

The character of PA3235 virulence factors of *Pseudomonas aeruginosa* PAO1 – a preliminary study



Mariana Wahjudi^{1*}, Samuel Stefanus Widodo^{2,3},
Ida Bagus Made Artadana², Yulanda Antonius²

ABSTRACT

Introduction: Many virulence factors of *Pseudomonas aeruginosa* PAO1 are regulated by temperature and host conditions upon infection. Based on microarray data, the PA3235 gene is one of the upregulated genes during cell growth at 37 °C. Until now, no information about its role in PAO1 pathogenicity.

Methods: The PAO1ΔPA3235 strain was constructed by overlapping polymerase chain reaction (PCR) method and through biparental mating. The deletion was confirmed by PCR and restriction analyses. The virulence factors of both *P. aeruginosa* PAO1 wild type and ΔPA3235 mutant strains were examined, which consisted of the amount of pyocyanin and pyoverdine, swarming, swimming, and twitching motility, biofilm formation, 3-oxo-dodecanoyl-homoserine lactone concentration, and growth curve profile. Data were analyzed using Student's t-tests to determine differences between treatments. P-value < 0.05 were considered significant.

Results: The ΔPA3235 strain was successfully constructed. At 37 °C, the mutant produced less pyocyanin (p-value 0.0004), pyoverdine (p-value 0.0009), and swarm area than the wild-type. The dendrites pattern of both strains was similar. The mutant and parental strains showed no differences in swimming and twitching motility when incubated at 22 °C and 37 °C. The mutant produced more biofilm compared to the wild-type strain (p-value 0.0013). The AHL was higher in the mutant than in wild type strain (p-value 0.0095) after 24 h incubation. Both the wild type and mutant strains exhibited similar growth patterns in LB broth. The mutant colonies also showed the same morphology as the wild type on the LB plate (not shown here).

Conclusion: The deletion of the PA3235 gene from the *Pseudomonas aeruginosa* genome caused some changes in virulence factors production, as the bacterium grew at body temperature 37°C. We predicted that the PA3235 gene might function to transport molecules involved in the early infection of this bacterium to humans.

Keywords: pathogenicity, pyocyanin, pyoverdine, swarming, swimming, twitching.

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¹Magister of Biotechnology, University of Surabaya, Jalan Raya Kalirungkut, Surabaya 60292, East Java, Indonesia;

²Department of Biology, University of Surabaya, Jalan Raya Kalirungkut, Surabaya 60292, East Java, Indonesia;

³Department of Surgery, The Royal Melbourne Hospital, The University of Melbourne, Parkville, Australia;

*Corresponding author:

Mariana Wahjudi;
Magister of Biotechnology, Universitas Surabaya, Jalan Raya Kalirungkut, Surabaya, East Java, Indonesia;

mariana_wahjudi@staff.ubaya.ac.id

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INTRODUCTION

Pseudomonas aeruginosa PAO1 is a Gram-negative bacterium that is commonly used as a model microorganism for studying biofilm, quorum sensing and pathogenesis. Although commonly found in soils and aquatic habitats, it can occupy a wide range of hosts, including humans, plants, and animals.¹⁻³ *P. aeruginosa* is a major human nosocomial pathogen, responsible for acute or chronic infections in immune-compromised patients, especially in cystic fibrosis patients.

The ability of *P. aeruginosa* to colonize and grow under a wide range of habitats relies on a few factors, such as its large genome size which provides complexity

and adaptability properties, as well as a broad metabolic capacity.^{4,5} *P. aeruginosa* that colonizes patients persistently usually has unique regulatory gene features by producing manifold receptors for adherence to the target cells or by expression of adaptable genes which escort the cell growth in diverse habitats, including in blood.^{1,6-9}

P. aeruginosa PAO1 and *P. aeruginosa* isolated from patients express the virulence genes at 37 °C.¹⁰ Some virulence factors, including those involved in quorum sensing, are temperature dependent.^{6,10,11} One of the genes regulated by temperature is the PA3235 gene. PA3235 is a locus tag on *P. aeruginosa* PAO1 genome. The PA3235 genes are predicted to encode a

hypothetical membrane protein, *yjch*.^{12,13}

Information about the roles of the PA3235 gene in nature or the pathogenicity of *P. aeruginosa* cells is scarce. Currently, information about this gene is based on the similarities of the nucleotide and protein sequences to other known sequences, and from transcriptomic studies. Microarray data from Barbier et al. exhibited that this gene belongs to temperature and quorum-sensing-dependent genes.¹⁰ When the cells were cultured in the whole blood of human volunteers, the gene was expressed 16 times higher compared to cells grown in the common medium Luria Bertani Broth.⁸ All those studies indicate that the PA3235 gene might be involved in *P. aeruginosa*'s pathogenicity against

mammals or when the bacterium infects the human body.

To investigate the involvement of the gene in the pathogenicity of *P. aeruginosa* at 37 °C, we constructed a deleted PA3235 (Δ PA3235) mutant from the parental strain. The Δ PA3235 mutant was subjected to some assays to understand the roles of the gene. In this study, we proved that the PA3235 gene might be involved in some virulence factors level of *P. aeruginosa* during cell growth at 37 °C, the human body temperature.

MATERIALS AND METHODS

Bacterial strains and growth

Bacterial strains and plasmids used in this study are listed in Table 1. Otherwise mention else, cells were grown in Luria Bertani (LB) broth or LB agar (Merck). Gentamicin (Sigma) was added to the medium at a final concentration of 10 mg.mL⁻¹ for *Escherichia coli* or 30 mg.mL⁻¹ for *P. aeruginosa* cultures.

Construction of PAO1 Δ PA3235 strain

The upstream region of PA3235 was first amplified using ForA and RevA primers, whereas the downstream region was amplified using ForB and RevB primers pair (Table 2). Both amplicons were purified and ligated using T4 DNA Ligase (Promega), forming a flanking fusion

region without the PA3235 gene. The fusion fragment was further amplified using RevA and ForB primers pair and digested using *SacI* and *EcoRI* (Thermo Scientific). The purified fragment was then cloned into pEX18Gm plasmid and transformed into *E. coli* S17- λ pir cell.^{14,15} The pEX- Δ PA3235 recombinant plasmid was transferred into *P. aeruginosa* through biparental mating. Overnight culture of *P. aeruginosa* PAO1 (diluted 10-fold) was incubated at 42 °C prior to mating. The mixture of donor and recipient cells (3:1) was incubated on an LB agar plate for 16 h at 30 °C. The selection of transconjugants was done on an LB plate containing 60 mg of L⁻¹ gentamicin. After the allelic exchange mechanism, transconjugants were counter-selected in an LB agar plate supplemented with 10 % sucrose. The deletion was confirmed by PCR using RevA and ForB primers pair and by restriction analyses.

Pyocyanin production

Pyocyanin was extracted using the method described by Essar et al.¹⁶ Overnight culture was first adjusted to OD₆₀₀ value of 1.0 in LB broth and diluted 100-fold in 25 mL LB. The culture was then incubated at 37 °C or 22 °C for 24 h with 200 rpm shaking. The pyocyanin was extracted from 5 mL supernatant of the culture using 3 mL chloroform. Two milliliters of

the organic layer were transferred to a new tube and extracted again using 1 mL 0.2 M HCl. The re-extracted pyocyanin was measured at 520 nm. The concentration of pyocyanin (μ g.mL⁻¹) was determined as (OD₅₂₀ x 17.072/OD₆₀₀). The assay was done in triplicates.

Pyoverdine concentration measurement

Overnight culture of wild-type and Δ PA3235 mutant strain was adjusted to OD₆₀₀ of 1.0 and diluted 100-fold in 25 mL LB. After 24 h incubation at 37 °C or 22 °C, cell-free supernatant containing pyoverdine was measured at 405 nm.

Motility Assay

Swarming, swimming, and twitching motility assays were evaluated for both wild-type and Δ PA3235 mutant strains to see whether the deletion affects bacterial motility. A swarming medium was made by mixing 8 g.L⁻¹ Nutrient Broth (Merck) and 0.5 % agar. The pH of the medium was adjusted to 7.5. The medium was supplemented with 5 g.L⁻¹ filter-sterilized glucose solution added separately after autoclaving. As much as 2 μ L culture (OD₆₀₀ of 0.5) was inoculated on the surface of the medium and let dry for several minutes. The plates were incubated upside-down for 24 h.¹⁷ Swimming medium was made of 10 g.L⁻¹ tryptone and 5 g.L⁻¹ NaCl, mixed with 0.3 % agar. Both strains were inoculated as 1 μ L culture (OD₆₀₀ of 0.5) in LB broth on the surface of the medium. The halo diameter was measured after 24 h incubation at 22 °C and 37 °C.¹⁸ Twitching motility was done using LB medium mixed with 1 % agar. The overnight culture of both strains in LB broth was adjusted to OD₆₀₀ 0.5 and inoculated by stabbing into the LB agar. After 24 h incubation at 22 °C and 37 °C, the medium was stained using Coomassie Brilliant Blue (CBB) R-250 and the diameter of the stained area was recorded.

Table 1. Bacterial strains and plasmids used in the study.

Strains	Relevant characteristic	Source or reference
<i>P. aeruginosa</i> PAO1	Wild-type	Holloway collection
<i>P. aeruginosa</i> PAO1 Δ PA3235	Derivative of PAO1, PA3235 deleted	This study
<i>E. coli</i> S17-1 λ pir	Δ ara-leu7697 Δ lacX74 Δ phoAPvuII <i>phoR</i> <i>araD139</i> <i>ahpC</i> <i>galE</i> <i>galK</i> <i>rpsL</i> F'[lac ⁺ (lacI ^q) pro] <i>gor522::Tn10</i> (Tc ^R) <i>trxB::kan</i>	15
<i>E. coli</i> JM109 pSB1075	Biosensor for sensing 3O-C12-HSL	20
Plasmid		
pEX18Gm	Gm ^R , <i>oriT</i> ⁺ <i>sacB</i> ⁺ , vector for gene replacement	14
pEX- Δ pa3235	pEX18Gm holding flanking region of PA3235 gene	This study

Table 2. Primers used in this study.

Primers Name	Sequence (5'→3')	Position (NC_002516)	Target
ForA	AATACTGCAGCCTCAAGGAGGCGCAGCAATGAT	3623178-3623156	Upstream of PA3235 region
RevA <i>EcoRI</i>	CCTAGAATTCGACATGGTAGTTGAGGCCGAACAG	3622608-3622632	PA3235 region
ForB <i>SacI</i>	TGCCGAGCTCCTGGATTCCGCACTGGATGTTTC	3623962-3623941	Downstream of PA3235 region
RevB	CGGCAAGCTTCGCTGGTAGATGCTGCTCGTTCA	3623446-3623467	PA3235 region

Crystal violet biofilm assay

Biofilm formation was measured using crystal violet staining as described by Merritt et al. (2005) with modifications.¹⁹ Overnight culture of both wild-type and Δ PA3235 mutant was adjusted to OD₆₀₀ of 0.001 in LB broth. The culture was then inoculated in 96-well polystyrene microtiter as much as 100 μ L per well and incubated at 22 °C and 37 °C for 24 h. Biofilm was washed using NaCl 0.9 % three times and fixated with methanol. Staining was done using 1 % crystal violet solution for 30 minutes. The rest of the crystal violet was washed using 0.9 % NaCl solution. Stained biofilm was diluted in 100 μ L of 33 % acetic acid and the absorbance was measured at 595 nm.

Growth curve profiling

Cells were refreshed overnight on LB broth at 37 °C. The overnight culture was diluted and used as inoculum to a final OD₆₀₀ of 0.01 in LB broth. The cell suspensions were taken every hour and the cell density was measured at OD₆₀₀.

Acyl-homoserine lacton (AHL) measurement

The production of 3-oxo-dodecanoyl-homoserine lactone (3O-C12-HSL), one of the AHLs, was evaluated using *E. coli* harbouring pSB1075 plasmid as a biosensor.²⁰ Overnight culture of wild-type and Δ PA3235 mutant strain was adjusted to OD₆₀₀ of 1.0 and diluted 100-fold in 10 mL LB. After 5 h and 24 h incubation at 37 °C, cell-free supernatant was acidified using 1 M HCl (9:1). AHL was extracted from 1 mL acidified supernatant using two times 250 μ L of chloroform. The organic phase was moved to a fresh tube and allowed to evaporate. The AHL was then diluted in 100 μ L methanol. As much as 2 μ L AHL solution was added to a 96-well microtiter plate. Then, two hundred microliters of the 10-fold diluted overnight biosensor were then added. Bioluminescence was measured using a microplate reader (Omega Star).²¹

Data analysis

Data were analyzed using Student's t-tests to determine differences between treatments. P-value < 0.05 were considered significant.

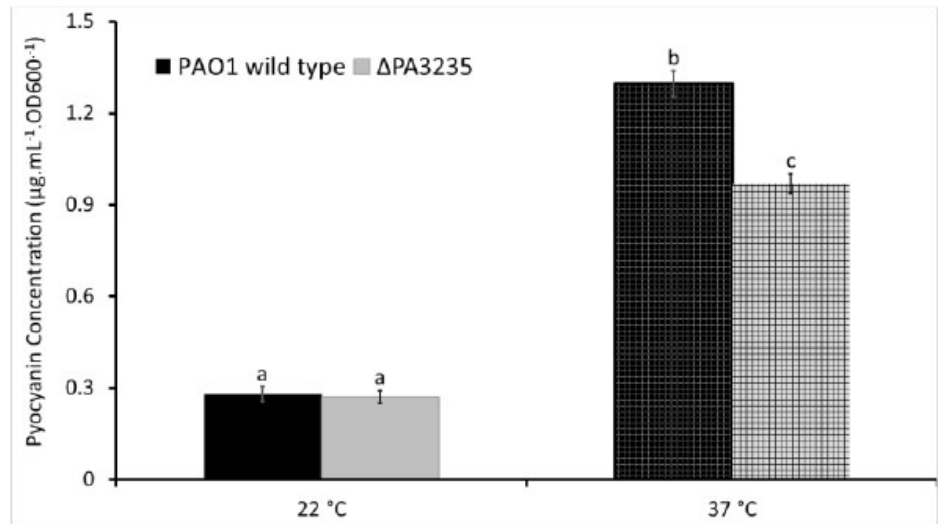


Figure 1. Production of pyocyanin by Δ PA3235 mutant (grey bar) and parental strain (black bar).

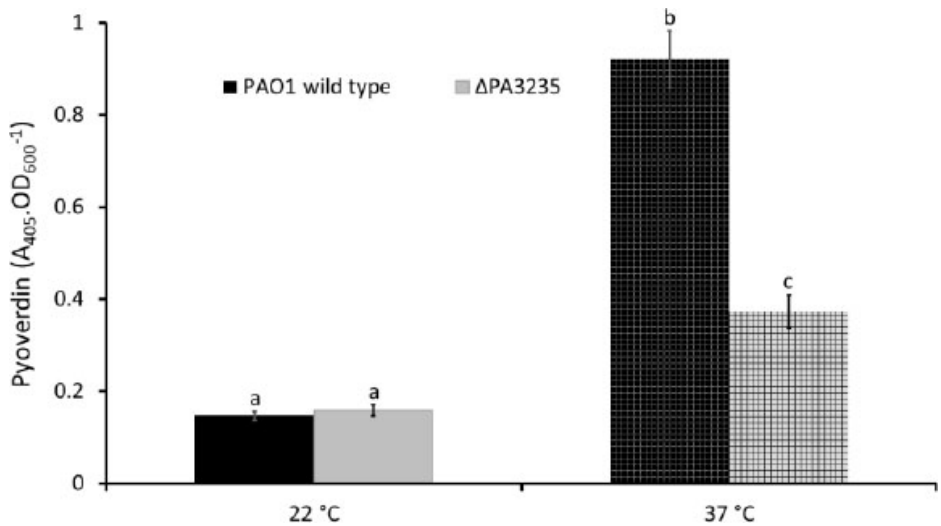


Figure 2. Pyoverdine production by Δ PA3235 mutant (grey bar) and parental strain (black bar).

RESULTS

To understand the gene's involvement in the virulence factor production, several assays such as pyocyanin and pyoverdine production, swarming, swimming, twitching motilities, and biofilm formation were performed. Deletion of the PA3235 gene from the PAO1 genome is a good way to study the role of PA3235 in the pathogenicity of this bacterium. In this study, an incubation temperature of 22 °C was used to observe the phenotypes of *P. aeruginosa* PAO1 at room temperature, while 37 °C represents the human body temperature, as stated by Barbier.¹⁰

Pyocyanin production

The result showed that both wild-type and mutant strains demonstrate no statistical differences in pyocyanin production at 22 °C. A significant difference was observed in 37 °C cultures, where the mutant produced less pyocyanin (p-value 0.0004) (Figure 1).

Pyoverdine concentration measurement

Pyoverdine is an important protein for the iron acquisition of *P. aeruginosa* during infection in the hosts, such as the human body. In comparison to the wild-type strain, the pyoverdine production was

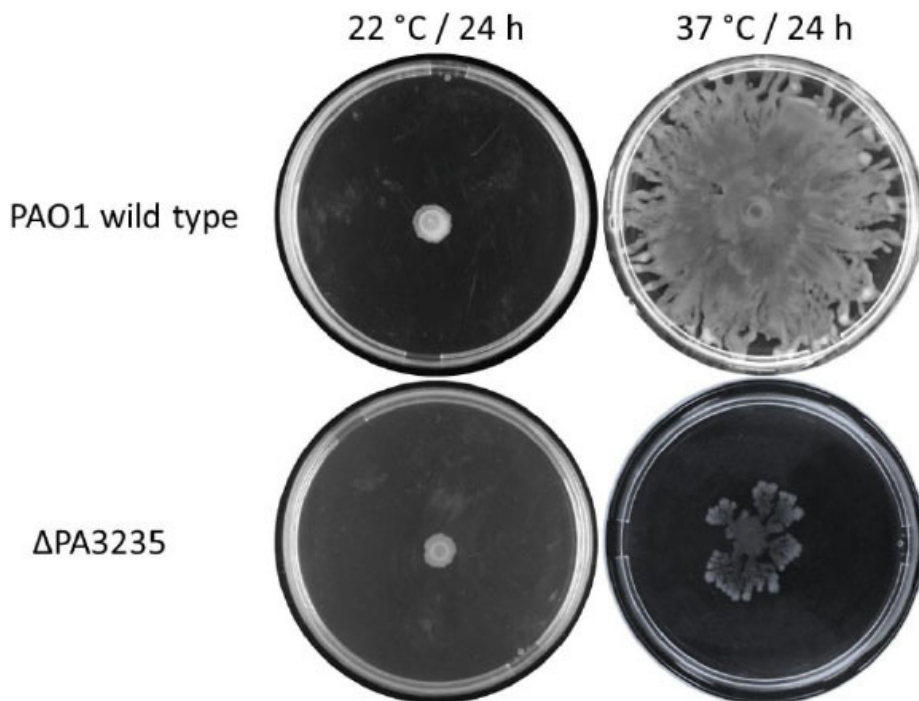


Figure 3. Swarming motility of Δ PA3235 mutant and parental strain.

lower in the Δ PA3235 mutant when it was grown at 37 °C (p-value 0.0009). No significant difference was observed in the 22 °C cultures (Figure 2).

Effects of PA3235 deletion on *P. aeruginosa* PAO1 motility

Three types of motilities were observed in this study: swarming, swimming, and twitching motilities. Incubation at 22 °C did not promote any swarming motility for both strains. The swarm area of Δ PA3235 mutant was narrower compared to PAO1 when incubated at 37 °C for 24 h (Figure 3). The dendrites pattern of both strains was similar. Both the mutant and parental strains showed no differences in swimming and twitching motility when incubated at 22 °C and 37 °C (Figure 4).

Deletion of PA3235 increased biofilm formation

Biofilm formation of *P. aeruginosa* was determined as the A_{590} of de-stained crystal violet. Interestingly, Δ PA3235 mutant produced more biofilm on the microtiter wall, compared to the wild-type strain (p-value 0.0013). A lower quantity of biofilm was observed after 24 h incubation at 22 °C in both strains (Figure 5).

AHL level is altered at 37 °C in the absence of PA3235

Virulence determinants are known to be regulated by signal molecules. To confirm whether the differences in virulence factor production were influenced by AHL production from the strains at 37 °C, 3-Oxo-C12-HSL was quantified using a biosensor system. The result demonstrated no differences in 3-O-C12-HSL quantity between mutant and wild-type strains after 5 h incubation. However, after 24 h incubation, the AHL was higher in the mutant than in wild type strain (p-value 0.0095) (Figure 6). This may indicate that the reduced or increased virulence factors were not due to the increased level of AHL in Δ PA3235 strain.

The mutation did not change the growth profile of *P. aeruginosa*

To investigate whether the mutation on PA3235 gene affects cell growth, the cells were grown in LB broth at 37 °C with 250 rpm shaking. Both the parental and mutant strains exhibited similar growth patterns in LB broth (Figure 7). The mutant colonies also showed the same morphology as the wild type on the LB plate (not shown here).

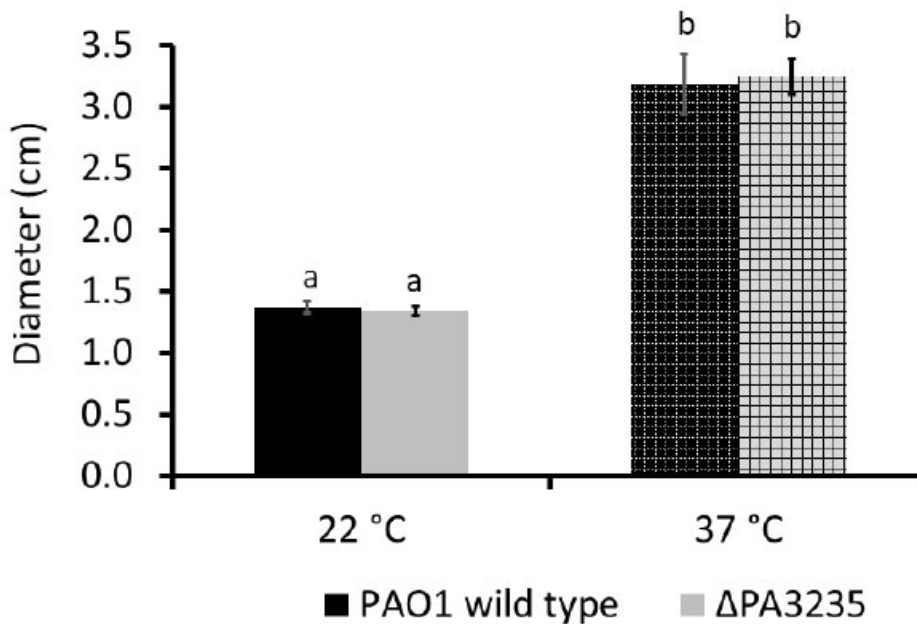
DISCUSSIONS

Many genes of *P. aeruginosa* cells are upregulated or downregulated when the cell is grown at the human body temperature, 37 °C.⁶ Since all these factors are modulated by the quorum sensing system, then signal molecule expression is also important for the pathogenicity of this bacterium. Many of the quorum sensing and virulence determinants genes are modulated by the *lasI-rhlR* quorum sensing system and other regulons.^{22,23} Based on microarray data, the *lasI* gene, one of the signal-molecules synthesizing genes, was upregulated in PAO1 strain during cell growth at human body temperature.¹⁰ The *lasI* gene from rhizospheres isolates also increases at the temperature.²⁴ The PA3235 transcript was increased during cell growth at human body temperature.^{6,10,11}

Although many genes are influenced by temperature, however the result showed that there were differences in phenotypes between wild type and the mutant. The Δ PA3235 mutant showed an increase in biofilm (Figure 5) and the level of 3O-C12-HSL (Figure 6) compared to the PAO1 wild type. The twitching and swimming motility was unchanged (Figure 4), whilst pyocyanin, pyoverdine, and swarming motility were less in this mutant than in the wild type (Figures 1, 2, and 3). These differences were not caused by differences in the growth phases since the wild type and mutant exhibited the same growth patterns in LB broth at 37 °C (Figure 7).

Pyocyanin is partly modulated by the *lasI-rhlR* quorum sensing system,²⁵ and mostly by pseudomonas quinolone signal (pqs) signal and a complex circuit.²⁶ The presence of iron also influences pyocyanin production levels.⁶ Several enzymes are involved in the biosynthesis and secretion of this phenazine, such as those encoded by *phzA-G*, *phzM* and *phzS* genes.²⁷ Pyocyanin is produced at a higher level at 37 °C by PAO1 and *Pseudomonas* sp, isolated from the rhizosphere.²⁸ As the PAO1 grows at 37 °C, the *phzA-G*, *phzM* and *phzS* biosynthesis genes and type 3 secretion systems are upregulated.⁶ Conversely, Barbier's microarray data revealed that not all of those pyocyanin transcripts were upregulated, only *phzS*

(A) Swimming



(B) Twitching

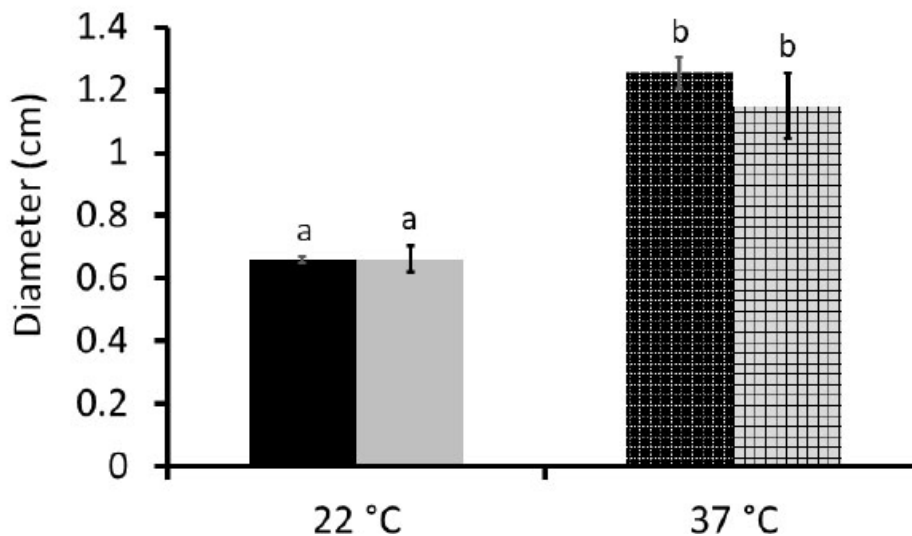


Figure 4. Swimming (A) and twitching motility (B) of Δ PA3235 mutant and PAO1.

was increased and *phzH* was decreased.¹⁰ It is likely that PA3235 is important for pyocyanin production. Although the 3-OC12-HSL level of the mutant was higher than the wild type, however pyocyanin concentration was lower in Δ PA3235 mutant than in wild-type strains at 37 °C (Figure 1). By looking at the prediction that PA3235 protein is a membrane protein, it may be true that this protein is involved in the exports of molecules crucial for phenazine metabolism.

Like pyocyanin, pyoverdine was also produced in a lower quantity in Δ PA3235 than in the wild-type strains (Figure 2). Pyoverdine is expressed under iron-limiting conditions,²⁹ not by signal molecules,²⁵ nor body temperature.¹⁰ It is interesting to note that the deletion of PA3235 caused reducing of pyoverdine in the mutant, although it grew in rich, non-iron limited, medium, and under higher 3-O-C12-HSL concentration (Figure 6).

Motility is important for virulence, and biofilm attachment, development,

maturation, and dispersion.³⁰ Swimming and swarming motility rely on flagella whilst twitching on motility type IV pili. In this research, swimming and twitching motility are unaffected by the mutation. The swarming motility of *P. aeruginosa* PAO1 is modulated by quorum sensing.³¹ Interestingly, in this study, we found that the 3O-C₁₂-HSL level was significantly increased in Δ PA3235 strain although the swarming motility was reduced (Figure 3 and Figure 6). Based on microarray data, the PA3235 does not belong to genes involved in swarming motility,³² and the transcript was downregulated in tendrils compared to non-swarming cells.³³ The swarming motility is also regulated by multifactorial determinants, for instance rhamnolipid, nitrogen starvation as well as particular amino acids,³¹⁻³⁴ and nutrition availability in the environment, especially iron.^{29,31} The decreased swarming area exhibited by the mutant might be attributed to the lessen of pyoverdine production which in turn causes less iron uptake necessary for PAO1 cells to swarm.

Although the PA3235 gene was known to be expressed less in biofilm compared to planktonic cells (E-GEOD-10030)³⁵, however the result of this study revealed that deletion of this gene caused increasing biofilm quantity. Based on microarray data, the PA3235 belongs to the genes that are downregulated in biofilm,²⁵ and expressed less in biofilm compared to the planktonic cells (E-GEOD-10030).³⁵ During the growth of *P. aeruginosa* in LB Broth, the PA3235 gene was upregulated at the early stationary phase and then decreased at the stationary phase on static incubation (E-GEOD-4026).²⁶ The result of this study revealed that deletion of this gene caused increasing in biofilm quantity. It seems that the PA3235 gene might involve in the early stage of biofilm formation. Initiations of biofilm formation are driven by complex factors, such as antimicrobials, motility, and iron.³⁶⁻³⁹ Other studies have proven that swarm behaviour and biofilm formation are inversely regulated in *P. aeruginosa* cells.⁴⁰ Swarming motility is important for early biofilm development, defect in swarming motility impairs biofilm formation.^{36,41} This was confirmed in this study that the biofilm of Δ PA3235 was increased at 37 °C, whilst swarming was decreased (Figure 5 and Figure 3).

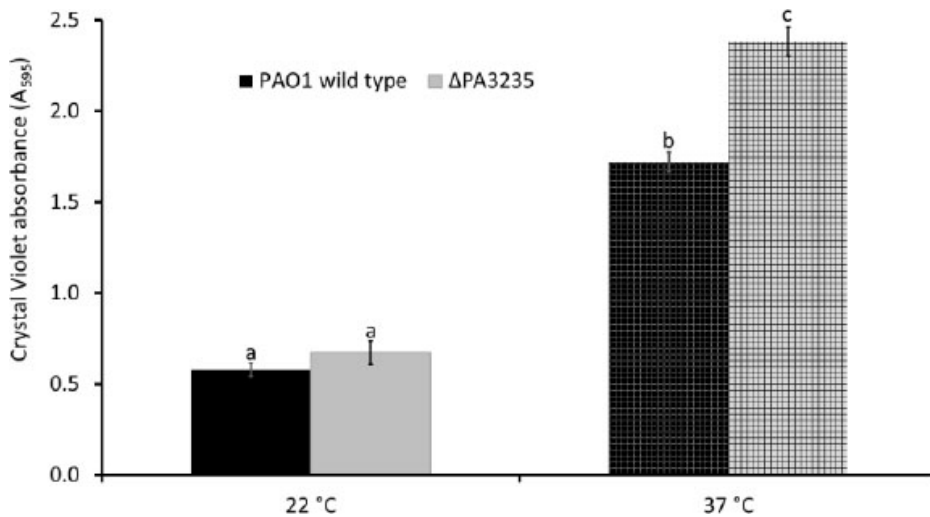


Figure 5. Biofilm of Δ PA3235 mutant and PAO1.

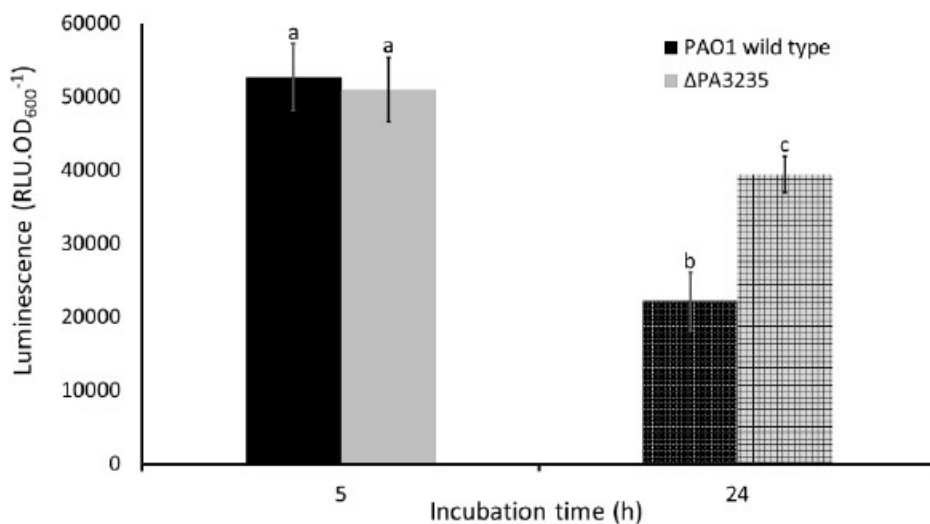


Figure 6. The production of signal molecule by Δ PA3235 mutant and PAO1.

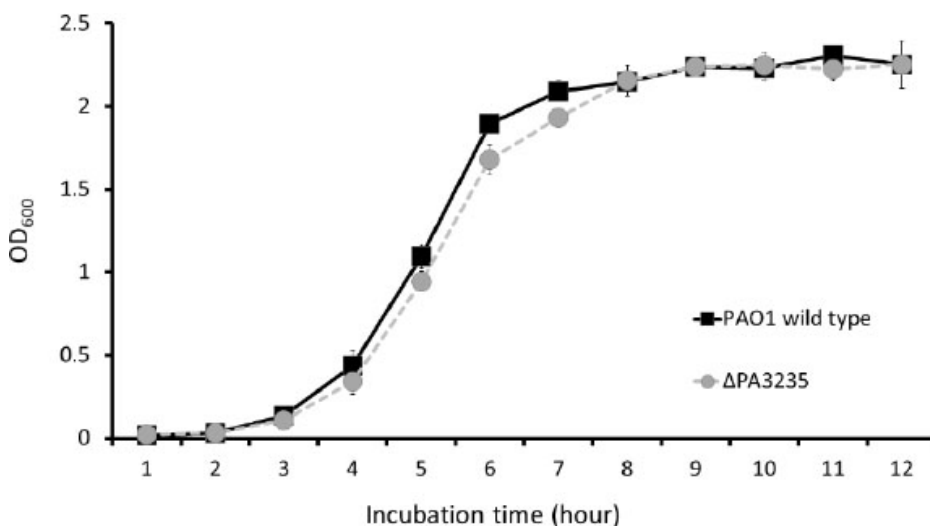


Figure 7. The growth pattern of PAO1 and Δ PA3235 mutant.

The increased level of AHL in Δ PA3235 might be responsible for the modulation of many virulence factors which are quorum-sensing dependence genes. The mutant showed the same amount of 3-O-C12-HSL as the PAO1, until 5 h

incubation and then the signal molecule was less in the extracellular environment after the culture reached the stationary stage. The 3-O-C12-HSL was produced constitutively in small amounts, and deliberately from the cell. When this molecule reaches a certain threshold amount in the environment, it is taken back to the cell by facilitated diffusion. We predicted that PA3235 is important for transporting this AHL and certain nutrients into the cell. There are four main reasons. First, the PA3235 protein is predicted as a transmembrane protein according to TMHMM-2.0 analyses.⁴² Until now, no information about the transport protein of the AHL, nor the real role of the PA3235 protein. Second, no AHL synthesis genes were detected in the stationary phase.²⁵ The PA3235 gene was categorized as a quorum sensing modulated gene;^{25,43} which expression was upregulated at the early stationary phase and decreased at the stationary phase (E-GEOD-4026).²⁶ This means that this protein might be involved in transporting the AHL into the cells. So that, the absence of PA3235 protein might cause problems in the uptake of 3-O-C12-HSL into the cell and the molecule getting abundant in the extracellular medium. Third, the lower amount of 3-O-C12-HSL inside the cell might cause changes in a few phenotypes. Fourth, the availability of certain nutrients is important for the phenotypic traits of the colony. For example, iron impacted the pyoverdine level of cells, pyocyanin, swarming and biofilm. The presence of amino acid and other nutrients are also important for swarming motility. This means that the protein might involve in the metabolism or transportation of certain molecules.

PA3235 is predicted to encode a hypothetical membrane protein with an unknown function. It is comprised of 312 nucleotides, and encodes a protein with a domain similar to *E. coli* K12 YjcH, an inner membrane protein.¹³ Analysis of the genome structures showed that this protein is highly conserved amongst other *P. aeruginosa* strains.⁴⁴ This gene is not known as a protein related to efflux pump, siderophore or pyochelin. However, during the growth of *P. aeruginosa* in iron limiting medium, the PA3235

gene was expressed at the logarithmic phase (E-GEOD-2885).⁴⁵ Furthermore, microarray data revealed that the expression was downregulated in response to siderophore/ β -lactam conjugate addition (E-MTAB-1381,⁴⁶ and the PA3235 expression is not regulated by Fe in iron depletion condition.⁴⁵ This hypothesis was supported by the evidence that pyoverdine and swarming motility were reduced in Δ PA3235 strain, whereas the biofilm was increased compared to the wild type. Low iron concentration in the environment impedes biofilm formation and lowers the swarming motility.^{47,39} However, high iron concentration can disrupt the biofilm.⁴⁸ The abundant quantity of ferric ions reduces rhamnolipid production which in turn represses swarming motility. A study by Schmidberger et al. (2014) has proven that excess ferric ion decreases the expression of the genes involved in rhamnolipid production, such as *rhlA*, and *rhlC*.⁴⁹ Rhamnolipid was known to be crucial in surface motility, and biofilm formation.⁵⁰ PvdQ, that is important for pyoverdine synthesis, is also expressed in iron-limiting condition, which then related to swarming motility and biofilm development. Looking at the previous evidence, we believe that the deletion of PA3235 enables cells to uptake more Fe³⁺ ions from the medium than the wild type, resulting in less pyoverdine production and swarming motility as the formation of thicker biofilm. The association between this gene and iron uptake still needs to be confirmed. We predicted that PA3235 might contribute to the uptake and release of molecules.

Furthermore, the PA3235 might be involved in the early pathogenesis of this bacterium in host cells. When the cells were harvested at the early stationary phase, the gene was upregulated at 37 °C compared to 22 °C,¹⁰ and then downregulated at the stationary growth phase.⁶ The results of microarray data indicate that this gene might be involved in the early infection stage of *P. aeruginosa* in mammalian host cells. The PA3235 was expressed in response to epithelial cells (GDS2502)⁵¹ and in human whole blood cells,⁸ mimicking the condition when the bacterium infects humans, such as cystic fibrosis patients. However, the expression

of this gene was downregulated when this bacterium was grown on mouse tumors, cystic fibrosis lung and burned wound mouse,¹¹ or from infected human, such as sputum and burn wound.⁵² Until now, no information about factors which may inhibit its expression in these cells.

Based on this evidence, we proposed that the PA3235 might involve in the pathogenesis of *P. aeruginosa* during infecting the human body. It is highly likely that the PA3235 is modulated by quorum sensing and involved in the transport of molecules out or into the *P. aeruginosa* cells, which are important for early pathogenesis. Future works are needed to find the precise molecules transported by the PA3235 protein and to identify the exact roles of this gene in the pathogenicity of the bacterium during infection in mammalian and human cells. Given that the gene has not been previously characterized and the influence of the gene on the increase of biofilm and 3O-C12-HSL, we hypothesize that the modulation of this gene might be used to control *P. aeruginosa* pathogenicity when this bacterium infects the warm-blood hosts.⁵³ Biofilm is the persistent form of PAO1 against antibiotics and immune cells.^{22,54-56}

Infections by *P. aeruginosa* are still an issue until now. However, the bacterium has been known as an opportunistic pathogen however infected patients are rarely survived. The severe effects are caused by these factors: virulence factors, resistance towards antibiotics, emerging of multidrug resistance antibiotics. The finding of anti-infectives against this bacterium is important. In this study, we prove that the PA3235 gene influences increasing biofilm and 3O-C12-HSL, lowering pyocyanin, pyoverdine, and swarming motility. Biofilm is the persistent form of PAO1 against antibiotics and immune cells. Several reported microarray data gave the impression that this gene might be involved in the early pathogenesis of *P. aeruginosa*, given the facts that PA3235 gene has not been previously characterized and its influence on several virulence factors, we hypothesize that the modulation of this gene might be used to control *P. aeruginosa* pathogenicity in human.

CONCLUSIONS

The Δ PA3235 mutant showed some differences when grown at 37 °C compared to the wild type. Both strains showed no differences in growth patterns, twitching or swimming motilities. We predicted that the PA3235 gene might play a role in the pathogenesis of PAO1 to the human body by facilitating the transport of molecules out or into PAO1 cells.

ETHICAL CLEARANCE

This research received ethical approval from Universitas Surabaya, with certificate number 33A/KE/VIII/2018.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHOR'S CONTRIBUTION

Mariana Wahjudi is involved in conceptualization, funding acquisition, analysis and interpretation of results, and manuscript preparation and finalization. Samuel Stefanus Widodo: study conception, design, and data collection. Ida Bagus Made Artadana: data analysis and interpretation of results. Yulanda Antonius: manuscript finalization and review

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Biomedicine Postgraduate Program, Udayana University
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Faculty of Medicine, Universitas Udayana, Indonesia

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
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ORIGINAL ARTICLE

Factors attributed to depressive symptoms in women coping with infertility during the pandemic of COVID-19 (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4214>)

Mila Maidarti, Emily Bailie, Aprilia Siregar, Prini Diandara Garinasih, Vita Silvana, Achmad Kemal Harzif, Gita Pratama, Kanadi Sumapraja, R Muharam, Andon Hestiantoro, Budi Wiweko

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ORIGINAL ARTICLE

The effectiveness of the application of self-hypnosis and prenatal gentle yoga on emesis gravidarum in the first-trimester pregnant women (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4303>)

Yasi Anggasari, Fauziyatun Nisa, Ratna Ariesta Dwi Andriani, Yunik Windarti

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ORIGINAL ARTICLE

Correlation between Superoxide Dismutase (SOD) with Malondialdehyde (MDA) level in blood plasma of seborrheic keratosis (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4034>)

Yesie Elvira, Imam Budi Putra, Nelva K. Jusuf

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ORIGINAL ARTICLE

Characteristics of patients with nasopharyngeal carcinoma in Dr. Soetomo General Academic Hospital Surabaya (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4228>)

Nasopharyngeal Carcinoma

Audi Wahyu Utomo, Achmad Chusnu Romdhoni

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ORIGINAL ARTICLE

Survival analysis of breast cancer patients luminal subtype B on lymphovascular invasion (LVI), tumor-infiltrating lymphocyte (TIL), and expression of mammaglobin A (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4381>)

I Wayan Sudarsa, Nyoman Diwiya

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ORIGINAL ARTICLE

The effects of Curcuma Longa extract on fibroblast count and collagen density in left colon anastomosis with acute intra operative loss of 15% circulating blood volume in rats (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4487>)

Nasrul Haidi, Tomy Lesmana

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ORIGINAL ARTICLE



Posterior annulus elevation using pledget stitch: An adjuvant technique to improve the mitral valve coaptation in pediatric mitral valve repair (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4607>)

Budi Rahmat, Bambang Budi Siswanto, Dicky Fakhri, Indriwanto Sakidjan, Tri Wahyu Murni Sulisetyowati, Ina Susianti Timan, Aria Kekalih, Yovi Kurniawati, Putu Wisnu Arya Wardana, Dwi Gunawan Fardhani

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Nocturia Overview: a survey from General Practitioners in Indonesia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4256>)

Madhyra Tri Indraswari, Harrina Erlianti Rahardjo

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ORIGINAL ARTICLE

Histopathological findings of the liver and kidneys of wistar rat exposed to insect repellent (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4315>)

Ary Andini, Lysa Veterini, Edza Aria Wikurendra, Achmad Syafiuddin, Defi Rimasari, Munifa Nur Aida

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The effectiveness of platelet rich fibrin (PRF) graft to expression of IL-1 and TNF- α in cornea post NaOH exposure: an experimental study (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4389>)


Marisa Surya Airlangga, Reni Prastyani, Nurwasis, Hani Plumeriastuti, Budi Utomo

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Diagnostic accuracy of hyponatremia as a biomarker of perforated appendicitis in pediatrics in Dr. Soetomo General Hospital, Surabaya (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4503>) 

Bela Mayvani Rachman, I Gusti Bagus Adria Hasriastawa, Ariandi Setiawan

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The effect of *Chromolaena odorata* on endometriosis implants in mice model of endometriosis
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4096>)

Rusnaldi, Rajuddin, Reno Keumalazia Kamarlis, Dasrul

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A comparison of otoacoustic emissions examination results as early hearing screening in normal and infants at risk of hearing loss
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4280>)

Rosa Falerina, Puguh Setyo Nugroho, Nyilo Purnami, Fatimah Azizah Salsabila

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ORIGINAL ARTICLE

Analysis of energy needs and energy intake with health status of field workers at PT. A
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4321>)


Merry Sunaryo, Ary Andini, Pratiwi Hariyani Putri, Mulyadi, Novegian Sunaryo, Iva Widyanti

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ORIGINAL ARTICLE

The effectiveness of triple elimination examination (HIV, syphilis, hepatitis), roll over test (ROT) and mean arterial pressure (MAP) and self hypnosis on emergency management of high risk pregnant women during pandemic
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4422>) 

Ika Mardiyanti, Esty Puji Rahayu, Nur Zuwariah, Priyo Mukti Pribadi Winoto, Hartatiek Nila Karmila

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ORIGINAL ARTICLE

Prostate specific antigen-age volume score in predicting prostate cancer among the Indonesian population
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4517>)

Agus Rizal Ardy Hariandy Hamid, Putu Angga Risky Raharja, Fakhri Rahman, Chaidir Arif Mochtar, Rainy Umbas

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ORIGINAL ARTICLE

The number of lymphocytes in rabbit gingival wounds covered with a periodontal pack with lime peel extract
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4121>)

Malianawati Fauzia, Ega Lucida Chandra Kumala, Ayu Nabilatul Ummah

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The effectiveness of acupressure and dhikr in reducing anxiety in pregnant women in the third trimester
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4329>)

Yati Isnaini Safitri, Uliyatul Laili, Nanik Handayani

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ORIGINAL ARTICLE

Risk factors of ventilator-associated pneumonia in intensive care patients at tertiary referral hospital
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4446>)

Ayu Permatasari Tribuana Tungga Dewi, Ni Made Mertaniasih, Bambang Pujo Semedi, Lindawati Alimsardjono, Pepy Dwi Endraswari

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The difference of depression level in pregnant women based on the acceptance of pregnancy during the COVID-19 pandemic: a study on pregnant women in Bontang, East Kalimantan (<https://www.balimedicaljournal.org/index.php/bmj/article/view/3697>)

I Putu Satrya Wijaya, Titin Andri Wihastuti, I Wayan Arsana Wiyasa, Muhammad Chair Effendi

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Correlation between stress and insomnia with learning outcomes: a cross sectional study (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4294>)

Nety Mawarda Hatmanti, Ulfa Mazuzin Zurmida, Yurike Septianingrum, Nunik Purwanti, Siti Maimunah

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Mother's motivation and attitude towards baby spa services during the COVID-19 pandemic (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4336>)

Esty Puji Rahayu, Nanik Handayani, Fritria Dwi Anggraini

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Optimization of a local type rabbit model for arteriovenous fistula, focused on study neointimal hyperplasia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4459>)

Yopie Afriandi Habibie, Dessy Rakhmawati Emril, Azharuddin, Dedy Syahrizal

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ORIGINAL ARTICLE

Efficacy and safety of topical doxycycline reduce MMP-9 expression towards populations with corneal alkali burn
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4533>)

Anindita Juwita

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High-risk human papillomavirus prevalence among patients with cervical cancer at Moewardi General Hospital in Surakarta, Indonesia
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3782>)

Brian Wasita, Suyatmi, Riza Novierta Pesik, Ratih Dewi Yudhani, Nanang Wiyono, Rachmi Fauziah Rahayu, Kristanto Yuli Yarso

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Evaluation of hearing limits post tympanoplasty in patients with chronic suppurative otitis media
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4203>)

Nico Probosutejo, Titiek Hidajati Ahadiah

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Comparison of freeze dried human amniotic membrane and its combination with platelet rich fibrin for the epithelial acceleration in an acute wound excision using Rattus Novergicus study model
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4300>)

Yanuar Ari Pratama, Lobredia Zarasade, Beta Subakti Nata'atmadja, Arif Rahman Nurdianto

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ORIGINAL ARTICLE

Correlation between T-lymphocyte CD4+ and Total Lymphocyte Count (TLC), hemoglobin, Neutrophil to Lymphocyte Ratio (NLR) and T-lymphocyte CD4+/CD8+ ratio in HIV patients at Prof. Dr. I.G.N.G Ngoerah Hospital, Denpasar, Bali, Indonesia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4342>)

Made Ayu Vita Prianggandanni, Anak Agung Wiradewi Lestari, I Nyoman Wande, Ni Nyoman Mahartini, Sianny Herawati

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Metabolic profiles of internal medicine residents (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4479>)

I Made Pande Dwipayana, Wira Gotera, Made Ratna Saraswati, I Made Semadi, Ida Bagus Nugraha, Anak Agung Gede Budhiartha, Ketut Suastika

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Endometrial thickness is a prognostic factor in endometrial carcinoma (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4552>)

Very Great Eka Putra, Teuku Mirza Iskandar

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Evaluation of the severity of striae distensae using the new scoring system (<https://www.balimedicaljournal.org/index.php/bmj/article/view/3994>)

Alviera Yuliandra Amal, Imam Budi Putra, Nelva Karmila Jusuf, Khairina Nasution

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Psychometrics of social norm and beliefs on gender-based violence in Indonesia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4307>)

Syiddatul Budury, Nunik Purwanti, Khamida , Diah Jerita Eka Sari

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The bcl-2 and caspase-3 expression after purple sweet potato treatment on isoniazid and rifampicin-induced liver injury (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4370>)

I Gusti Ayu Artini, Ketut Widyani Astuti, I Gusti Made Gede Surya Chandra Trapika, Agung Wiwiek Indrayani

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ORIGINAL ARTICLE

Mechanism of neurological deficit improvement through analysis in cerebral artery stenosis, Endothelial Progenitor Cells (EPC), Asymmetric Dimethylarginine (ADMA), Malondialdehyde (MDA), and Superoxide Dismutase (SOD) after balloon angioplasty procedure in ischemic stroke patients (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4485>)

Nasrul Musadir, Soetojo, Syahrul, Ketut Sudiana, Budi Utomo, Muhammad Hamdan, Fritz Sumantri Usman, Siti Pariani

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ORIGINAL ARTICLE

Effect of human granulosa cells vitrification on the expression of oocyte secreted factors (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4600>)

Batara Sirait, Budi Wiweko , R. Muharram, Ahmad Aulia Jusuf , Ichramsjah A. Rachman, Arief Boediono

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ORIGINAL ARTICLE



The ethical dilemma of medical specialists in the era of national health insurance in Semarang
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4068>)

Sigid Kirana Lintang Bhima, Yayi Suryo Prabandari, Edward Kurnia Setiawan Limijadi, Astika Utomo, Laila Mubarakah, Mohammad Hakimi

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 Abstract

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ORIGINAL ARTICLE

Diagnostic and predictive value of hematological parameters of COVID-19 patients: a retrospective study
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4253>)

Estie Ludi Kiriwenno, Yulia Nadar Indrasari

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ORIGINAL ARTICLE

The effect of lavender aromatherapy on the incidence of dyspareunia in post partum mothers
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4313>)

Yunik Windarti, Fitria Dwi Anggraini, Hinda Novianti

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Simvastatin: a new therapeutic strategy for Chronic Kidney Disease (CKD) (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4636>)


Putu Nita Cahyawati, I Nyoman Mantik Astawa, Bagus Komang Satriyasa, I Made Bakta

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ORIGINAL ARTICLE

Correlation between sebum level and severity of male androgenetic alopecia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4084>) 

Regina Maharani Tambunan, Nelva Karmila Jusuf, Imam Budi Putra

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ORIGINAL ARTICLE

Exploring waiting time, waste, and resources used for boarding patients in emergency department
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4318>)

Agus Aan Adriansyah, Nurul Jannatul Firdausi, Trisasi Lestari, Kuncoro Harto Widodo, Nikmatus Sa'adah

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Impact of Abelmoschus esculentus fruit extract on endonuclease_G and apoptosis index in adenocarcinoma mammae. A laboratory experiment: rats given chemotherapy AC (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4412>)

Selamat Budijitno, Satrio Putra Prawiro, Eriawan Agung Nugroho, Luqman Alwi, Putu Anda Tusta Adiputra

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ORIGINAL ARTICLE

Retrospective study on nasopharyngeal cancer (RENOCS): outcome management of in-hospital patients
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4512>)

Achmad Chusnu Romdhoni, Hayyu Fath Rachmadhan, Yufi Aulia Azmi, Faisal Yusuf Ashari, Astri Dewayani

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ORIGINAL ARTICLE

Causality relationship between Hounsfield Unit in epidural hematoma and subdural hematoma and hematoma expansion
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4114>)

Gunna Hutomo Putra, Agus Turchan, Sri Andreani Utomo, Muhammad Arifin Parenrengi, Asra Al Fauzi, Arief Wibowo



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ORIGINAL ARTICLE

Phytochemical screening and evaluation of glucose-6-phosphate dehydrogenase activity of fermented honey-garlic in hypothyroidism rats (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4286>)

Devvana Dyah Wulandari, Devyani Diah Wulansari, Andreas Putro Ragil Santoso, Ary Andini, Ersalina Nidianti, Rahayu Anggraini, Alfian Hendra Krisnawan, Firdaus, Mahestinnisa Mutiara Firdaus, Mun'im Azaki

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ORIGINAL ARTICLE

The effect of family background on autism spectrum disorder student's pronunciation mastery: a case study (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4326>)

Nurul Latifatul Azizah, Tiyas Saputri, Syiddatul Budury

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ORIGINAL ARTICLE

The influence of health education on dietary approaches to stop hypertension (DASH) on knowledge and attitude of hypertension patients (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4437>)

Difran Nobel Bistara, Ganda Putra Kurniawan, Arif Helmi Setiawan, Nanik Handayani

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ORIGINAL ARTICLE

The relationship between parental risk factors with degree of severity in myopia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4522>)

Marisa Surya Airlangga, Ria Sandy Deneska, Rozalina Loebis, Reni Prastyani

Online First: May 29, 2023 |



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ORIGINAL ARTICLE

Comparison of efficacy, safety, and cost between ultrasonography and fluoroscopy-ultrasonography as a target device in extracorporeal shock wave lithotripsy in kidney stones less than 1.5 centimeters (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4133>)

Gede Wirya Kusuma Duarsa, Firman Pribadi

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ORIGINAL ARTICLE

Radar plot analysis of Helicobacter pylori detection in North Peninsular Malaysia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4334>)

Che Wan Sharifah Robiah Mohamad, Yahya Mat Arip, Uyub Abdul Manaf, Marni Azera Markon

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ORIGINAL ARTICLE

Comparison on the efficacy and safety of bipolar transurethral vaporization of the prostate (B-TUVP) with bipolar transurethral resection of the prostate (B-TURP) for benign prostatic hyperplasia (BPH): a systematic review and meta-analysis of randomized controlled trial (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4531>)

Made Adi Wiratama, Dimas Panca Andhika, Chi-Fai Ng, Lukman Hakim

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Correlation between burnout and patient safety culture on nurses at private hospital in Yogyakarta, Indonesia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/3732>)

Rizky Amelia Febriani, Lisa Musharyanti

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Effect of mini low carbohydrate diet and eating speed in obese adults on fasting blood glucose
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Muhammad Aldhi Ainul Yaqiin, Anik Lestari, Sumardiyono

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Relationship between the level of participation in implementing fit-to-work on unsafe behavior in lift and transport operators at PT. BJTI (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4340>)

Friska Ayu, Firmansyah Ilham Sasmita Diharja, Moch. Sahri, Merry Sunaryo

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LOX-1 rs1050283 TT genotype is associated with the severity of peripheral artery disease: a cross-sectional study in Mataram, Indonesia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4221>)

Yanna Indrayana, Irawan Yusuf, Agussalim Bukhari, Idar Mappangaro, Herpan Syafii Harahap

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The effectiveness of CRP and leukocyte examinations as a detection of risk factors for pre-eclampsia in pregnant women
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4304>)

Nur Masruroh Masruroh, Lailatul Khusnul Rizki, Uliyatul Laili, Dhifa Nur Alifah

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The character of PA3235 virulence factors of *Pseudomonas aeruginosa* PAO1 – a preliminary study
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4364>)

Mariana Wahjudi, Samuel Stefanus Widodo, Ida Bagus Made Artadana, Yulanda Antonius

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Genetic heterogeneity of thalassemia major patients in Rembang Regency, Central Java, Indonesia
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4482>)

Nyoman Suci Widyastiti, Ita Margaretha Nainggolan, Edward Kurnia Setiawan Limijadi, Meita Hendrianingtyas, Dwi Retnoningrum, Ariosta, Yetty Movieta Nancy, Mayasari Dewi, Sutamti, Tri Ratnaningsih, Usi Sukorini

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Correlation of serum D-dimer level and the event microvessel cardiac thrombosis observed on core biopsy in post mortem COVID-19 Patients in Dr. Soetomo Hospital Surabaya, Indonesia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4568>)

Achmad Lefi, Lalu Galih Pratama Rinjani, Muhammad Yusuf Alsagaff, Raden Mohammad Budiarto, Priangga Adi Wiratama, Ety Hary Kusumastuti, Isnin Anang Marhana, Alfian Nur Rosyid, Dwi Wahyu, Bambang Pujo Semedi, Ricardo Adrian Nugraha, Ryan Ernest Intan, Muhammad Ramadhan, Ika Caesarina, Asiyah Nurul Fadila, Muhammad Surya Tiyantara, Gilang Muhammad Setyo Nugroho, Ummi Maimunah, Edi Suyanto, Adhitri Anggoro, I Komang Rusgi Yandi, Jilleanastasia Godrace Lilihata

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The effect of giving extract of Giwang ferns (*Euphorbia milii*) cactus leaves on the number of fibroblast white rats burn infected with *Pseudomonas aeruginosa* (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4050>)

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Ultrasound evaluation of post-cesarean uterine wound healing based on a figure of eight suturing technique
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4241>)

Makmur Sitepu, Muhammad Birza Rizaldi, Djafar Siddik

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Estimating the safe duration and concentration of benzene exposure in the workplace in the printing industry
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4311>)

Moch. Sahri, Octavianus Hutapea, Muslikha Nourma Romadhoni, Friska Ayu, Efi Sriwahyuni, Shamsul Bahari Shamsudin

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Effect of intravenous methylprednisolone on the degree of hepatic ischemia/reperfusion injury in class III hypovolemic shock conditions performed continuous clamping in rats (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4488>)

Suryo Wahyu Raharjo, Tomy Lesmana

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Do scientists still believe in mindfulness meditation for pain therapy? a bibliometric analysis regarding meditation trends for therapy from 1946 To 2022 (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4080>)

Arman Yuribaldi Saleh, Rizky Valentina

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Effect of probiotics as adjuvant therapy of antidepressants in male Wistar rats with anhedonia behavior
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4263>)

Wati Evilia, Anak Ayu Sri Wahyuni, Ida Aju Kusuma Wardani, I Wayan Gede Artawan Eka Putra, Lely Setyawati Kurniawan, Ni Ketut Sri Diniari, I Gusti Ayu Indah Ardani, I Gusti Kamasan Nyoman Arijana

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ORIGINAL ARTICLE

The effectiveness of banana consumption on blood pressure, liver function, and lipid function in construction workers
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4316>)

Andreas Putro Ragil Santoso, Devyana Dyah Wulandari, Firdaus, Rizki Nurmalaya Kardina, Ahmad Jazuly Nabil, Dewi Kuncoro Yakti Pamungkas, Salfa Salsabilah Zain, Marotur Rohima

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BRCA 1 and 2 somatic mutation in high grade serous epithelial ovarian cancer in Indonesian women that was operated on Dr. Soetomo General Hospital, Surabaya in 2019-2021 (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4504>)

Jonathan Kevin Djuanda, Brahmana Askandar Tjokroprawiro, Grace Ariani

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Medical students' mental health state during pandemic COVID-19 in Indonesia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4104>)

Putu Asih Primatanti, Yuda Turana, Wawang S. Sukarya, Marwito Wiyanto, Artha Budi Susila Duarsa

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ORIGINAL ARTICLE



The effect of dietary antioxidant vitamins on malondialdehyde, white blood cells, and platelets
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4284>)

Ary Andini, Farah Nuriannisa, Gilang Nugraha, Nathalya Dwi Kartika Sari, Muslikha Nourma Rhomadhoni, Satya Nugraha Wirayudha, Eka Apriliani Maisurotun Sholeh, Audria Intan Faradita, Fika Dwi Wahyuningtiyas

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The effectiveness of the ERACS (Enhanced Recovery After Caesarean Surgery) method on postoperative pain and the onset of colostrum excretion (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4324>)

Esty Puji Rahayu, Fauziyatun Nisa, Ratna Ariesta Dwi Andriani, Fritria Dwi Anggraini

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Family support in chronic kidney failure patients with hemodialysis (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4423>)

Lono Wijayanti, Ah Yusuf, Ika Yuni Widyawati, Moch. Faisol Arif, Priyo Mukti Pribadi Winoto, Yurike Septianingrum, Erika Martining Wardani

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Different clinicopathological characteristics in Indonesian colorectal patients with RAS mutations and LC3 over-expression: a cross-sectional study (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4519>)

Rio Andreas, Reno Rudiman, Kiki Lukman, Bambang Am Am Setya Sulthana, Andriana Purnama, Mochammad Riskie Aditya Putra, Prapanca Nugraha, Etis Primastari

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The effectiveness of heat patch on afterpain levels during the puerperium (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4331>)



Lailatul Khusnul Rizki, Nur masruroh, Yati Isnaini Safitri

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Efficacy and safety of microsurgical varicocelectomy with subinguinal and inguinal approaches: a systematic review and meta-analysis (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4528>)

Muhammad Wahyu Ali, Agung Ravi Saputra Sangadji, Yufi Aulia Azmi, Fikri Rizaldi, Doddy Moesbadianto Soebadi

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Nursing education institutions' readiness to use online objective structured clinical examination scoring management system (<https://www.balimedicaljournal.org/index.php/bmj/article/view/3700>)

Yanuar Primanda, Ferika Indarwati, Fahni Haris, Resti Yulianti Sutrisno

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Effects of diabetes mellitus regulation on antibody response to inactivated virus vaccine: a systematic review (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4171>)

Dewi Prasetyaningtyas, Gatot Soegiarto, Laksmi Wulandari

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Health profile of batik workers in Malon Village Indonesia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4295>)

Evi Widowati, Arif Rahmat Kurnia, Yuliaty, Yoris Adi Maretta, Puji Lestari, Muhammad Kurniawan, Widya Hary Cahyati

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Implementing the Sendai Framework for Volunteers in Sidoarjo District (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4337>)

Priyo Mukti Pribadi Winoto, Nursalam, Iis Noventi, Sulistyorini, Ika Mardiyanti, Ainul Rofik

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Bevacizumab and triamcinolone acetonide intravitreal effect on Transforming Growth Factor Beta (TGF- β) and Plasminogen Activator Inhibitor-1 (PAI-1) expression in open globe injury model (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4534>)

Kautsar Abiyoga, Delfitri Lutfi, Yulia Primitasari, Citra Dewi Maharani, Clarisa Finanda, Wimbo Sasono, Nurwasis, Evelyn Komaratih, Joko Legowo

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Activity of enzyme Esterase, Glutathione S Transferase and Inorganic Substance of Dengue vector *Aedes aegypti* larvae against *Lansium domesticum* leave extract and fractionation (<https://www.balimedicaljournal.org/index.php/bmj/article/view/3946>)

Devita Febriani Putri, Ismail Husna, Mala Kurniati, Annisa Primadiamanti

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Drug-Induced Liver Injury (DILI) related to Propylthiouracil (PTU) in hyperthyroidism with liver cirrhosis (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4206>)

Arina Salsabila, Ulfa Kholili, Hermina Novida

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Medication adherence and visiting compliance: interventions self-management education based on health belief model
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4302>)

Joni Iskandar , Eppy Setiyowati, Chilyatis Zahroh

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Comparative study on albumin, C-Reactive Protein (CRP) and D-dimer in chronic hemodialysis patients with COVID-19
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4345>)

Robinson, Kevin Gracia Pratama, Aditiawardana

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Psychiatric aspects of healthcare workers during COVID-19 pandemic in Surabaya, Indonesia: prevalence of anxiety, resilience, burnout, and their correlations to stress markers (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4480>)

Margarita M. Maramis, Soetjipto, Yuniati Setiawati, Agustina Konginan, Nalini Muhdi, Winson Chuanardi, Yusuf Ibrahim, Rosalia A. Malika, Sandra C.N. Tang, Kadek D. Chandita, Natasha A. Tayibnapi, Abdul J.A. Hayyan, Adde M.P. Chafid, Elizeus Hanindito, Nancy M. Rehatta, Moses G.R. Pandin, Tarmono, Damayanti Tinduh, Cita R.S. Prakoeswa, Fitriah Munawaroh

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Sequencing analysis of anti mullerian hormone in polycystic ovarian syndrome and primary ovarian insufficiency
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4556>)

Budi Ermanto, Fadilah, Anom Bowolaksono, Asmarinah, Tono Djuwanton, Aria Kekalih, Mila Maidarti, Wisnu Ananta Kusuma, Budi Wiweko

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Effect of isothiocyanate therapy on trophoblast cell culture-hyperglycemia atmosphere against Tumor Necrosis Factor- α (TNF- α) and Transforming Growth Factor- β (TGF- β) levels (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4016>)

Harry Kurniawan Gondo

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Mirror therapy combined with flashcards on the extremity function and stages of self-acceptance of stroke patients (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4225>)

Maria Magdalena Purba, Christine Aden, Mars Khendra Kusfriadhi

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Trigone point as an alternative location for ventricular shunt insertion (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4309>)

Yuriz Bakhtiar, Dewi Sartika, Zainal Muttaqin, Muhammad Thohar Arifin, Sukma Imawati, Farah Hendara Ningrum

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High levels of interleukin-6 and triglycerides and low levels of soluble leptin receptors as risk factors for leptin resistance in obese adolescents (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4371>)

Komang Januartha Putra Pinatih, I Putu Gede Karyana, Ni Nyoman Metriani Nesa, Ni Luh Sri Apsari, Desak Made Wihandani

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The influence of social media on the treatment and psychosocial of acne vulgaris patient (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4076>)

Kristin Stephanie, Nelva Karmila Jusuf, Imam Budi Putra

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ORIGINAL ARTICLE

Profile of tracheotomy patients at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4254>)

Siska Citra Amalia, Achmad Chusnu Romdhoni

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ORIGINAL ARTICLE

Effect of dexmedetomidine administration on malondialdehyde levels in lower extremity surgery using tourniquets (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4386>)

Bayu Wijanarko, Prananda Surya Airlangga, Mariza Fitriati, Christrijogo Sumartono, Prihatma Kriswidyatomo, Pudji Lestari

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ORIGINAL ARTICLE

Modification of BACAP score as a predictor of pancreatic carcinoma resectability at Dr. Cipto Mangunkusumo National Center Hospital Jakarta (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4502>)

Ahmad Ravles, Agi Satria Putranto, Dhanasari Vidiawati Trisna

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ORIGINAL ARTICLE

Antibacterial potential of *Curcuma caesia* Roxb ethanol extract against nosocomial infections (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4320>)

Siti Juariah, Fazleen Izzany Abu Bakar, Mohd Fadzelly Abu Bakar, Susi Endrini

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ORIGINAL ARTICLE

Molecular docking studies of Brucein D as a potential inhibitor of the Bcl-2 anti-apoptotic protein (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4414>)

Pandu Ishaq Nandana, Haerani Rasyid, Prihantono, Ika Yustisia, Lukman Hakim

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ORIGINAL ARTICLE

The role of mean platelet volume (MPV) and platelet distribution width (PDW) pre-operating as sepsis indicators in laparotomy patients in Dr. Zainoel Abidin Hospital Banda Aceh, Indonesia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4116>)

Darul Ilham, Dian Adi Syahputra, Muhammad Yusuf

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ORIGINAL ARTICLE

Lipopolysaccharide-induced pregnant mice had decreased serum iron while maintaining hepcidin level and Hamp1 mRNA expression (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4328>)

Gilang Nugraha, Widjiati, Aryati, Citrawati Dyah Kencono Wungu, Harianto Notopuro, Win Darmanto, Agus Sulistyono, Hari Basuki Notobroto, Purwo Sri Rejeki

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ORIGINAL ARTICLE



Student perception of nurse communication learning with patients according to pancasila values
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4438>)

M. Shodiq, Siti Nur Hasina, Siti Maimunah, Mujad Didien Afandi

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ORIGINAL ARTICLE

Prevalence and characteristics of Postoperative Cognitive Dysfunction (POCD) in on-pump cardiac surgery patients at Dr. Kariadi General Hospital Semarang (<https://www.balimedicaljournal.org/index.php/bmj/article/view/3689>)

Widya Istanto Nurcahyo, Ginanto Auzan Adhyatmoko, Muhammad Farhan Kurniawan, Chandra Hermawan Manapa, Satrio Adi Wicaksono, Cindy Elfira Boom, Zainal Muttaqin

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The comparison of effects of iron supplementation since pre-pregnant and during pregnant period on reducing iron deficiency anemia in pregnant women with mild anemia in Bali (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4149>)

Luh Seri Ani, I Made Bakta, Made Ayu Hitapretiwu Suryadhi, Nyoman Agus Bagiada

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A review of fit to work assessment program on the work performance of heavy equipment operators during the pandemic covid-19 at Indonesia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4293>)

Friska Ayu, Muslikha Nourma, Moch Sahri, Octavianus Hutapea, Bondan Winarno

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Effect of essential oil Citrus aurantium l var amara on menopause syndrome (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4335>)



Uliyatul Laili, Nur Zuwariyah

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SOD2 and HIF-1 α expression in rat ovaries (*Rattus norvegicus*) administered with forest bee honey (*Apis dorsata*) following physical stress (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4532>)

Hani Plumeriastuti, Widjiati Widjiati, Annise Proboningrat, Mey Vanda Pusparina Sajida

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The description of mothers' knowledge of exclusive breastfeeding according to the maternal characteristics at Dr. Ramelan Central Naval Hospital, Surabaya (<https://www.balimedicaljournal.org/index.php/bmj/article/view/3745>)

Anne Marie Mantofa, Peter Prayogo Hsieh, Fricillia Mapantow, Monique Wongsodiharjo, Exousia Kirana Chandra, Devina Theo Hengky Handoyo, Rizqi Rokhmadoni Pikir, Dian Ardana

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Anxiety and perceived mental healthcare need among non-frontline in coronavirus referral hospital, Surabaya (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4197>)

Heru Wijono, Soenarnatalina Melaniani, Kuntoro, Zainul Amiruddin Zakaria, Made Oka, Najihah Hanisah Bte Marmaya, Risma Ekawaty, Bagus Ida Saputra

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Mozart's or murotal, which is more effective for spatial memory? an experimental study on mice (*Mus musculus*) (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4299>)

Akbar Reza Muhammad, Dyah Yuniati, Irmawan Farindra, Fifi Khoirul Fitriyah, Hafid Algristian



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Impact of preeclampsia on the outcome of COVID-19 infection (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4341>)

Jonathan Kevin Djuanda, M. Aldika Akbar, Agus Sulistyono, Rozi Aditya, Ernawati

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Interobserver agreement and the role of smoothelin immunostain in the evaluation of Muscularis Propria (MP) invasion of Bladder Urothelial Carcinoma (BUC) (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4541>)

Ni Wayan Winarti, Ni Putu Sriwidyani, Luh Putu Iin Indrayani Maker, I Made Gotra, Ni Made Mahastuti, Tanaka, Silvia Kosashi, I Wayan Yudiana

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The relationship of the use of masks with the event of maskne on Universitas Sumatera Utara Hospital healthcare workers during the COVID-19 pandemic (<https://www.balimedicaljournal.org/index.php/bmj/article/view/3967>)

Raisa Khairuni, Nelva Karmila Jusuf, Imam Budi Putra

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Platelet count, platelet lymphocyte ratio, and Ki67 as a predictive factor of neoadjuvant chemotherapy response in locally advanced breast cancer (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4222>)

Sasongko Hadi Priyono, Badriatunnor, Meitria Syahadatina Noor, Agung Ary Wibowo, Didik Dwi Sanyoto, Audi Ardansyah

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ORIGINAL ARTICLE

Analysis of the characteristics of pregnant women affect nurse interaction with self hypnosis approach in prevention of preeclampsia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4306>)

Faridah Umamah, Budi Santoso, Esti Yunitasari, Siti Nur Hasina, Raden Khairiyatul Afiyah

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ORIGINAL ARTICLE

Effect of medroxyprogesterone and doxycycline on vascular endothelial growth factor (VEGF) expression and corneal neovascularization in corneal alkali trauma (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4366>)

Muhammad Fariz, Luki Indriaswati, Sutjipto

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ORIGINAL ARTICLE

The effect of Mozart's classical music on blood pressure in Wistar white rats (*Rattus norvegicus*) (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4577>)

Rivans Jackson Tandirerung, Irwanto, Anak Agung Ngurah Krisna

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Sinonasal inverted papilloma extirpation by endoscopic approach: a case report (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4060>)

Teuku Husni TR, Ridha Chaharsyah Mulya

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Development of non-pharmacological pain management (behavioral intervention) model based on family-centered empowerment in toddlers with invasive procedures (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4312>)

Wesiana Heris Santy, I Dewa Gede Ugrasena, Yuni Sufyanti Arief, Nur Hidayah, Firdaus, Resti Utami

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The effect of school closure and online learning during the COVID-19 pandemic on the academic performance of elementary school-aged children (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4384>)

Glabela Christiana Pandango, Ahmad Suryawan, Mira Irmawati

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ORIGINAL ARTICLE

Prognostic scoring system to predict mortality after surgery in resectable colorectal cancer (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4491>)

Alldila Hendy Prihanda Suryaningprang, Agi Satria Putranto, Luthfian Aby Nurachman

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Analysis of donor hemoglobin levels at the blood transfusion service of Dr. Sardjito Hospital, Yogyakarta (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4617>)

Usi Sukorini, Galih Retno Martani, Teguh Triyono

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Community behavioral change and attitudes on the health protocol during the Covid-19 vaccination period and level 1 restriction (PPKM) (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4269>)

Reny Sulistyowati, Khoirunnisa, Vissia Didin Ardiyani, Syam'ani

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Mindfulness eating based on spiritual interventions on diet compliance and blood sugar levels in type 2 DM patients (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4317>)

Riska Rohmawati, Lono Wijayanti, Ratna Yunita Sari, Imamatul Faizah, Rahayu Anggraini

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The correlation between spiritual coping with the lifestyle of hypertension patients in Ploso Kuning village (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4285>)

Umdatus Soleha, Siti Nurjanah, Firnanda Erindia

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ORIGINAL ARTICLE

The self-acceptance model improves the behavior of maintaining the quality of life after a hysterectomy (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4325>)

Raden Khairiyatul Afyah, Faridah Umamah, Nanik Handayani, Rusdianingseh, Budi Prasetyo

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Determinants of fracture patients in nonunion or delayed union (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4427>)

Su Djie To Rante, S. M. J. Koamesah, Prisca Pakan, Conrad Liab Hendricson Folamauk

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ORIGINAL ARTICLE

Identification of tumor infiltrating lymphocyte CD8 in Indonesian colorectal cancer population: a cross-sectional study (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4520>)

Elit Irawan, Kiki Lukman, Nurhayat Usman, Bambang Am Am Setya Sulthana, Reno Rudiman, Deny Budiman, Prapanca Nugraha, Etis Primastari

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ORIGINAL ARTICLE

Composite characterization of freeze-dried human amnion membrane and human adipose tissue derived stromal cells for soft tissue engineering (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4333>)

Yusuf Rizal, Mouli Edward, Tri Wahyu Martanto, Heri Suroto

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ORIGINAL ARTICLE

Surgical epidemiology of spinal cord tumors at Dr. Kariadi Hospital, Semarang, Indonesia (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4450>)

Endi Suryo Utomo, Happy Kurnia Broto Arianto, Ajid Risdianto, Dody Priambada, Erie Bambang Priyono Setyabudi Andar, Zainal Muttaqin, Muhamad Thohar Arifin, Krisna Tsaniadi Prihastomo, Yuriz Bakhtiar

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REVIEW



Intravitreal triamcinolone acetonide and bevacizumab injection as prevention of proliferative vitreoretinopathy in open globe injury (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4339>)

Kautsar Abiyoga, Yulia Primitasari, Delfitri Lutfi

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REVIEW

Effect of platelet rich fibrin membrane on the expression of smooth muscle actin and transforming growth factor beta in corneal wound healing Pseudomonas aeruginosa keratitis patient: a literature review (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4535>)

Bimanda Rizki Nurhidayat, Nurwasis, Evelyn Komaratih

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REVIEW

Comparison of the efficacy of hot saline irrigation and tranexamic acid on Boezaart score, intraoperative blood loss, and duration of surgery in functional endoscopic sinus surgery: a systematic review and meta-analysis (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4362>)

Timmy Wibisono, Budi Sutikno, Titiiek Hidayati Ahadiah, Budi Utomo, Citrawati Dyah Kenconowungu

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REVIEW

The role of Platelet Rich Fibrin (PRF) membrane and conjunctival autograft on TGF- β and collagen type 1 expression in conjunctival wound healing: a literature review (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4310>)

I Nyoman Ananta Karisma, Wimbo Sasono, Susy Fatmariyanti

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REVIEW

Topical nonsteroidal anti-inflammatory drugs in the prevention of pseudophakic cystoid macular edema following phacoemulsification: A systematic review (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4079>)

Ni Putu Ayu Pande Arista Dewi, Cokorda Istri Dewiyani Pemayun

Online First: May 27, 2023 |

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REVIEW

The immune response of SARS-CoV-2 vaccine in population with obesity: a systematic review (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4170>)

Nur Arafah, Gatot Soegiarto, Laksmi Wulandari

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REVIEW

Platelet rich fibrin effect in MMP-9 and TIMP-1 expression as bacterial keratitis therapy (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4385>)

Oggy Satriya Putra, Nandang Sudrajat, Bimanda Rizki Nurhidayat, Luki Indriaswati, Yulia Primitasari

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REVIEW

Clinicopathological and Prognostic Significance of SRY-Box Transcription Factor 2 (SOX2) Overexpression in Central Nervous System Tumor: A Meta-Analysis (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4493>)

I Gede Aswin Parisya Sasmana, Sinta Wiranata, Komang Chandra Yogananda, Desak Made Wihandani, I Gede Putu Supadmanaba

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REVIEW

The effect of bisphosphonate and platelet-rich plasma in anterior cruciate ligament reconstruction: an article review (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4292>)

Tangkas Sibarani, Bambang Purwanto, Ambar Mudigdo, Brian Wasita



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REVIEW

Omega-3 intake and cachexia risk in cancer patients: systematic literature review (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4297>)

Fildzah Karunia Putri, Nabilah Farah Diba, Endah Budi Permana Putri

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REVIEW

Epigallocatechin gallate effect on Interleukin-1^β and MMP-9 expression as Pseudomonas aeruginosa keratitis adjuvant therapy (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4382>)

Tarosa Yodia Urolita, Fariztah Sukainah Nur Fathimah, Annisa Karima, Nurwasis, Ismi Zuhria

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 Abstract

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REVIEW

Leucocytes, thrombocytes and immature platelets in patients with dengue hemorrhagic fever (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4613>)

Ahmad Fahrudi Setiawan, Yuyun Yueniwati Prabowowati Wajib, Kusworini Handono, Setyawan Purnomo Sakti

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 Abstract

 pdf (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4613/2886>)

REVIEW

Comparison of Cost-Effectiveness Analysis (CEA) between sevoflurane inhalation anesthetic and Propofol Total Intravenous Anesthesia (TIVA) in craniotomy surgery: a literature review (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4390>)

Petrus Devi Doko Rehi

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REVIEW

Managing and diagnosing fibromyalgia in psychiatry (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4289>)

Popy Arizona, Yunias Setiawati

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REVIEW

The role of Resveratrol as a neuroprotective agent in the prevention of retinal ganglion cell loss in ischemic reperfusion injury animal model: a literature review (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4449>)

Amelia Shinta Prasetya, Evelyn Komaratih, Wimbo Sasono, Mercia Chrysanti, Maria Debora Niken Larasati, I Ketut Sudiana

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REVIEW

The potential of MLC901 as adjuvant therapy for traumatic spinal cord injury by multi-pathway biomechanism: a systematic review (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4606>)

Dewa Putu Wisnu Wardhana, Agung Bagus Sista Satyarsa, Rohadi Muhammad Rosyid, Husni Harmansyah, Tjokorda Gde Bagus Mahadewa, Andi Asadul Islam, I Made Jawi, Sri Maliawan

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REVIEW

Effectiveness of relevant interventions with readiness for discharge in transitional care of low birth weight infants: a systematic review (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4314>)

Resti Utami, I Dewa Gede Ugrasena, Ernawati, Yuni Sufyanti Arief, Wesiana Heris Santy

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REVIEW

Efficacy of topical medroxyprogesterone acetate 1 % and topical doxycycline reduce MMP-9 and TGF- β 1 expression as corneal ulceration due to alkali burn: literature review (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4278>)

Anindita Juwita, Lukisiari Agustini, Rozalina Loebis, Ismi Zuhria, Ridholia, Chrismawan Ardianto

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REVIEW

Obstetrical ballooning and avulsion of levator ani muscle after vaginal delivery: a literature review (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4514>)

Muhammad Nurhadi Rahman, Mochamad Rizkar Arev Sukarsa, Andi Rinaldi, Eppy Darmadi Achmad, Raden Mas Sonny Sasotya, Edwin Armawan, Herdifitrienne Saintissa Yanuaristi, Azura Nabila Putri

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REVIEW

Lupus nephritis and kidney transplantation: past, present and future (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4456>)

Dana Pramudya, Decsa Medika Hertanto, Afina Thara Pitaloka, Artaria Tjempakasari, Pranawa

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REVIEW

The role of stem cell secretome on spinal cord injury regeneration: a systematic review and meta-analysis (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4131>)

I Nyoman Semita, Dwikora Novembri Utomo, Heri Suroto

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REVIEW

Determinants of patient satisfaction after total knee arthroplasty (TKA): a literature review (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4529>)

Anggi Dwi Putera, Muhamad Hasan, Muhammad Riyadli, Muhammad Nadlir Fakhry

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CASE REPORT

Cryptococcal meningoencephalitis in an immunodeficiency virus positive patient coinfectd with tuberculosis (<https://www.balimedicaljournal.org/index.php/bmj/article/view/4180>)

Hendy Wirantara, Musofa Rusli, Muhammad Vitanata Arfijanto, Bramantono

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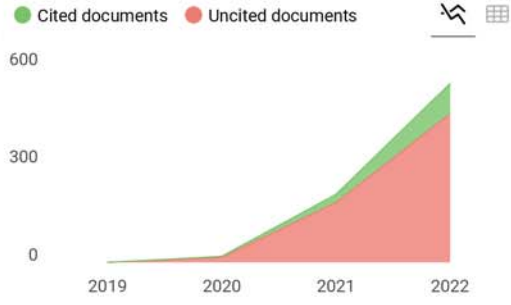
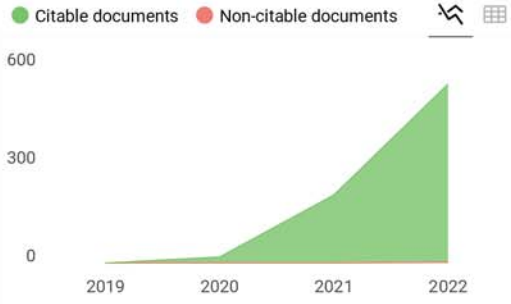
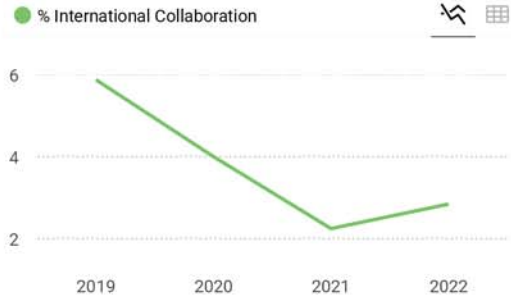
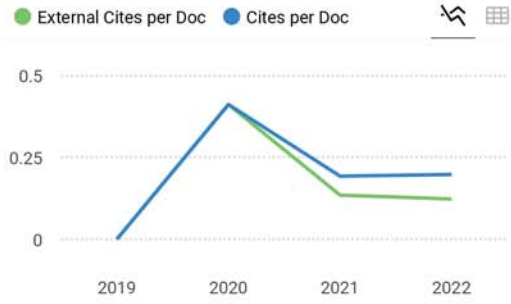
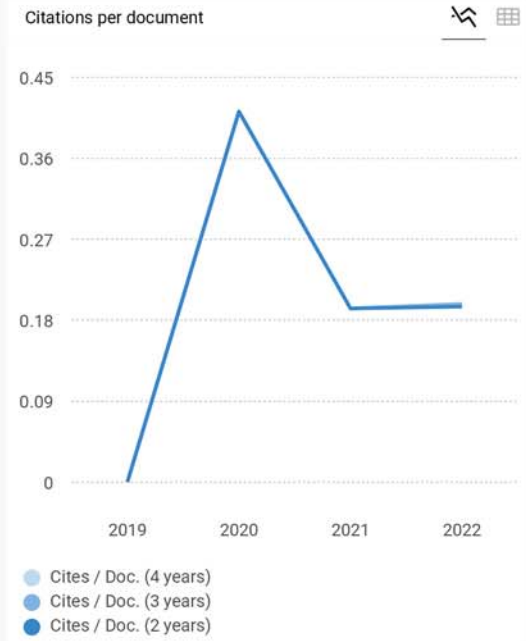
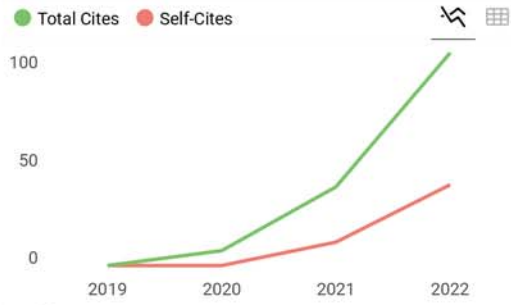
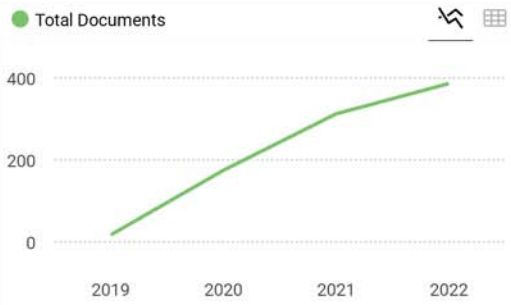
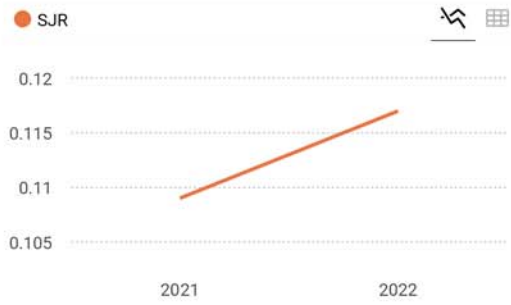
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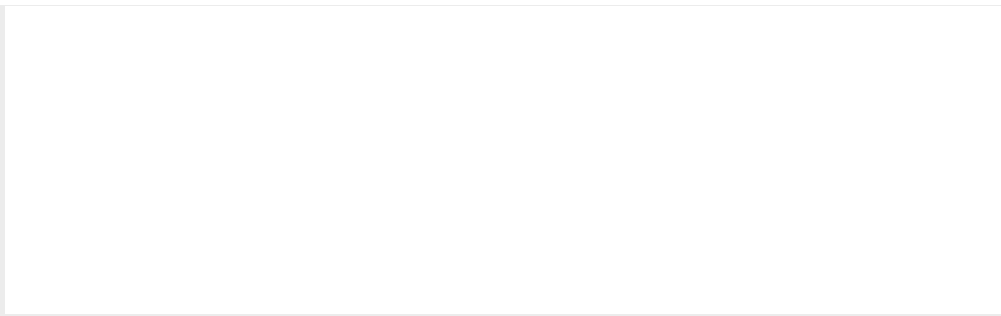
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