

Effectiveness of topical combination of finasterid and minoxidil in the management of male androgenetic alopecia (systematic review and meta-analysis: Hair density study)

Puguh Riyanto¹, Muhammad Zuldhan Karami², Diah Adriani Malik³

^{1,2,3}Department of Dermatovenereology, Faculty of Medicine, Universitas Diponegoro, Indonesia

ARTICLE INFO

Article history:

Received Oct 5, 2025

Revised Oct 10, 2025

Accepted Oct 20, 2025

Keywords:

Hair Density
Male Androgenetic Alopecia
Topical Finasteride
Topical Minoxidil

ABSTRACT

Androgenetic alopecia (AAG) is the most common hair loss problem in men, characterized by miniaturization of hair follicles due to systemic androgens and genetic factors. AAG treatment aims to prevent follicle miniaturization. Treatment modalities for AAG include hair transplantation, platelet-rich plasma (PRP), microneedling, and stem cells. Each treatment modality has its benefits and risks. The combination of topical finasteride and topical minoxidil has been shown to improve outcomes in several studies. This study aimed to evaluate the efficacy of topical finasteride compared to topical minoxidil in improving hair density among male AAG patients. A systematic literature search method was conducted using MEDLINE, Embase, AMED, Cochrane Library, Clinicaltrials.gov, Web of Knowledge, Web of Science, and WHO ICTRP with the search terms "topical finasteride and minoxidil" 'AND' "male androgenetic alopecia" 'AND' "male pattern hair loss". The literature search was carried out in accordance with the PRISMA 2009 path. Three RCTs were included in the qualitative synthesis and included in the meta-analysis. The results showed that the overall SMD in hair density was 0.751 ± 0.215 (95% CI: 0.331 – 1.162, $p < 0.001$) in favor of topical finasteride and topical minoxidil combination treatment, suggesting that topical finasteride and topical minoxidil combination had much greater effectiveness than control treatments in improving hair density among male patients with AAG.

This is an open access article under the [CC BY-NC](#) license.



Corresponding Author:

Muhammad Zuldhan Karami,
Department of Dermatovenereology,
Faculty of Medicine,
Universitas Diponegoro,
Jl. Prof. Soedarto, Tembalang, Kec. Tembalang, Kota Semarang, Jawa Tengah, 50275, Indonesia
Email: zuldhan.dvju18@gmail.com

INTRODUCTION

Androgenetic alopecia (AAG) is the most common hair baldness problem in men, characterized by miniaturization of hair follicles due to systemic androgens and genetic factors (Putri & Listiawan, 2022). The incidence and prevalence of AAG depends on age and race. Prevalence data available, that 30% of white men will experience AAG by age 30, 50% by age 50, and 80% by age 70. Chinese,

Japanese, and African-Americans are less affected than Caucasians. Wang et al.'s research found that in the Caucasian population, the prevalence of AAG was 2.8% aged 18–29 years, 13.3% aged 30–39 years, 21.4% aged 40–49 years, 31.9% aged 50–59 years, 36.2% aged 60–69 years and 41.4% aged 70 years and above. The most common type was mixed baldness (51%), followed by frontal type (29.2%), vertex type (16.1%) (Indonesia, 2015), (Harmilah et al., 2025).

Androgenetic alopecia (AAG) is mainly influenced by genetic factors because the androgen receptor gene is located on the X chromosome and is influenced by environmental factors. The pathogenesis of AAG is related to the binding of dihydrotestosterone (DHT) to androgen receptors (AR) located in hair follicles (Darmaningrat, Ari, Lousiana, & Nurhidayati, 2022), (Stephanie, 2018). DHT is produced by testosterone conversion using type 2 5- α -reductase, an enzyme located in follicular dermal papillae. Dihydrotestosterone (DHT) binds to androgen receptors resulting in miniaturization of hair follicles. This will result in progressive miniaturization of the hair follicles due to changes in the duration of the anagen phase to be shorter and the telogen phase longer, resulting in a change in terminal hair that should be long, thick, pigmented to small, thin, and less pigmented (MIMIJA, 2023), (Pramitha, Linawati, Made, & Rusyati, 2013).

AAG treatment options should be viewed in terms of efficacy, practicality, risk, and cost. The goal of AAG therapy is to prevent the process of miniaturization (Hidayati, Habib, Dewi, Setiani, & Widodo, 2024), (Nugroho, n.d.). The therapies currently authorized by the *Food and Drug Administration* (FDA) for the treatment of AAG are minoxidil and finasteride which can be used alone or in combination. Therapeutic modalities for AAG include hair transplantation, platelet rich plasma (PRP), microneedling and stem cell transplantation (Gentile & Garcovich, 2020), (Kaiser, Abdin, Gaumond, Issa, & Jimenez, 2023).

Minoxidil is an FDA-approved topical agent for male and female alopecia patterns, acts as a potassium channel opener, improves follicle vascularization, prolongs anagen phase and shortens telogen phase, increases VEGF in dermal papillae and causes angiogenesis, vasodilation and also converts a small portion of hair follicles into terminal hair. Side effects of minoxidil are contact dermatitis, headache, hypertrichosis and leg edema (Hati, 2023), (Puspitasari, 2025).

Finasteride is a competitive inhibitor of 5- α -reductase type 2 and inhibits the conversion of testosterone to dihydrotestosterone (DHT), thereby inhibiting the miniaturization of hair follicles and promoting the anagen phase of hair growth. Systemic finasteride has side effects of decreased libido, erectile dysfunction, prostate cancer risk and depression so some patients are hesitant to continue using the therapy (Akbar, 2018), (Rusdi, 2019). Topical finasteride is a potential alternative option to minimize systemic side effects. Studies show that topical finasteride in AAG tends to have the same sensitivity and good as oral finasteride. Treatment with 0.005% solution – Finasteride 0.5% in men with AAG showed a greater increase in hair growth compared to the placebo group. A study of finasteride gel compared to oral finasteride 1 mg, showed that finasteride gel 1% had relatively similar therapeutic results in hair growth (Earlia et al., 2024), (Mahmudi, 2025).

The study conducted by Chen li et al found that combination therapy on AAG was shown to have a better effect than monotherapy. Other studies have shown that topical combination therapy of finasteride and minoxidil compared to topical minoxidil and oral finasteride has the same effectiveness, so a combination of topical finasteride and minoxidil is recommended because of the minimal side effects (Mahmudi, 2025), (Maharani, 2025).

Objective assessment of hair growth using non-invasive trichoscopic methods. Trichoscopy is a dermoscopy tool for hair and scalp that can assess the hair shaft, hair follicles, perifollicular epidermis. Normal scalp hair has a hair follicle density of 200–400 per cm², while scalp hair diameter ranges from 50–90 μ m (TETI INDRAWATI, 2025), (MAULIDA, 2023).

Several experimental studies to prove the effectiveness of the topical combination of finasteride and minoxidil in the management of androgenetic alopecia in men have been conducted frequently, but no systematic studies and meta-analyses have been conducted.

RESEARCH METHOD

This research employed an observational analytical design with a systematic review and meta-analysis approach. The study population comprised all clinical trial reports on the topical combination of finasteride and minoxidil in men with androgenetic alopecia. The sample was determined based on inclusion criteria: randomized controlled trials (RCTs) with a control group, male subjects aged 18 years and older, diagnosed with AAG based on the Norwood-Hamilton II-VII scale, and a minimum follow-up of 6 months with hair density per cm² as the outcome. Studies in the form of case reports, case series, reviews, previous meta-analyses, or written in languages other than Indonesian or English were excluded from the analysis.

The analysis was conducted by extracting data from the selected studies, including subject characteristics, intervention methods, and primary outcomes related to hair density. Quantitative data were analyzed using standardized mean differences with a 95% confidence interval (CI) significance level. Risk of bias was assessed based on the randomization method, concealment, blinding, and data completeness. The quality of evidence was evaluated using the Grading of Recommendations Assessment, Development, and Evaluations (GRADE) system. The results of the systematic review and meta-analysis are expected to provide objective conclusions regarding the effectiveness of the topical combination of finasteride and minoxidil compared to minoxidil monotherapy in increasing hair density in men with androgenetic alopecia.

RESULTS AND DISCUSSIONS

This study is a meta-analytic observational study, a systematic review and meta-analysis of the effectiveness of the combination of topical finasteride and topical minoxidil on increasing hair density in male androgenetic alopecia patients. Three studies were included in a qualitative review (systematic review) and a review (meta-analysis) to determine the effect of topical administration of finasteride and topical minoxidil on increased hair density in male androgenetic alopecia patients.

Androgenetic alopecia (AAG) is the most common hair baldness problem in men, characterized by miniaturization of hair follicles due to systemic androgens and genetic factors (Tanaka et al., 2018a). Androgenetic alopecia (AAG) is mainly influenced by genetic factors because the androgen receptor gene is located on the X chromosome and is influenced by environmental factors. The pathogenesis of AAG is related to the binding of dihydrotestosterone (DHT) to androgen receptors (AR) located in hair follicles. DHT is produced by testosterone conversion using type 2 5- α -reductase, an enzyme located in follicular dermal papillae. DHT binds to androgen receptors resulting in miniaturization of hair follicles.

Other etiologies of AAG are follicular inflammation and environmental factors. Microbial toxins associated with *Propionibacterium sp.*, *Staphylococcus sp.*, *Malassezia sp.*, or *Demodex* can be involved in the formation of an inflammatory response. Smoking also affects the development of AAG because the genotoxic compounds in cigarettes can damage the DNA in hair follicles and cause microvascular poisoning of the dermal papillae. Keratinocytes can respond to chemical stress from the use of cosmetic and treatment agents, pollutants and damage from UV radiation by producing radical oxygen species and nitric oxides. Combined with all these factors, it will inhibit hair growth in the dermis papilla, the anagen phase becomes shorter and the telogen phase is longer, resulting in hair miniaturization, judging from the reduced number of hairs and the shrinking size.

AAG treatment options should be viewed in terms of efficacy, practicality, risk, and cost. The goal of AAG therapy is to prevent the process of miniaturization. The therapies currently authorized by the *Food and Drug Administration* (FDA) for the treatment of AAG are minoxidil and finasteride which can be used alone or in combination. Therapeutic modalities for AAG include hair transplantation, platelet rich plasma (PRP), microneedling and stem cell.

Minoxidil was initially developed as an anti-hypertensive agent but has great potential as a hair loss therapy. A topical formulation that has become the first-line treatment for hair loss patterns. After application, minoxidil is converted into minoxidyl sulfate, a potassium channel opener, which relaxes the smooth muscles of blood vessels and improves blood flow. Topically applied minoxidil is currently available as a preparation in a 2 or 5% solution and a 5% foam. Response to treatment should ideally be assessed at the end of 6 months. Patients should be told there will be telogen release, which is usually seen within the first 8 weeks of therapy. Side effects that can arise such as irritation, itching, burning, hypertrichosis of the face, irritant contact dermatitis. A common side effect is contact dermatitis, which can be replaced with a decrease in concentration from the previous one or given a foam form, which lacks propylene glycol. Minoxidil therapy is applied 2 times a day to maintain good results. Minoxidil works directly on hair follicles by stimulating hair growth. The following are the effects of minoxycil from several studies, namely playing a role in lengthening keratinocyte cells (hair follicle-forming cells), growing and prolonging the anagen phase, and accelerating the change of telogen hair into anagen, extending the life span of keratinocyte cells in vitro. Causes vasodilation of arterial blood vessels in hair follicles (Rahardja, 2023), (Jessika, 2023).

Finasteride is a competitive inhibitor of type 2.5- α reductase and inhibits the conversion of testosterone to dihydrotestosterone (DHT), thereby inhibiting the miniaturization of hair follicles and promoting the anagen phase of hair growth. Systemic finasteride has side effects of decreased libido, erectile dysfunction, prostate cancer risk and depression so some patients are hesitant to continue using the therapy. Studies show that topical finasteride in AAG tends to have the same sensitivity and good as oral finasteride. Topical finasteride is a potential alternative option to minimize systemic side effects. Treatment with a solution of 0.005% - 0.5% finasterid in men with AAG showed a greater increase in hair growth compared to the placebo group. When compared to the current standard treatment, finasteride 1 mg daily, finasteride 1% gel reveals relatively similar therapeutic results in hair growth. DHT can inhibit the expression of Wnt/ β -catenin and result in miniaturization of hair follicles. Finasteride is a competitive inhibitor of type 2.5- α reductase by means of finasteride reduced to dihydrofinasteride thereby blocking the conversion of testosterone to dihydrotestosterone (DHT) at the dermal papilla level, resulting in a significant reduction in DHT in the scalp and serum DHT levels.

Evaluation of hair growth can be seen after the telogen phase (3 months) is completed and a few weeks later it enters the anagen phase again. Currently, there are several invasive and non-invasive methods for evaluating hair density and diameter. Skin biopsy is one of the invasive methods used to determine hair parameters in clinical practice and several research studies. However, it is not the preferred option for hair and scalp examinations due to pain and scarring can occur. Non-invasive techniques such as washing tests, trichoscopy, and phototrichograms are more commonly used. Quantitative trichoscopy analysis is a form of video dermoscopy combined with an image analysis system that has the ability to show hair density (per cm²) and hair diameter (μ m). This method is less complicated, easy to use, and less time-consuming, but it also produces accurate results, especially when combined with computer-aided analysis (Pratiwi, Awangga, & Setyawan, 2020), (Batubara, Awangga, & Pane, 2020).

Studies included in systematic reviews as well as meta-analyses have a different age range of study subjects in each study. The age range in the study was Tanglertsampan (2012) 18-47 years, Suchonwanit (2018) 18-60 years and Gowda (2021) 18-45 years. The type of MPHL according to the Norwood-Hamilton classification varies between II-VII. Based on the literature of European-American men in the US, it was revealed that the prevalence of frontal area baldness of variant A was 12% and Type III was 16% in 18-29 years old, increasing progressively to 53% at the age of 40-49 years. Norwegian men aged 20-50 years are most often Type I (31%), Type II (26%) and Type V (20%). Wang et al.'s research found that the Caucasian population of 2.8% was aged 18-29 years, 13.3% were aged 30-39, 21.4% were aged 40-49, 31.9% were aged 50-59, 36.2% were aged 60-69

and 41.4% were aged 70 years and above. A gradual increase in incidence with age and occurs after puberty.

The first hypothesis is that there is an increase in hair density in the group given topical minoxidil. The results of the analysis from 3 studies that were given topical minoxidil 2 times a day were then evaluated at the 6th month. Tanglertsampan's research (2012) showed a statistically significant increase in average hair density ($p = 0.114$) of 2.91 ± 6.93 hairs/cm² (from 62.41 ± 15.49 to 65.31 ± 18.91 hairs/cm²). Suchonwanit's research (2018) showed an increase in the average density of statistically meaningful hair ($p = 0.04$) by 34.88 ± 10.24 hairs/cm². Gowda's research (2021) showed an increase in the average density of statistically significant hair ($p = 0.005$) by 65.73 ± 13.78 to 72.40 ± 15.26 hair/cm². Suchonwanit (2018) and Gowda (2021) found a significant increase in hair density, while Tanglertsampan (2012) found a significant increase in hair density. This is consistent with the hypothesis that there is an increase in hair density after topical administration of minoxidil. Minoxidil plays a role in the elongation of keratinocyte cells (hair follicle-forming cells), grows and prolongs the anagen phase, and accelerates the conversion of telogen hair into anagen, extending the lifespan of keratinocyte cells in vitro. Causes vasodilation of arterial blood vessels in hair follicles (Hati, 2023), (Diana, Wijayanti, Mawardi, & Genteng, 2022).

The second hypothesis is that there is an increase in hair density in the group given a combination of topical finasteride and topical minoxidil. The results of the analysis from 3 studies that were given topical minoxidil 2 times a day were then evaluated at the 6th month. Tanglertsampan's research (2012) showed an increase in the average density of statistically significant hair ($p = 0.044$) by 4.82 ± 9.12 hairs/cm² (from $58.09.6 \pm 13.39$ to 62.91 ± 13.43 hair/cm²). Suchonwanit's (2018) research showed an increase in the average density of statistically significant hair ($p = 0.003$) by 61.84 ± 15.65 hairs/cm². Gowda's research (2021) showed an increase in the average density of statistically significant hair ($p < 0.001$) by 65.73 ± 13.78 to 72.40 ± 15.26 hairs/cm². Tanglertsampan (2012), Suchonwanit (2018) and Gowda (2021) found significant increases in hair density. This is consistent with the hypothesis that there is an increase in hair density after a combination of topical finasteride and topical minoxidil. DHT can inhibit the expression of Wnt/ β -catenin and result in miniaturization of hair follicles. Finasteride is a competitive inhibitor of type 2.5- α reductase by means of finasteride reduced to dihydrofinasteride thereby blocking the conversion of testosterone to dihydrotestosterone (DHT) at the level of the dermal papillae, resulting in a significant reduction in DHT in the scalp and serum DHT levels. Minoxidil plays a role in the elongation of keratinocyte cells (hair follicle-forming cells), grows and prolongs the anagen phase, and accelerates the conversion of telogen hair into anagen, extending the lifespan of keratinocyte cells in vitro. Causes vasodilation of arterial blood vessels in hair follicles.

The third hypothesis is that the increase in hair density in the group given the combination of the topical combination of finasteride and minoxidil is greater than in the topical group of minoxidil. The results of the meta-analysis showed that the overall difference in hair density after topical therapy of finasteride and topical minoxidil compared to after topical therapy of minoxidil was 0.751 ± 0.214 (95% Confidence Interval = 0.331 to 1.172). This indicates that the hair density after topical therapy of finasteride and topical minoxidil is higher than after topical therapy of minoxidil. The results of the analysis showed a value of $z = -3.500$ with a value of $p < 0.001$. This indicates that hair density after topical therapy of finasteride and topical minoxidil was significantly higher than after topical therapy of minoxidil ($p < 0.001$). This is consistent with the hypothesis that combination therapy at AAG has been shown to have a better effect than monotherapy. The role of finasteride is a competitive inhibitor of type 2.5- α reductase and inhibits the conversion of testosterone to dihydrotestosterone (DHT), thereby inhibiting the miniaturization of hair follicles and promoting the anagen phase of hair growth. Systemic finasteride has side effects of decreased libido, erectile dysfunction, prostate cancer risk and depression so some patients are hesitant to continue using the therapy. Topical finasteride is a potential alternative option to minimize systemic side effects. The role of Minoxidil improves follicle vascularization,

prolongs the anagen phase and shortens the telogen phase, increases VEGF in the dermal papillae and causes angiogenesis, vasodilation and also converts a small part of the hair follicle into terminal hair. Topical combination therapy of finasteride and minoxidil compared to topical minoxidil and oral finasteride has the same effectiveness, so a combination of topical finasteride and minoxidil is recommended because of the minimal side effects.

CONCLUSION

Based on the data of systematic review and meta-analysis, it can be concluded that 1) Topical minoxidil is effective against increasing hair density. 2) The topical combination of finasteride and minoxidil is effective against increasing hair density. 3) The increase in hair density in the group given the combination of the topical combination of finasteride and minoxidil was greater compared to the topical group of minoxidil.

ACKNOWLEDGEMENTS

Thank you to the main supervisor and the second supervisor who have provided valuable direction, input, and guidance in the process of preparing this scientific paper. Thank you also to the examiners, teaching staff, and all colleagues in the Dermatology and Venereology Study Program, Faculty of Medicine, Diponegoro University/Dr. Kariadi Semarang Hospital for their support and cooperation. Not to forget, thank you to the beloved family for their endless prayers, enthusiasm, and motivation, as well as to all parties who have helped, both directly and indirectly, in completing this research. Hopefully all the help and support that has been given will be multiplied from Allah SWT.

References

- Akbar, N. (2018). Efektivitas Kombinasi Dutasteride dan Lycopene untuk Menurunkan Perdarahan pada BPH pasca TURP: Tinjauan pada Ekspresi HIF-1 α dan Kadar Hematokrit. FK UNDIP.
- Batubara, N. A., Awangga, R. M., & Pane, S. F. (2020). *Perbandingan Faster R-CNN dengan SSD Mobilenet Untuk Mendeteksi Plat Nomor* (Vol. 1). Kreatif.
- Darmaningrat, A., Ari, S., Lousiana, S., & Nurhidayati, N. (2022). Alopecia Androgenetik: Mengenali Manifestasi Klinis Hingga Tatalaksana. *JUKEJ: Jurnal Kesehatan Jompa*, 1(2), 109-117.
- Diana, E. D. N., Wijayanti, N., Mawardi, P., & Genteng, B. (2022). Terapi Efluvium Telogen pada SLE dengan Minoksidil 2% dan Antioksidan Oral: Satu Laporan Kasus. *Health and Medical Journal*, 4(3), 178-185.
- Earlia, N., Maulida, M., Vella, F. S., Budini, S. S., Lestari, W., Hidayati, A., ... Handriani, R. (2024). *Penggunaan Platelet-Rich Plasma (PRP) dalam Bidang Dermatologi*. Syiah Kuala University Press.
- Gentile, P., & Garcovich, S. (2020). Systematic review of platelet-rich plasma use in androgenetic alopecia compared with Minoxidil®, Finasteride®, and adult stem cell-based therapy. *International Journal of Molecular Sciences*, 21(8), 2702.
- Harmilah, N., Kep, M., Kep, S., Hartoyo, M., Fajar, H., Mardalena, I., ... Kep, M. (2025). *Buku Asuhan Keperawatan Medikal Bedah Pada Sistem Paru*. Mahakarya Citra Utama Group.
- Hati, I. P. (2023). Pengaruh Pemberian Gel Topikal Secretome Hypoxia Mesenchymal Stem Cells (SH-MSCs) Terhadap Ekspresi Gen Il-10 Dan TNF- α (Studi Eksperimental in Vivo Pada Tikus Jantan Galur Wistar Model Alopecia Like Yang Diinduksi Fluconazole). Universitas Islam Sultan Agung (Indonesia).
- Hidayati, W., Habib, M. P. F., Dewi, F. R., Setiani, L. A., & Widodo, G. G. (2024). *Farmakologi Keperawatan*. PT. Sonpedia Publishing Indonesia.
- Indonesia, P. E. (2015). Pengelolaan dan pencegahan diabetes melitus tipe 2 di Indonesia. *Pb. Perkeni*, 6.
- Jessika, C. (2023). Pengaruh Pemberian gel Topikal Secretome Hipoksia Mesenchymal Stem Cell (SH-MSCs) Terhadap Ekspresi gen Pdgf Dan Il-1 β (Studi Eksperimental in Vivo Tikus Jantan Galur Wistar Model Alopecia-like Yang Diinduksi Fluconazole). Universitas Islam Sultan Agung (Indonesia).
- Kaiser, M., Abdin, R., Gaumond, S. I., Issa, N. T., & Jimenez, J. J. (2023). Treatment of androgenetic alopecia: current guidance and unmet needs. *Clinical, Cosmetic and Investigational Dermatology*, 1387-1406.
- Maharani, R. (2025). Pengaruh perbandingan lipid formulasi nanostructured lipid carrier (NLC) gel terhadap

- laju pelepasan minoxidil dan finasteride. Universitas Islam Negeri Maulana Malik Ibrahim.
- Mahmudi, L. K. (2025). Evaluasi stabilitas fisikokimia nanostructured lipid carrier (NLC) gel kombinasi minoxidil dan finasteride. Universitas Islam Negeri Maulana Malik Ibrahim.
- MAULIDA, S. (2023). IDENTIFIKASI INFEKSI PENYAKIT KULIT KEPALA BERDASARKAN PEMERIKSAAN LABORATORIUM PADA SISWA DAN SISWI DI SDN 367 PARDAMEAN BARU KECAMATAN NATALKABUPATEN MANDAILING NATAL. Fakultas Kedokteran, Universitas Islam Sumatera Utara.
- MIMIJA, R. (2023). HUBUNGAN PEMAKAIAN ALAT PELURUS RAMBUT (Flat Iron) DENGAN KEJADIAN ALOPESIA PADA MAHASISWI FAKULTAS KEDOKTERAN UNIVERSITAS ISLAM SUMATERA UTARA MEDAN. Fakultas Kedokteran, Universitas Islam Sumatera Utara.
- Nugroho, E. A. (n.d.). Buku Ajar dr. Eriawan Agung Nugroho.
- Pramitha, R. J., Linawati, N. M., Made, L., & Rusyati, M. (2013). Farmakoterapi alopesia androgenetik pada laki-laki. *E-Jurnal Med Udayana*, 2, 515-534.
- Pratiwi, D. A., Awangga, R. M., & Setyawan, M. Y. H. (2020). *Seleksi calon kelulusan tepat waktu mahasiswa teknik informatika menggunakan metode Naïve Bayes* (Vol. 1). Kreatif.
- Puspitasari, Y. (2025). PENGARUH PEMBERIAN EXOSOME HYPOXIA MESENCHYMAL STEM CELLS (EH-MSCs) TERHADAP KADAR TGF- β DAN PDGF (Studi Eksperimental in Vivo Pada Tikus model Alopecia-like yang diinduksi Fluconazole). Universitas Islam Sultan Agung Semarang.
- Putri, A. I., & Listiawan, M. Y. (2022). Pendekatan Diagnosis dan Tata Laksana Alopesia Androgenetik. *Medicinus*, 35(1), 3-9.
- Rahardja, C. K. (2023). Pengaruh Pemberian Gel Topikal Secretome Hipoksia Mesenchymal Stem Cell (SH-MSCs) Terhadap Ekspresi Gen IL-15 Dan IFN- γ (Studi Eksperimental in Vivo Tikus Jantan Galur Wistar Model Alopecia-Like Yang Diinduksi Fluconazole). Universitas Islam Sultan Agung (Indonesia).
- Rusdi, G. P. N. (2019). Gambaran Disfungsi Ereksi dan LUTS Pada Penderita Pembesaran Prostat Jinak= Overview of Erectile Dysfunction and LUTS in Patients with Benign Prostate Enlargement. Universitas Hasanuddin.
- Stephanie, A. (2018). Tatalaksana Alopesia Androgenetik. *Cermin Dunia Kedokteran*, 45(8), 582-587.
- TETI INDRAWATI, T. (2025). ANATOMI FISIOPLOGI RAMBUT.