

How to Cite:

Umborowati, M. A., Syamsuri, A., Endaryanto, A., Surono, I. S., Thio, H. B., & Prakoeswa, C. R. S. (2022). Correlation between disease severity and quality of life index in psoriasis patients treated with *Lactobacillus plantarum* IS-10506. *International Journal of Health Sciences*, 6(S9), 2433–2443. <https://doi.org/10.53730/ijhs.v6nS9.12957>

Correlation between disease severity and quality of life index in psoriasis patients treated with *Lactobacillus plantarum* IS-10506

Menul Ayu Umborowati

Doctoral Program of Medical Science, Faculty of Medicine, Universitas Airlangga, Indonesia, Department of Dermatology and Venereology, Faculty of Medicine, Universitas Airlangga/Dr. Soetomo General Academic Hospital, Surabaya, Indonesia

Almira Syamsuri

Department of Dermatology and Venereology, Faculty of Medicine, Universitas Airlangga/Dr. Soetomo General Academic Hospital, Surabaya, Indonesia

Anang Endaryanto

Department of Pediatrics, Faculty of Medicine Universitas Airlangga/Dr. Soetomo General Academic Hospital, Surabaya, Indonesia

Ingrid S. Surono

Faculty of Engineering, Food Technology Department, Bina Nusantara University, Jakarta, Indonesia

Hok Bing Thio

Department of Dermatology, Erasmus Medical Center, Rotterdam, The Netherland

Cita Rosita Sigit Prakoeswa

Department of Dermatology and Venereology, Faculty of Medicine, Universitas Airlangga/Dr. Soetomo General Academic Hospital, Surabaya, Indonesia
Corresponding author email: cita-rosita@fk.unair.ac.id

Abstract---Psoriasis is a chronic and relapsing inflammatory skin disease that affects both genders at all ages. The purpose of this study is to identify the correlation between psoriasis area severity index (PASI) and Dermatology Life Quality Index (DLQI) for patients with plaque psoriasis before and after treatment with *Lactobacillus plantarum* IS-10506. This was a before after cohort study. Adults with mild to moderate psoriasis were recruited into the study. All participants received the original Indonesian probiotic strain *Lactobacillus plantarum* IS-10506 at a dose of 2×10^{10} colony forming units (CFU) per day for six weeks. A total of 22 patients, with a mean

age of 43 years, participated in the study. Participants had psoriasis for an average of 14 years. There was a correlation between PASI score and several quality-of-life questionnaire elements in certain condition, such as professional jobs, unemployment, obesity, and joint symptoms. The correlation between particular conditions reveals that occupations, obesity, and joint symptoms have a greater impact on psoriasis patients.

Keywords---Psoriasis, Disease severity, Quality of life, Probiotic, Therapy.

Introduction

Psoriasis is a chronic and relapsing inflammatory skin disease that is influenced by genetic susceptibility, immunological processes, and environmental triggers. Clinically on the skin presented by erythematous plaques, well-defined, covered with thick white scales layered. Psoriasis relate with the occurrence of arthritis, cardiovascular, and psychological disorders (Gudjonsson & Elder, 2019). Psoriasis occurs in all ethnicities, with a prevalence of 0.09%-11.4% of the entire world population (Organization, 2016). In Indonesia, it is estimated that there are 2-6 million psoriasis patients in 2010 (Fransiska et al., 2018). The prevalence of psoriasis patients in Dr. Soetomo General Academic Hospital Surabaya in 2013 was 0.46% (Setyowatie et al., 2016).

Psoriasis is a condition that poses a significant physical and mental burden on sufferers. Clinical severity of psoriasis is described by psoriasis area severity index (PASI) score that calculated intensity of the erythema, induration, and scale of the skin lesions, as well as the extent of the affected body surface area (Gudjonsson & Elder, 2019). It was rated on a scale of 0 to 4, and the extent of skin involvement was measured. The total PASI score ranges from 0 to 72. Mild psoriasis has a PASI value of <5, moderate psoriasis is 5-10, and severe psoriasis has a PASI value of >10 (Naldi, 2010)(Imafuku et al., 2018). Psoriasis affects physical, social, psychological, emotional, and quality of life. One of the measures of disease severity is psoriasis patients' impaired quality of life. Dermatology Life Quality Index (DLQI) is an instrument to assess the quality of life of patients with skin diseases, including psoriasis (Fransiska et al., 2018)(Rahmayanti et al., 2019). The DLQI is a 10-item survey evaluating the quality of life in patients with a skin disease, covering six domains: symptoms and feelings, daily activities, leisure, work and school, personal relationships, and treatment (Finlay & Khan, 1994). This self-filled questionnaire has been found highly sensitive to measure improvements in psoriasis symptoms and shows correlation with the PASI (Basra et al., 2008)(Revicki et al., 2008). PASI and DLQI are the most cited and most often used tools due to their high degree of reliability, applicability, and reproducibility (Silva et al., 2013)(Smith et al., 2005).

The composition of gut microbiome known to be perturbed in psoriasis patient compare to healthy individual (Thio, 2018). The involvement of gut microbiota in psoriasis pathogenesis justifies the use of probiotics as an adjuvant treatment (GA et al., 2004). The use of probiotic showed beneficial effect on improving adult

atopic dermatitis clinically and laboratory (Umborowati et al., 2022). *Lactobacillus plantarum* IS-10506 is probiotic strain originated from Dadih, traditional fermented cow milk from north Sumatra, Indonesia (Surono, 2003). This strain already proven to be efficacious for child and adult atopic dermatitis in Indonesian population (Prameswari et al., 2017),(Prakoeswa et al., 2022). The role of this strain on quality of life has not been investigated.

This study aims to investigate the correlation between clinical severity and quality of life of psoriasis patients with probiotic *Lactobacillus plantarum* IS10506 supplementation.

Method

This was a before after cohort study, conducted in dermatology and venereology outpatient department of Dr. Soetomo General Academic Hospital in Surabaya-Indonesia. This study was reviewed and approved by the hospital's ethic committee with number 0315/KEPK/XI/2021. Adults who clinically diagnosed with psoriasis and categorized as mild to moderate psoriasis (PASI score < 10) were recruited into the study. Patients who were on systemic immunosuppressive medication, probiotic supplementation, pregnant, breastfeeding, or suffering from severe systemic illness were excluded. All participants received standard therapy and also supplemented with the original Indonesian probiotic strain *Lactobacillus plantarum* IS-10506 at a dose of 2×10^{10} colony forming units (CFU) per day for six weeks. Standard therapy given was topical corticosteroid and moisturizer, according to Indonesian Society of Dermatology and Venereology (INSDV) guideline. The study was evaluated at the beginning and end of the sixth week. Physical examination, as measured by the PASI score, was used to determine clinical severity. Area, erythema, induration, and scales of the head, trunk, upper extremities, and lower extremities were all recorded in the PASI score. It may be rated between 0 and 72 (Imafuku et al., 2018). The impact of skin condition on quality of life was measured using the DLQI questionnaire, which was filled by the patients themselves. DLQI-questionnaire was divided into six aspects, there were symptoms, daily activities, leisure, work/study, personal relationship, and treatment. Its total score ranged from 0 to 26 (Rahmatina, 2012).

Statistical analysis was performed using the IBM Statistical Package for the Social Sciences (SPSS) software, version 23. Demographic data were analysed descriptively. Numerical data was presented as mean \pm standard deviation, while categorical data presented as proportions or percentages.

Results

A total 22 patients participated in this study. The demographic characteristic was described in table 1. The mean age was 43.55 years. Gender distribution was male predominance (59.1%). The majority occupation was professional workers (45.5%). Eighty-six-point-four percent of the participants were married. Comorbid conditions obtained were Diabetes Mellitus in 18.2% of patients, while Body Mass Index (BMI) categories predominantly overweight in 50% of patients. The most non-skin disorder was joint disorder (54.5%).

There was no significant difference between PASI and DLQI score before and after treatment ($p > 0.05$) (table 3). However there was a significant correlation between PASI and several quality-of-life questionnaire elements in certain condition before treatment (table 4), such as obesity ($p: 0.041$), professional workers ($p: 0.037$), unemployment ($p: 0.014$), and joint symptoms sufferers ($p: 0.037$). There was also a positive correlation between PASI and DLQI after treatment (table 5) for professional workers ($p: 0.016$).

Table 1. Demographic characteristic

No		Frequency	%
1	Gender		
	Male	13	59.1
	Female	9	40.9
2	Work		
	Professional worker	10	45.5
	Field worker	0	0
	Students	1	4.5
	Unemployment	4	18.2
	Others	7	31.8
3	Marriage		
	Married	19	86.4
	Not married	3	13.6
4	Nail disorder		
	Yes	8	36.4
	No	14	63.6
5	Joint disorder		
	Yes	12	54.5
	No	10	45.5
6	History of Diabetes Mellitus		
	Yes	4	18.2
	No	18	81.8
7	History of Obesity		
	Yes	5	22.7
	No	17	77.3
8	Body Mass Index Categories		
	Underweight	2	9.1
	Normal	4	18.2
	Overweight	11	50
	Obese	5	22.7

Table 2. Baseline characteristic

No		Mean (SD)
1	Age (years)	43.55 (13.90)
2	BMI	27.33 (7.03)
3	Disease duration (years)	14.57 (9.18)
4	PASI	4.69 (2.96)
5	DLQI	7.64 (3.82)

BMI= Body Mass Index, PASI= Psoriasis Area Severity Index, DLQI= Dermatology Life Quality Index

Table 3. Comparison of PASI and DLQI before and after treatment

	Before treatment (n=22)	After treatment (n=22)	% improvement
PASI (mean)	4.35 (2.98)	3.76 (2.88)	13.56*
DLQI (mean)	7.2 (3.86)	6.67 (5.79)	7.36*

*= non-significant ($p > 0,05$), PASI= Psoriasis Area Severity Index, DLQI= Dermatology Life Quality Index

Table 4. Correlation between the PASI and DLQI elements before treatment (spearman)

	PASI Before treatment					
	Symptoms	Daily activities	Leisure	Work/study	Personal relationship	Treatment
Obese	p: 0,041 rs: 0,894	ns*	ns	ns	ns	ns
Professional worker	ns	ns	ns	ns	ns	p: 0,037 rs: 0,661
Unemployed	ns	ns	ns	ns	p: 0,014 rp: -0,986	ns
Joint complaints	ns	ns	ns	ns	ns	p: 0,037 rs: 0,604

PASI= Psoriasis Area Severity Index, ns= non-significant ($p > 0,05$)

Table 5. Correlation between the PASI and DLQI elements after treatment (spearman)

	PASI After treatment					
	Symptoms	Daily activities	Leisure	Work/study	Personal relationship	Treatment
Professional worker	ns	ns	p: 0,016 rs: -0,849	ns	ns	ns

PASI= Psoriasis Area Severity Index, ns= non-significant ($p > 0,05$)

Discussion

Psoriasis represents a considerable burden for patients, often resulting in feelings of embarrassment and anxiety and poor self-esteem and limiting daily, social and work-related activities (Lambert et al., 2021). Among 22 subjects who participated in this study were dominated by male. This result is consistent with previous research, it was found that the number of psoriasis sufferers was male dominated by 0.23% and 67.5%, respectively (Yip, 1984) (Chen' et al., 2009). This difference

can be caused by the culture and habits of people in a country or region about their daily lives such as bad living habits, and poor weight control diet (Lin et al., 2011). Half of the subjects in this study had a BMI category of overweight, although there was no history of obesity or DM. Psoriasis incidence in Asia is the lowest (0.4%), while in other continents were higher with 2.2%-5.2% in Europe and 2.3%-6.6% in Australia (Parisi et al., 2013). Almost all subjects in this study were married. Marital status was a determinant of quality of life in psoriasis patients in study of Sendrosa et al (Sendrasoa et al., 2020).

The duration of psoriasis appears to be associated with quality-of-life impairment. Diseases duration among subjects in this study was 14.57 years. A study of Rahmayanti suggest that the longer disease duration the more life quality affected (Rahmayanti et al., 2019). Disease duration has been suggested as a predictor of lower DLQI (Lee et al., 2010). However, other studies found the Monali et al. explained that the chronic and recurrent characteristic of the disease often lowers patients life quality regarding treatment plans and diseases prognosis (Bhosle et al., 2006). However, other studies have shown the opposite finding. Valenzuela et al. showed that patients with recent psoriasis (<5 years) had a more impaired QoL than those with psoriasis over 20 years (Valenzuela, 2011). The findings explained that patients were not always adapting with the disease as time goes by (Gelfand et al., 2004). The difference between several studies may result from the cultural, social, and economic differences of the groups studied (Sendrasoa et al., 2020).

There was no correlation between PASI and DLQI before and after supplementation with the probiotic. These results are in agreement with previous studies using systemic treatment, there was no correlation between the PASI and DLQI. In other words, clinical severity assessed by the physician was not necessarily associated with an impaired quality of life reported by the patients, both before and after treatment (da Silva et al., 2013). However, the results of this study found that PASI is related to several elements of QoL, such as obesity, joint symptoms sufferers, professional workers, and unemployment.

Obese psoriasis patients are associated with stigmatization and psychological distress. About 50% of psoriasis patients in this group feel unattractive and anxious because of the disease (Nayak et al., 2018). Psoriasis lesions commonly affect appearance, influencing perceptions of a patient's body image. It is also seen in other disorders that also have apparent clinical signs. The presence of lesions in visible body area leads to a considerably lower quality of life (Nazik et al., 2017)(Khoury et al., 2014)(Lipowska & Lipowski, 2015)(Timotijević et al., 2017). This in turn can lead to patients avoiding interpersonal situations or public places where rejection may occur, reducing social and occupational opportunities, and further compromising quality of life. Feelings of embarrassment, shame, and lack of self-esteem result in significant levels of life disruption and social withdrawal (Basavaraj et al., 2011).

Joint complaints are reported to be experienced by about one third of psoriasis patients. The risk of psoriasis vulgaris patients to get this is about 7-48% (Mabuchi et al., 2012). Psoriatic arthritis is usually affecting the fingers, toes, wrists, hips, and back. It can result in damage to bone and synovial membranes, pronounced disability, and increased mortality (Basavaraj et al., 2011). In our

study 54.5% subjects have joint complaints. In this group, quality of life regarding treatment has positive correlation with disease severity. Some previous studies reported that psoriatic arthritis negatively affected the quality of life in more than half cases (Rosen et al., 2012)(Çakmur & Derviş, 2015)(Zachariae et al., 2002).

Most subjects in this study are professional workers, including office workers, teachers, doctors, lawyers, and other professional jobs. In professional worker group, psoriasis severity was correlated with quality of life before therapy in the treatment section and after therapy in the leisure section. Diseases severity can impact their ability to work. Patients with more severe psoriasis must spend more time and money on treatment, which can ultimately affect their work (Kimball et al., 2005). One study found that 86% of patients with severe psoriasis were “moderately” or “a lot” concerned with the time and costs of treating psoriasis (Basavaraj et al., 2011). The study reported 64% patients with moderate psoriasis were concerned about time spent on the disease, while 69% were concerned about costs. The results of the questionnaire also revealed that 36% of patients with severe psoriasis felt “moderately” or “a lot” bothered by work loss due to the disease (Basavaraj et al., 2011). Apparent from long-life treatment plans, psoriasis may also limit many other aspects of patients’ life, including physical activity limitation due to physical and physiological discomfort (Yeroushalmi et al., 2022)(Yeroushalmi et al., 2022). Chronic diseases can also impact patients’ leisure activities (Leino et al., 2014). In a study by Sampogna et al., 69% of patients reported difficulty carrying out work/hobbies sometimes, often or all the time (Sampogna et al., 2012). Their conception of the disease or the burden of it on leisure-time activities could have changed during the years with psoriasis and it could have been difficult to remember the situation without the disease (Leino et al., 2014).

Our study shows 18.2% of the subjects are unemployed and this group showed positive correlation between disease severity and their personal relationship quality. On study from Judith et al, psoriasis patients shows low positive intrinsic affect, and high score for impulsive behaviour (Bahmer & Bahmer, 2011). Faced with a stressful situation, patients with psoriasis shows deficit in controlling the situation and more likely to avoid negative outcome for they tend to be passive in action (Bahmer & Bahmer, 2011). In a study of 369 patients with severe psoriasis, the occupational disability caused by the disease was significant. Of those who were not working or retired, 33.9% attributed their employment status to their psoriasis (Choi & Koo, 2003).

The limitation of this study is small number of participants, bigger and larger population coverage could increase the study’s significance. Moreover, the duration and evaluation of probiotic supplementation can be longer to show more significant effect.

Conclusion

Psoriasis is a chronic skin disease and represent a considerable burden for patients. The PASI score is not always correlated with the impact to quality of life. Disease duration affects most psoriasis patients’ acceptance to their condition.

Diseases severity in particular condition such as obesity, joint symptom, and professional worker give impact to quality of life.

Funding

This study is funded by a research mandate top tier grant form Universitas Airlangga, Indonesia.

References

- Bahmer, J., & Bahmer, F. (2011). Psoriasis, Addiction, and Personality. *Archives of Dermatology*, 147, 988. <https://doi.org/10.1001/archdermatol.2011.223>
- Basavaraj, K. H., Navya, M. A., & Rashmi, R. (2011). Stress and quality of life in psoriasis: An update: Stress and psoriasis. *International Journal of Dermatology*, 50(7), 783–792. <https://doi.org/10.1111/j.1365-4632.2010.04844.x>
- Basra, M. K. A., Fenech, R., Gatt, R. M., Salek, M. S., & Finlay, A. Y. (2008). The Dermatology Life Quality Index 1994-2007: A comprehensive review of validation data and clinical results. *British Journal of Dermatology*. <https://doi.org/10.1111/j.1365-2133.2008.08832.x>
- Bhosle, M. J., Kulkarni, A., Feldman, S. R., & Balkrishnan, R. (2006). Quality of life in patients with psoriasis. *Health and Quality of Life Outcomes*, 4(1), 35. <https://doi.org/10.1186/1477-7525-4-35>
- Çakmur, H., & Derviş, E. (2015). The relationship between quality of life and the severity of psoriasis in Turkey. *European Journal of Dermatology*, 25(2), 169–176. <https://doi.org/10.1684/ejd.2014.2511>
- Chen', Y.-T. C. T.-J., Chen', P.-C. L. Y.-C., Chen, Y.-J., Jih', Y.-L. H.-J.-S., & Chen', C.-C. (2009). *Epidemiological Study of Psoriasis in the National Health Insurance Database in Taiwan*. 6.
- Choi, J., & Koo, J. Y. M. (2003). Quality of life issues in psoriasis. *Journal of the American Academy of Dermatology*, 49(2), 57–61. [https://doi.org/10.1016/S0190-9622\(03\)01136-8](https://doi.org/10.1016/S0190-9622(03)01136-8)
- da Silva, M. F. P., Fortes, M. R. P., Miot, L. D. B., & Marques, S. A. (2013). Psoríase: Correlação entre gravidade clínica (PASI) e qualidade de vida (DLQI) em pacientes avaliados antes e depois de tratamento sistêmico. *Anais Brasileiros de Dermatologia*, 88(5), 760–763. <https://doi.org/10.1590/abd1806-4841.20132052>
- Finlay, A. Y., & Khan, G. K. (1994). Dermatology Life Quality Index (DLQI)-a simple practical measure for routine clinical use. *Clinical and Experimental Dermatology*, 19(3), 210–216. <https://doi.org/10.1111/j.1365-2230.1994.tb01167.x>
- Fransiska, A., Surya Husada, M., & Effendy, E. (2018). The differences of depressive symptoms by gender in people with psoriasis. *Asian Journal of Pharmaceutical and Clinical Research*, 11(Special Issue 1), 42–45. <https://doi.org/10.22159/ajpcr.2018.v11s1.26564>
- GA, M., L, A., & ASB, M. (2004). Validation of life quality questionnaires for psoriasis patients. *An Bras Dermatol*, 79, 521–535.
- Gelfand, J. M., Feldman, S. R., Stern, R. S., Thomas, J., Rolstad, T., & Margolis, D. J. (2004). Determinants of quality of life in patients with psoriasis: A study

- from the US population. *Journal of the American Academy of Dermatology*, 51(5), 704–708. <https://doi.org/10.1016/j.jaad.2004.04.014>
- Gudjonsson, J. E., & Elder, J. T. (2019). Psoriasis. In S. Kang, M. Amagai, A. Bruckner, A. Enk, D. Margolis, A. McMichael, & J. Orringer (Eds.), *Fitzpatrick's dermatology in general medicine* (9th ed, pp. 457–497). McGraw Hill.
- Imafuku, S., Zheng, M., Tada, Y., Zhang, X., Theng, C., Thevarajah, S., Zhao, Y., & Song, H. J. (2018). Asian consensus on assessment and management of mild to moderate plaque psoriasis with topical therapy. *The Journal of Dermatology*, 45(7), 805–811. <https://doi.org/10.1111/1346-8138.14338>
- Khoury, L. R., Danielsen, P. L., & Skiveren, J. (2014). Body image altered by psoriasis. A study based on individual interviews and a model for body image. *Journal of Dermatological Treatment*, 25(1), 2–7. <https://doi.org/10.3109/09546634.2012.739278>
- Kimball, A. B., Jacobson, C., Weiss, S., Vreeland, M. G., & Wu, Y. (2005). The Psychosocial Burden of Psoriasis: *American Journal of Clinical Dermatology*, 6(6), 383–392. <https://doi.org/10.2165/00128071-200506060-00005>
- Lambert, J., Hansen, J. B., Sohrt, A., & Puig, L. (2021). Dermatology Life Quality Index in Patients with Moderate-to-Severe Plaque Psoriasis Treated with Brodalumab or Ustekinumab. *Dermatology and Therapy*, 11(4), 1265–1275. <https://doi.org/10.1007/s13555-021-00545-5>
- Lee, Y. W., Park, E. J., Kwon, I. H., Kim, K. H., & Kim, K. J. (2010). Impact of Psoriasis on Quality of Life: Relationship between Clinical Response to Therapy and Change in Health-related Quality of Life. *Annals of Dermatology*, 22(4), 389. <https://doi.org/10.5021/ad.2010.22.4.389>
- Leino, M., Mustonen, A., Mattila, K., Koulu, L., & Tuominen, R. (2014). Perceived impact of psoriasis on leisure-time activities. *European Journal of Dermatology*, 24(2), 224–228. <https://doi.org/10.1684/ejd.2014.2282>
- Lin, T.-Y., See, L.-C., Shen, Y.-M., Liang, C.-Y., Chang, H.-N., & Lin, Y.-K. (2011). *Quality of Life in Patients with Psoriasis in Northern Taiwan*. 34(2), 11.
- Lipowska, M., & Lipowski, M. (2015). Narcissism as a Moderator of Satisfaction with Body Image in Young Women with Extreme Underweight and Obesity. *PLOS ONE*, 10(5), e0126724. <https://doi.org/10.1371/journal.pone.0126724>
- Mabuchi, T., Yamaoka, H., Kojima, T., Ikoma, N., Akasaka, E., & Ozawa, A. (2012). *Psoriasis Affects Patient's Quality of Life More Seriously in Female than in Male in Japan*. 5.
- Naldi, L. (2010). Scoring and monitoring the severity of psoriasis. What is the preferred method? What is the ideal method? Is PASI passé? facts and controversies. *Clinics in Dermatology*, 28(1), 67–72. <https://doi.org/10.1016/j.clindermatol.2009.03.001>
- Nayak, P., Girisha, B., & Noronha, T. (2018). Correlation between disease severity, family income, and quality of life in psoriasis: A study from South India. *Indian Dermatology Online Journal*, 9(3), 165. https://doi.org/10.4103/idoj.IDOJ_250_17
- Nazik, H., Nazik, S., & Gul, F. (2017). Body image, self-esteem, and quality of life in patients with psoriasis. *Indian Dermatology Online Journal*, 8(5), 343. https://doi.org/10.4103/idoj.IDOJ_503_15
- Organization, W. H. (2016). Global Report on Psoriasis. *WHO Press*, 978, 48.
- Parisi, R., Symmons, D. P. M., Griffiths, C. E. M., & Ashcroft, D. M. (2013). Global Epidemiology of Psoriasis: A Systematic Review of Incidence and Prevalence.

- Journal of Investigative Dermatology*, 133(2), 377–385. <https://doi.org/10.1038/jid.2012.339>
- Prakoeswa, C. R. S., Bonita, L., Karim, A., Herwanto, N., Umborowati, M. A., Setyaningrum, T., Hidayati, A. N., & Surono, I. S. (2022). Beneficial effect of *Lactobacillus plantarum* IS-10506 supplementation in adults with atopic dermatitis: A randomized controlled trial. *Journal of Dermatological Treatment*, 33(3), 1491–1498. <https://doi.org/10.1080/09546634.2020.1836310>
- Prameswari, R., Astari, L., Hidayati, A. N., & Prakoeswa, C. R. S. (2017). *Efek Lactobacillus plantarum terhadap Imunoglobulin E Serum Total dan Indeks Scoring Atopic Dermatitis (SCORAD) Pasien Dermatitis Atopik Anak*. 8.
- Rahmatina. (2012). Uji Validitas Dan Reliabilitas Dermatology Life Quality Index (Dlqi) Berbahasa Indonesia Pada Pasien Poliklinik Ilmu Kesehatan Kulit Dan Kelamin Rumah Sakit Dr. Cipto Mangunkusumo. *Fakultas Kedokteran Universitas Indonesia Program Pendidikan Dokter Spesialis Ilmu Kesehatan Kulit Dan Kelamin*, 5–34.
- Rahmayanti, N. D., Hidayati, A. N., Ervianti, E., & Muhdi, N. (2019). *Association of psoriasis severity degree with self- esteem, depression and dermatology life quality index*. 11.
- Revicki, D. A., Willian, M. K., Menter, A., Saurat, J.-H., Harnam, N., & Kaul, M. (2008). Relationship between Clinical Response to Therapy and Health-Related Quality of Life Outcomes in Patients with Moderate to Severe Plaque Psoriasis. *Dermatology*, 216(3), 260–270. <https://doi.org/10.1159/000113150>
- Rosen, C. F., Mussani, F., Chandran, V., Eder, L., Thavaneswaran, A., & Gladman, D. D. (2012). Patients with psoriatic arthritis have worse quality of life than those with psoriasis alone. *Rheumatology*, 51(3), 571–576. <https://doi.org/10.1093/rheumatology/ker365>
- Sampogna, F., Tabolli, S., & Abeni, D. (2012). Living with Psoriasis: Prevalence of Shame, Anger, Worry, and Problems in Daily Activities and Social Life. *Acta Dermato Venereologica*, 92(3), 299–303. <https://doi.org/10.2340/00015555-1273>
- Sendrasoa, F. A., Razanakoto, N. H., Ratovonjanahary, V., Raharolahy, O., Ranaivo, I. M., Andrianarison, M., Rakotoarisaona, M. F., Rakotonaivo, N. A., Sata, M., Ramarozatovo, L. S., & Rapelanoro, R. F. (2020). Quality of Life in Patients with Psoriasis Seen in the Department of Dermatology, Antananarivo, Madagascar. *BioMed Research International*, 2020, 1–5. <https://doi.org/10.1155/2020/9292163>
- Setyowatie, L., Sukanto, H., & Murtiastutik, D. (2016). *C-Reactive Protein pada Berbagai Derajat Keparahan Psoriasis Vulgaris (C-Reactive Protein in Various Degrees Severity of Psoriasis Vulgaris)*. 28(2), 9.
- Silva, M. F. P. da, Fortes, M. R. P., Miot, L. D. B., & Marques, S. A. (2013). Psoriasis: Correlation between severity index (PASI) and systemic treatment. *Anais Brasileiros de Dermatologia*, 88(5), 760–763. <https://doi.org/10.1590/abd1806-4841.20132052>
- Smith, C. H., Anstey, A. V., Barker, J. N. W. N., Burden, A. D., Chalmers, R. J. G., Chandler, D., Finlay, A. Y., Griffiths, C. E. M., Jackson, K., McHugh, N. J., McKenna, K. E., Reynolds, N. J., Ormerod, A. D., & Chair of Guideline Group). (2005). British Association of Dermatologists guidelines for use of biological interventions in psoriasis 2005: Biological interventions for psoriasis. *British Journal of Dermatology*, 153(3), 486–497. <https://doi.org/10.1111/j.1365-2133.2005.06893.x>

- Surono, I. S. (2003). *In Vitro Probiotic Properties of Indigenous Dadih Lactic Acid Bacteria*. 6.
- Thio, H. B. (2018). The Microbiome in Psoriasis and Psoriatic Arthritis: The Skin Perspective. *The Journal of Rheumatology*, 94, 30–31. <https://doi.org/10.3899/jrheum.180133>
- Timotijević, Z. S., Majcan, P., Trajković, G., Relić, M., Novaković, T., Mirković, M., Djurić, S., Nikolić, S., Lazić, B., & Janković, S. (2017). The Impact of Changes in Psoriasis Area and Severity Index by Body Region on Quality of Life in Patients with Psoriasis. *ACTA DERMATOVENEROLOGICA CROATICA*, 8.
- Umborowati, M. A., Damayanti, D., Anggraeni, S., Endaryanto, A., Surono, I. S., Effendy, I., & Prakoeswa, C. R. S. (2022). The role of probiotics in the treatment of adult atopic dermatitis: A meta-analysis of randomized controlled trials. *Journal of Health, Population and Nutrition*, 41(1), 37. <https://doi.org/10.1186/s41043-022-00318-6>
- Valenzuela, F. (2011). *Epidemiology and Quality of Life of Patients With Psoriasis in Chile*. 7.
- Yeroushalmi, S., Hakimi, M., Chung, M., Bartholomew, E., Bhutani, T., & Liao, W. (2022). Psoriasis and Exercise: A Review. *Psoriasis: Targets and Therapy*, Volume 12, 189–197. <https://doi.org/10.2147/PTT.S349791>
- Yip, S. Y. (1984). *The prevalence of psoriasis in the Mongoloid race*. 4.
- Zachariae, H., Zachariae, R., Blomqvist, K., Davidsson, S., Molin, L., Mørk, C., & Sigurgeirsson, B. (2002). Quality of Life and Prevalence of Arthritis Reported by 5,795 Members of the Nordic Psoriasis Associations. *Acta Derm Venereol*, 7.