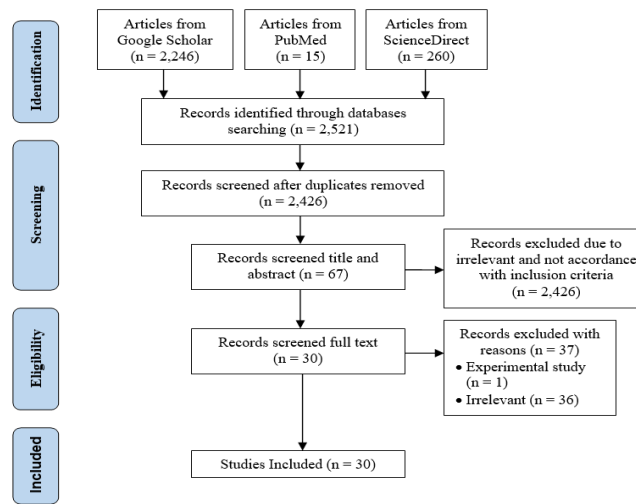
No	Author	Year	Study Design	Data Collection Method	Study Sample		Gender	
					Sample population	Age	Male	Female
1	Dundar and Ilhan Kal	2007	Statistical Analysis	E, I, Q	700 Elderly patients	$\geq 60$ years	430	270
2	Mujica <i>et al.</i>	2008	Descriptive Analysis	E & Q	266 Institutionalized elderly dan 74 Elderly patients	60-104 years	128	212
3	Freitas <i>et al.</i>	2008	Statistical Analysis	E	146 Elderly resident denture wearers dan 198 Elderly resident non-denture wearers	$\geq 60$ years	N/A	N/A
4	Taiwo <i>et al.</i>	2009	Cross-Sectional	E, I, Q	690 Elderly residents	65-90 years	403	287
5	Vidzis <i>et al.</i>	2009	Statistical Descriptive	E	212 Institutionalized elderly	65-74 years	N/A	N/A
6	Vidzis <i>et al.</i>	2011	Statistical Descriptive	E & I	116 Elderly patients dan 349 Institutionalized elderly	60-72 years	N/A	N/A
7	Mozafari <i>et al.</i>	2012	Descriptive Analysis	E & MR	237 Institutionalized elderly	60-105 years	53	184
8	Martori <i>et al.</i>	2013	Cross-Sectional	E, I, Q	84 Elderly resident denture wearers	$\geq 60$ years	21	63
9	Cueto <i>et al.</i>	2013	Statistical Analysis	E & I	126 Elderly patients	60-80 years	31	95

10	Shet <i>et al.</i>	2013	Statistical Analysis	E	570 Elderly patients	≥60 years	279	291
11	Kazancioglu <i>et al.</i>	2013	Cross-Sectional	E, Q MR	250 Elderly patients with dementia dan 200 Elderly patients with non-dementia	≥60 years	200	250
12	Asih <i>et al.</i>	2014	Descriptive Analysis	E & I	56 Institutionalized elderly	≥60 years	24	32
13	Singh <i>et al.</i>	2014	Descriptive Analysis	E, I, Q	100 Elderly resident denture wearers	65-75 years	50	50
14	Stančić <i>et al.</i>	2014	Statistical Descriptive	E, I, Q	301 Institutionalized elderly	≥65 years	104	197
15	Watuna <i>et al.</i>	2015	Cross-Sectional	E	30 Institutionalized elderly denture wearers	60-90 years	8	22
16	Bakhshi <i>et al.</i>	2015	Cross-Sectional	E & I	129 Elderly patients	60-87 years	75	54
17	Rastogi <i>et al.</i>	2015	Descriptive Analysis	E, Q, MR	400 Elderly patients	60-100 years	284	116
18	Minic <i>et al.</i>	2016	Descriptive Analysis	E & Q	75 Elderly patients	60-74 years	N/A	N/A
19	Nimri and Jebreen	2016	Statistical Descriptive	E, I, Q	2,409 Elderly patient denture wearers	65-90 years	1,280	1,129
20	Intapa <i>et al.</i>	2017	Retrospective Study	MR	2,310 Elderly patients	≥60 years	1,157	1,153
21	Quinterol <i>et al.</i>	2017	Cross-Sectional	E	240 Elderly patients with diabetes dan 413 Elderly patients with non-diabetes	≥60 years	287	366
22	Yoon <i>et al.</i>	2018	Cross-Sectional	E & MR	559 Institutionalized elderly	≥65 years	183	376
23	Barretto Montandon, <i>et al.</i>	2018	Cross-Sectional	E, I, MR	160 Institutionalized elderly	60-102 years	56	104
24	Priyaranjan <i>et al.</i>	2019	Statistical Analysis	E & I	320 Elderly patients	≥60 years	180	140
25	Mijoska <i>et al.</i>	2019	Cross-Sectional	E & Q	300 Elderly patients	≥60 years	N/A	N/A
26	Bozdemir <i>et al.</i>	2019	Statistical Analysis	E, I, MR	709 Elderly patients	≥60 years	375	334
27	Saberi <i>et al.</i>	2019	Cross-Sectional	E, I, Q	141 Institutionalized elderly dan 140 Elderly residents	60-95 years	135	146

28	Patel <i>and</i> Agrawal	2021	Prospective Study	E	714 Elderly residents	≥60 years	525	189
29	Nishat <i>et al.</i>	2021	Descriptive Analysis	E & MR	1,003 Elderly patients	60-95 years	672	331
30	Simin <i>et al.</i>	2021	Cross- Sectional	E & Q	200 Elderly patients	60-89 years	85	115

Q: Questionnaire; I: Interview; E: Intraoral Examination; MR: Medical Record; N/A: Not available

The search used the specified keywords in the identification stage, and 2,521 articles were identified. Subsequently, 30 articles that met the established criteria were included for further study. Figure 1 shows a flow chart representation of the article selection.

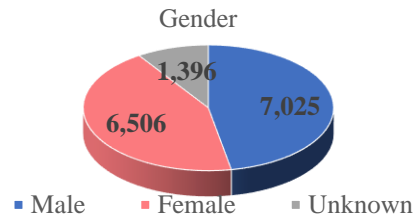


**Fig 1.** Article selection flow chart

Data on study characteristics and methodology were obtained from 30 articles between 2007 and 2021. The samples ranged from 30 to 2,409 elderly, and their overall age range was between 60 and 105. The population was diverse, including the elderly in healthcare facilities, institutionalized elderly, elderly residents, and denture wearers, as shown in Table 2, with gender distribution presented in Figure 2.

**Table 2.** Study Sample Population

No.	Population	No of Sample
1	Elderly patients	8,135 elderly (16 articles)
2	Institutionalized elderly	2,281 elderly (9 articles)
3	Elderly residents	1,742 elderly (4 articles)
4	Elderly resident denture wearers	330 elderly (3 articles)
5	Elderly patients denture wearers	2,409 elderly (1 article)
6	Institutionalized elderly denture wearers	30 elderly (1 article)

**Fig 2.** Study Sample Gender

The included studies were conducted across Asia, Europe, America, Eurasia, and Africa. Furthermore, the reported prevalence of angular cheilitis ranged from 1% to 46.66%, with 1,347 out of 14,927 elderly experiencing this condition. Table 3 summarize and present the prevalence rates of angular cheilitis among the elderly population, based on the study location.

**Table 3.** Prevalence of Angular Cheilitis Based on Study Location

Study Location	Author	Prevalence of Angular Cheilitis
Asia	India	<b>Shet <i>et al.</i></b> <b>1%</b>
		Rastogi <i>et al.</i> 1.5%
		Patel and Agrawal 3.78%
		Nishat <i>et al.</i> 9.57%
		Simin <i>et al.</i> 10.5%
		Priyaranjan <i>et al.</i> 25%
		Singh <i>et al.</i> 35%
	Indonesia	Asih <i>et al.</i> 5.3%
		<b>Watuna <i>et al.</i></b> <b>46.66%</b>
	Iran	Mozafari <i>et al.</i> 2.5%
		Bakhshi <i>et al.</i> 5.40%
		Saberi <i>et al.</i> 6.70%
Europe	Thailand	Intapa <i>et al.</i> 1.17%
	Jordan	Nimri and Jebreen 28.4%
	Latvia	Vidzis <i>et al.</i> 4.5%
		Vidzis <i>et al.</i> 8%
	North Macedonia	Mijoska <i>et al.</i> 5.4%
	Serbia	Minic <i>et al.</i> 5%
		Stančić <i>et al.</i> 18.6%
	Spain	Martori <i>et al.</i> 34%
	Brazil	Freitas, <i>et al.</i> 6.7%
		Barretto Montandon, <i>et al.</i> 4.4%
America	Canada	Yoon <i>et al.</i> 5.1%
	Chile	Cueto <i>et al.</i> 3.6%
	Cuba	Quinterol <i>et al.</i> 3.06%
	Venezuela	Mujica <i>et al.</i> 5%

Eurasia	Turkey	Dundar and Ilhan Kal	2.6%
		Bozdemir <i>et al.</i>	6.9%
		Kazancioglu <i>et al.</i>	7.1%
Africa	Nigeria	Taiwo <i>et al.</i>	7.74%

#### 4. Discussions

Angular cheilitis is an inflammation of the commissures that affect the skin and mucosa. It is characterized by fissures surrounded by erythema, maceration, and ulceration with or without a crust.[9],[10] This rapid review aimed to assess or evaluate the prevalence of angular cheilitis in the elderly. The process included 30 articles, which reported 1,347 elderly with this inflammation. These data were obtained from 16 countries with a total sample of 14,927 participants. As summarized in Table 3, the prevalence of angular cheilitis from all identified articles ranges from 1% to 46.66%, with 23 of 30 showing a rate below 10%. Meanwhile, studies with smaller samples tended to show a higher prevalence.[6],[23-52] The result is lower than the previous study by Ribeiro De Castro and Ramos-E-Silva in 2006, that the prevalence of angular cheilitis in the elderly was 25%.[53] The study indicated that most of the prevalence of angular cheilitis in the elderly worldwide is low (below 10%). However, there are only 2 studies with the overall results of the prevalence being quite varied due to differences in the study characteristics of the sample population, study location, gender allocation, and the study design and data collection method.

The highest prevalence in this study was reported by Watuna et al. in Indonesia at 46.66%. Meanwhile, the lowest was discovered in the study of Shet et al. in India at 1%. The high prevalence occurred because all samples were denture wearers, and 63% were edentulous, while in Shet et al., there were only 36% denture wearers and 19% edentulous. Furthermore, the results are also affected by the number of samples in each study. Watuna et al. reported the highest rate because it only has 30 samples. The prevalence rate was influenced by the fact that most of the participants in the study had poor oral hygiene, as evidenced by the high percentage with plaque and calculus, unadapted dentures, and poorer health status compared to Shet et al. study who paid more attention to oral health and had better health status. Differences in socio-economic conditions, culture, level of knowledge, and habits in maintaining oral hygiene in the two countries can also be the causes.[28],[37]

The prevalence results of studies conducted in Asia, Europe, America, and Eurasia, are within the range of 1%-46.66%, 4.5%-34%, 3.06%-6.7%, 2.6%-7.1%, with Africa having 7.74%. The outcome showed a slight difference compared to El Howati and Tappuni's review, indicating that oral candidiasis, including angular cheilitis, is highest in Asia and Africa, while in Europe and America, it tends to be lower.<sup>54</sup> This is because the edentulous sample in Africa was much less compared to Europe, which is one of the factors that increase the occurrence of this inflammation.[24],[25],[50] In addition, the results from America tended to be lower due to more advanced technology in dentistry, early prevention programs in oral health care facilities, and easier access to oral health facilities.[55]

Several studies conducted in India on the elderly population have demonstrated varied outcomes, including Shet et al., which yielded the lowest prevalence results in this study. Specifically, the prevalence of oral candidiasis ranged from 1.5% in Rastogi et al. to 9.57% in Nishat et al., 10.5% in Simin et al., and 25% in Priyaranjan et al. The low prevalence reported by Rastogi et al. and Nishat et al. could be due to the small number of denture wearers samples (8% and 11.1%). On the contrary, the high prevalence in Simin et al. and Priyaranjan et al. can be influenced by differences in nutritional factors, oral hygiene, smoking habits, and alcohol consumption, as well as systemic conditions such as comorbid diabetes in the sample. [26],[39], [41],[46]

There were discrepancies in the outcomes of two studies conducted in Indonesia. Asih et al. reported a prevalence of 5.4%, while that of Watuna et al. was 46.66%. This is because in Watuna et al.'s study, all the samples consisted of denture wearers who were not adapted to their dentures and exhibited at least one abnormality in their oral mucosa. However, in Asih et al., the sample size of denture wearers was smaller, and not all samples presented with abnormalities in the oral mucosa. According to Rosa et al., dental artisans in

Indonesia fabricate dentures for the elderly more frequently than dentists due to low costs. The satisfaction and comfort level are lower than those of dentists. This is because of a lack of knowledge and skills in creating good design, inadequate conduct of functional impressions, and recording of maxillomandibular relation (MMR). As a result, the elderly who use dentures made by dental artisans commonly experience several complaints and oral lesions, leading to a notable prevalence of angular cheilitis among unadapted wearers.[56],[57] This is also influenced by differences in the area where the study is conducted, causing differences in socio-economic conditions, culture, proper oral hygiene habits, and oral health status.

High prevalence was further observed in developing countries, including Indonesia<sup>28</sup> (46.66%), India [26],[38],[46] (10.5%, 25%, 35%), Jordan [51] (28.4%), and Serbia [50] (18.6 %). Spain, as a developed country, also exhibits a high prevalence of 34%.<sup>25</sup> This study results align with the review by El Howati and Tappuni that oral candidiasis was higher and more common in developing countries, as most have large populations with low socio-economic levels, poor sanitation, non-optimal health facilities, and malnutrition.[58] Furthermore, differences in the number of samples can affect the prevalence rate.

Studies that focused solely on elderly denture wearers, such as Watuna et al. in Indonesia, reported a high prevalence, as shown by Singh et al. (35%) in India, Martori et al. (34%) in Spain, and Nimri and Jebreen (28.4%) in Jordan. It was stated that angular cheilitis in the elderly is associated with age and factors such as loss of teeth, an infrequent visit to the dentist, using unadapted dentures, and decreasing vertical dimension.[25],[38],[51] This is supported by Rahmi et al. and Jafari et al., stating that the edentulous state and the use of unadapted dentures can cause a decrease in the vertical dimension, resulting in saliva accumulation in the commissures, making it easy for candida to invade and increase the risk of angular cheilitis.[59],[60] Consequently, studies indicated that populations with denture wearers have a notably higher prevalence of this inflammation, ranging from 28.4% to 46.66%, compared to elderly patients in healthcare facilities, institutionalized elderly individuals, and elderly residents.[6],[24-52]

Vidzis et al. reported that the prevalence of angular cheilitis in institutionalized elderly is higher than in elderly patients.[49] Furthermore, Saberi et al. showed a much higher prevalence in institutionalized elderly than in elderly residents.[34] This could be attributed to several factors, including the lower health status and higher incidence of physiological disorders among institutionalized elderly, as well as the limited assistance they receive for maintaining good oral hygiene. Additionally, most elderly only seek dental care when they have severe problems.[49],[50] These align with the review by Farias et al., showing that institutionalized elderly have poor oral health status due to their overall health condition, lack of dental service within social institutions, and insufficient coverage for dental care in medical care costs. In contrast, the elderly who do not reside in social institutions or live with their families pay more attention to health status and oral hygiene.[61]

In addition to advanced age, individuals may experience changes in taste and smell sensitivity, loss of appetite, limited mobility, and issues with the masticatory system, such as alterations in the masticatory muscles, leading to difficulty in swallowing, thereby reducing nutrient intake. Due to changes in absorption, more nutritious food is needed to meet essential nutrient requirements. Therefore, the elderly is more susceptible to malnutrition, which can increase the occurrence of angular cheilitis. Furthermore, the inflammation serves as early signs of systemic disease and malnutrition.[15],[19],[62-64]

The major limitation of this article is the wide variation in the number of samples used, which can affect the reported high and low prevalence (30 - 2,409 samples). The differences can be seen from the highest and lowest incidence reported by Watuna et al. and Shet et al., at 46.66% of 30 samples and 1% of 570 samples, respectively. Furthermore, another study showed a prevalence of 28.4% of 2,409 samples. This variability in sample sizes can introduce biases and result in prevalence rates that may not accurately reflect the actual situation in populations not included in this study. Other limitations include the absence of a risk of bias assessment and the heterogeneity of the characteristics of the sample population. The screening procedures



were performed by a single individual, thereby increasing the risk of subjectivity. However, this study was conducted systematically following PRISMA guidelines.

## 5. Conclusion

National study is necessary to determine the prevalence of angular cheilitis in the elderly population in Indonesia, as no national study has been conducted to gather such data. Further clinical study is required to explore the predisposing factors contributing to the development of this inflammation.

This rapid review of 30 articles showed that the prevalence of angular cheilitis in most countries is low. However, the two studies conducted in Indonesia have a high and low prevalence, respectively.

## 6. Acknowledgements

The author is grateful to Prof. Sunardhi Widyaputra, drg., MS., Ph.D. (Department of Oral Biology, Faculty of Dentistry, University of Padjadjaran), Dr. Kartika Indah Sari, drg., M.Kes. (Department of Oral Biology, Faculty of Dentistry, Padjadjaran University), and Dr. Gilang Yubiliana, drg., M.Kes. (Department of Community Oral Health, Faculty of Dentistry, University of Padjadjaran) for the suggestions provided to this manuscript.

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