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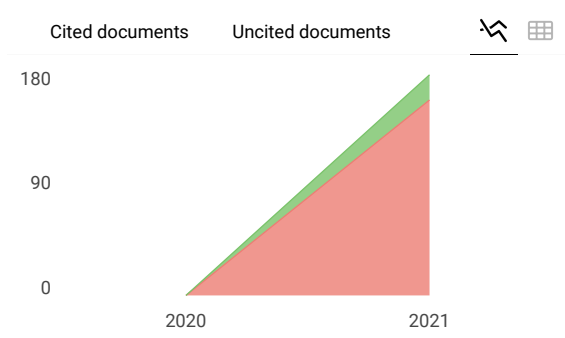
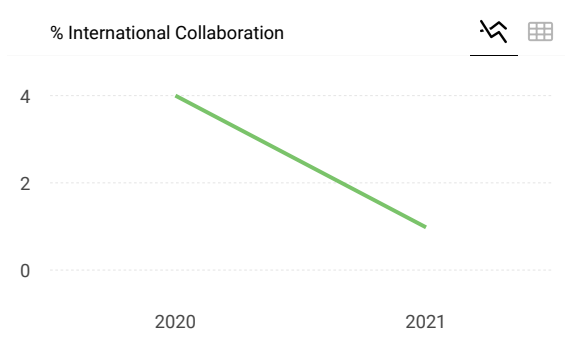
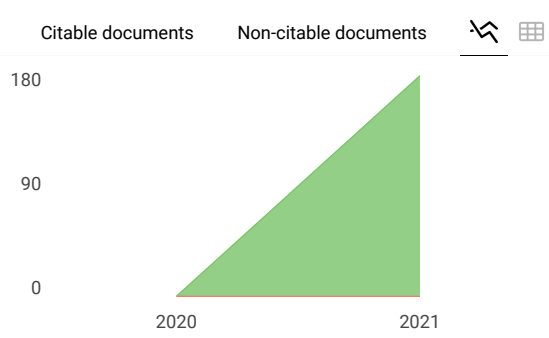
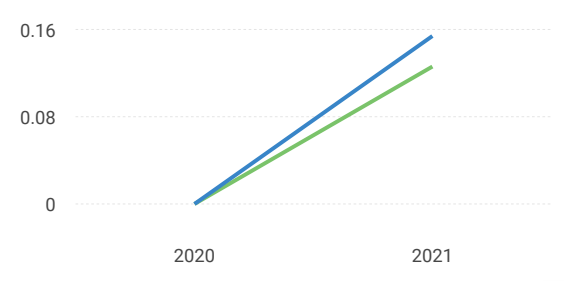
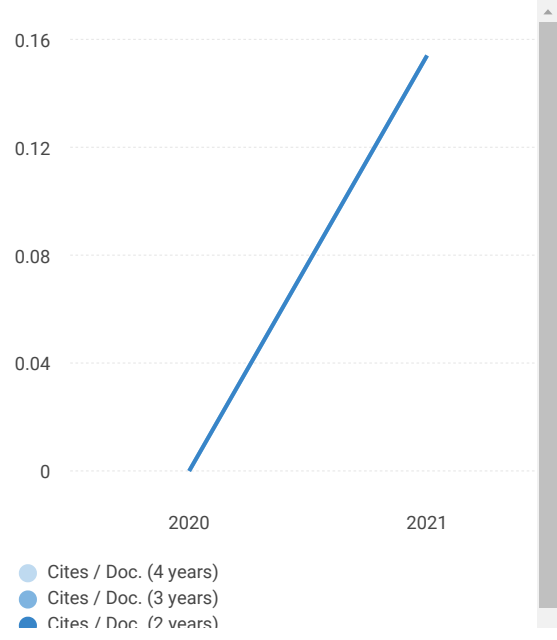
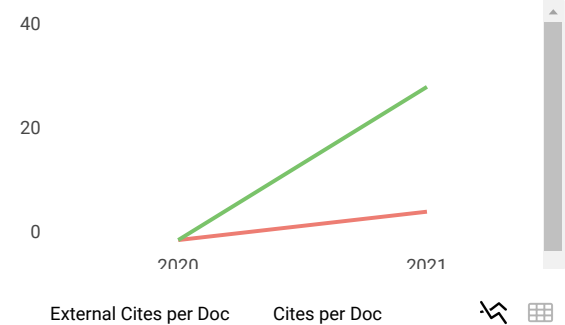
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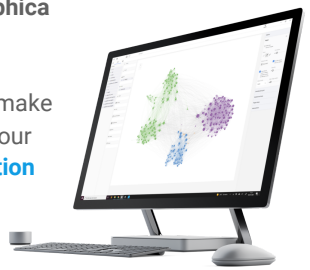
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ORIGINAL ARTICLE

Profile of matrix metalloproteinase activity, markers of collagen and elastin degradation during pregnancy, delivery, and puerperium in pelvic organ prolapse 3 months after childbirth

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4041/2470>)

Tyas Priyatini, Budi Iman Santoso, Trika Irianta, Herqutanto, Nuryati Siregar, Alida Harahap, Mohamad Sadikin

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ORIGINAL ARTICLE

p16 expression in uterine cervical lesions and its role as diagnostic markers and clinical management

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I Gusti Ayu Sri Mahendra Dewi, Ni Putu Sriwidnyani

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Relationship between angiotensin-like-protein-2 levels and anti-mullerian hormone levels in polycystic ovary syndrome of reproductive age

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Dyan Asih Rachmawati, Ashon Sa'adi, Budi Utomo, Arif Tunjungseto

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ORIGINAL ARTICLE

Copeptin levels as a predictor of acute kidney injury (AKI) in ST-segment elevation myocardial infarction (STEMI)

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3910>)

Dian Ariningrum, Mas Aditya Senaputra, Sumardiyono, Purwanto Adhi Pireno, Lisyani B. Suromo

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The Operative Duration of Elective and Emergency Hernia Repair Surgery: A Single Center Experience

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Natalia Maria Christina, Valeska Siulinda Candrawinata, Christine Nathalia, Ivory Seiko, Ivy Nadia Yuwono

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Results and cost analysis of Amplatzer® Ductal Occluder-ii, Nit Occlud® Lê Coil, and Konar-MF® ventricular septal defect occluder for percutaneous ventricular septal defect closure

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3487>)

Eka Gunawijaya, Ni Putu Veny Kartika Yantie, Anlidya Permatasari Gunawijaya

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(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3487/2657>)

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Islamic nursing care implementation: patients' perception

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Novita Kurnia Sari, Aspia Dwi Asriani

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(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3780/2537>)

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Diagnostic test thyroid elastography examination and mRNA expression of the Cytokeratin-19 gene to determine the type of thyroid nodule

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3924>)

Fauzy Ma'ruf, Made Agus Suanjaya, Bachtiar Murtala, Muhammad Ilyas, Mochammad Hatta, Rahmad Mulyadi, Rosdiana Natzir, Irfan Idris, Muhammad Husni Cangara, Mirna Muis, Andi Alfian Zainuddin, Dewi Anjarwati, Wiwik Sari Aprianturi

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(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3924/2613>)

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Profile of female blood donors in the blood transfusion units of Dr. Sardjito Central General Hospital Yogyakarta

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Teguh Triyono, Marini Taslima, Usi Sukorini

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(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3988/2493>)

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Comparison of trauma scoring system in predicting post-surgical fixation outcomes of traumatic rib fracture

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4141>)

Ketut Putu Yasa, Raymen Satria, I Komang Adhi Parama Harta, I Wayan Sudarma, I Nyoman Semadi

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Bacteriocin potency test of lactic acid bacteria (LAB) isolated from rumen of Bali cattle against low pH and bile salt

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Hamong Suharsono, I Wayan Suardana, Komang Januartha Putra Pinatih

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Pregnancy characteristics of patients with placenta accreta spectrum at Prof. Dr. I.G.N.G. Ngoerah Hospital Denpasar, Bali-Indonesia during January 2020 - January 2022

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3797>)

Anak Agung Ngurah Jaya Kusuma, I Wayan Artana Putra, I Gde Sastra Winata, I Gusti Ngurah Wiranta Permadi, William Alexander Setiawan

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(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3797/2462>)

Factors related to mortality in geriatric patients after elective surgery: a retrospective cohort study

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4005/2528>)

Yudo Murti Mupangati, Mustain, Henry Setyawan, Ignatius Riwanto, Czeresna Heriawan Soejono, Muhammad Hussein Gasem

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The relationship between nutritional status before chemotherapy with nutritional status after chemotherapy in locoregionally advanced nasopharyngeal carcinoma patients

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4070>)

Felita Surya Rini, Etisa Adi Murbawani, Minidian Fasitasari, Niken Puruhita, Khairuddin

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The effect of Curcuma longa extract on fibroblast count and collagen density in intestinal anastomosis: an experimental study on New Zealand rabbits

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4151/2566>)

Sarwendah Pratiwi Rudiman, I Gusti Bagus Adria Hariastawa, Fendy Matulatan

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ORIGINAL ARTICLE

Experiences of HIV/AIDS women in planning their pregnancies during the COVID-19 pandemic

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3692>)

Nur Azizah Indriastuti, Erna Rochmawati, Luluk Rosida, Riski Oktafia, Rizka Mega Putri Ariyanto

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Improved abdomen muscle activity with interferential current therapy in cerebral palsy with controlled trial study

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3819/2398>)

Shofie Sabatin Verayunia, Sri Mardjiati Mei Wulan, Noor Idha Handajani, Andriati, Martha Kurnia Kusumawardani, Andy Darma, Reza Gunadi Ranuh, Soenarnatalina Melaniani

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Critical priority Multidrug-Resistant Organisms (MDROs) secondary infection among

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The impact of transcutaneous auricular vagus nerve stimulation on C-reactive protein in patients



COVID-19 patients: hidden threat during a pandemic? A retrospective study

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3950>)

Irbasmantini Syaiful, Ni Made Mertaniasih, Lindawati Alimsardjono, Pepy Dwi Endraswari, Arie Utariani, Budi Utomo

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Yanjar Uzlifatin, Raden Ayu Meisy Andriana, Indrayuni Lukitra Wardhani, Imam Subadi, Paulus Sugianto, Soenarnatalina Melaniani

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The percentage of positive biopsy cores in predicting biochemical recurrence and adverse pathology in prostate cancer patients after radical prostatectomy: a systematic review and meta-analysis

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Ahmad Fathira Fitra, Niwanda Yogiswara, Wahjoe Djatisoesanto, Eric Chung, Lukman Hakim

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Challenge in prominent grade IV hemorrhoid management: a case report

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Bernardus Parish Budiono, Neni Susilaningih, Sigit Adi Prasetyo, Melissa Angela Chionardes, Ignatius Riwanto

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Time to detection of Mycobacterium tuberculosis using culture filtrate H37rv supplementation on MGIT 960 System

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Resti Enggar Paweninggalih, Ni Made Mertaniasih, Eko Budi Koendhori, Soedarsono Soedarsono

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The effectiveness of incentive spirometry exercise on pulmonary function in COVID-19 survivors: a randomized controlled trial study

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3956>)

Rosa Indah Kusumawardani, Damayanti Tinduh, Andriati, Dewi Poerwardari, Isnin Anang Marhana, Soenarnatalina Melaniani

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Effect of Spiramycin and Moringa leaf feeding in improving placenta, heart, histopathological neurons and glia in fetal models with toxoplasmosis

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Hafi Nurinasari, Sajidan, Bambang Purwanto, Dono Indarto, Didik T

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The significance of immunoexpression of Polo Like Kinase 1 (PLK1) in retinoblastoma

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The Significance of PLK1 In Retinoblastoma
Yan Adhitya Kusuma, Dyah Fauzlah, Anny Setijo Rahaju

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Subekti, Hendrastuti Apriningsih, Ariva Syiva'a, Soetrisno

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Number of e-cadherin and VEGF in WiDr cell line post-induced by extract ethanol *Annona muricata* leaf

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3736>)

Yoni Astuti, Agus Suharto, Sabtanti Harimurti, Helmi Hana Prinanda, Wahyu Joko Priambodo

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Tumour infiltrating lymphocyt (TILs) as an excellent predictive factor for neoadjuvant chemotherapy response on locally

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Florencia Adys, Iwan Kristian, Sahudi, Alphania Rahniayu

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Prevalence and susceptibility profile of carbapenem-resistant pseudomonas aeruginosa (CRPA) at Dr. Soetomo Public Hospital, Surabaya, from January to December 2021

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4098>)

Andritta Febriana, Agung Dwi Widodo, Muhammad Vitanata Arfijanto

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Comparison between the time to detection of pathogenic and nonpathogenic microorganisms from blood culture specimens using the BACTECTM FX machine to determine the optimal

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4199/2624>)

Dewi Yana, Agung Dwi Wahyu Widodo, Pepy Dwi Endraswari

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Content validity and inter-rater reliability of procedural skill checklists used in the online OSCE scoring management system

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3760>)

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

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Efficacy of transcutaneous electrical nerve stimulation on slow transit constipation in children with cerebral palsy

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3750>)

Rifah Zafarani Soumena, Andy Darma, Reza Gunadi Ranuh, Prastiya Indra Gunawan, Alpha Fardah Athiyyah, Khadijah Rizky Sumitro, Subijanto Marto Sudarmo

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The Efficacy of Blood Flow Restriction Training for Grip Strength and Disability in Lateral Epicondylitis

(https://www.balimedicaljournal.org/index.php/bmj/article/view/39

Gede Parta Kinandana, Anak Ayu Nyoman Trisna Narta Dewi, I Made Niko Winaya, Ni Komang Ayu Juni Antari, Ari Wibawa, I Putu Gde Surya Adhitya

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Characteristic profiles of patients with diabetes mellitus and COVID-19 during the second epidemic wave in East Java, Indonesia: a retrospective study

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Batari Retno Minanti, Soebagijo Adi Soelistijo, Agung Pranoto

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Knowledge, Attitude and Practice Related to Organ Donation Among Healthcare Workers at University of Kebangsaan Malaysia Medical Centre (UKMMC)

(https://www.balimedicaljournal.org/index.php/bmj/article/view/31

Wan Haslina Wan Abdul Halim, Norshamsiah Mohd Din, Viknesh Kuppusamy, Sinaran Samsuri, Nurul Ayuni Syafiqah Mat Ropi, Thivyasri Kanapathy, Nur Najihah Mohd Shaiful Bahri

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Diet, physical activity and obesity incidence in adolescents with disabilities

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Titiek Hidayati, Mein-Woei Suen, Ratna Indriawati, Akrom

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Association between IL-6 rs1800795 and IL-1 β rs 16944 gene polymorphisms with clinical severity of COVID-19 in

Surakarta, Central Java, Indonesia

(https://www.balimedicaljournal.org/index.php/bmj/article/view/39

Hendrastutik Apriningsih, Betty Surtawati, Reviono, Tonang Dwi Ardyanto -, Dewi Pratiwi, Hafi Nurinasari

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Postoperative complications of Mathieu incised plate versus standard tubularized incised plate urethroplasty for distal hypospadias: a systematic review

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Unmet need for Family Planning (FP) in 7 national development areas in Indonesia

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(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4058>)
Musafaah Musafaah, Tris Eryando,
Alexhita Dwi Pratiwi, Nurul Huda, Nurul
Rahmaniati, Hadrianti Lasari

Muhammad Arif Hakim Jamhari, Ilham
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Setiawan, Sirin Salsabila, Johan Renaldo,
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Correlation between age, the clinical status of patients, operator characteristics, and surgical landmarks with the incidence of tracheotomy complications

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4235/2635>)

Evan Anindito, Muhtarum Yusuf, Titiek H
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Research map in the field of psychoneuroimmunology therapy, a bibliometric analysis

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Arman Yurisaldi Saleh, Miky Endro
Santoso

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Correlation of 5-minutes heart rate variability with health performance of resident physician in a tertiary academic

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4002/2436>)

Muhammad Ridwan, Subhan Rio
Pamungkas, Fauzul Husna, Willa Mutia
Syafrida, Inda Lestari

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Adjusted enhanced recovery after surgery (ERAS) protocol in colorectal surgery at dr. Cipto Mangunkusumo General Hospital, Jakarta

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4066>)

Andre Setiawan Suryadi, Vania Myralda
Giamour Marbun, Arnetta Naomi Louise
Lalisang, Wifanto Saditya Jeo, Yarman
Mazni, Toar Jean Maurice Lalisang

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Effectiveness of topical turmeric extract compared to topical zinc on fibroblast count and collagen density in clean-contaminated wound: a study on new zealand white rabbit

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4147/2559>)

Made Walmiky Budi, Adria Hariastawa,
Fendy Matulatan

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Hepatitis B vaccine knowledge, perception, and motivation among children and adults in the rural region at Semarang, Indonesia

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3681>)

Dimas Tri Anantyo, Yetty Movieta Nancy, Sri Suci Ningtyas Ardi, Najma Khairani Harahap, Ivan Pratama

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(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3681/2518>)

ORIGINAL ARTICLE

An evaluation of the relationship between the occurrence of chronic kidney disease and the use of NSAIDs

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3814/2451>)

Andi Maulana Kamri, Zullies Ikawati, Rosnani Hashim, Fita Rahmawati

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(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3814/2451>)

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The relationship between metabolic acidosis as a predictive factor of mortality in Ludwig's Angina patients at Dr. Soetomo General Hospital, Surabaya, Indonesia

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4070>)

Alif Rakhman Prima Adi, Marjono Dwi Wibowo, Dwi Hari Susilo

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(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4070/2638>)

ORIGINAL ARTICLE

Correlation between the number of Interstitial cells of Cajal (ICC) and defecation pattern in patients with Hirschsprung's disease after Duhamel's surgery at General Hospital Dr. Soetomo

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4154/2560>)

Yohanes Santosa Honggowarsito, Adria Hariastawa, Fendy Matulatan, Alphania Rahniayu

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(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4154/2560>)

ORIGINAL ARTICLE

Effect of online case-based learning on nursing students' self-confidence amid COVID-19 pandemic

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3702>)

Totok Harjanto, Made Satya Nugraha Gautama, Dimas Sumunar

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Effect of arabica Gayo coffee skin in repairing collagen damaged by UVB exposure

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3954/2433>)

Wahyu Lestari, Sitti Hajar, Nanda Earlia, Cynthia Wahyu Asrizal, Muhammad Arif Ritonga

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ORIGINAL ARTICLE

Exercise improving balance function in the older adult with locomotive syndrome stage 1: a

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Dynamic balance in obese subjects: before and after telerehabilitation weight-bearing



randomized clinical trial
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3726/2399>)

Ajeng Hayu Nayasista, Rwahita Satyawati Dharmanta, Yudith Dian Prawitri, Sri Mardjiati Mei Wulan, Yukio Mikami, Soenarnatalina Melaniani

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exercise for better balance
(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3726/2399>)

Astika Cahya Noviana, Meisy Andriana, I Putu Alit Pawana, Damayanti Tinduh, Hermina Novida, Soenarnatalina Melaniani

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Application of group positive psychotherapy to improve psychological well-being for people with HIV in Papua

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4035/2491>)

Nasrah, Korinus Suweni, Jems KR Maay, Siti RM Arifin, Abdilahi Yousuf

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Performance comparison between Conventional Polymerase Chain Reaction and AbTes Real-time polymerase chain reaction with imaging detection method

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4035/2437>)

Puspa Wardhani, Aryati, Nur Chamidah

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ORIGINAL ARTICLE

Profiles of patients with maxillofacial fractures in emergency department of head and neck surgery division of Dr. Soetomo General Hospital Surabaya in 2021 during COVID-19 pandemic

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4188/2600>)

Kevin Adrian, Marjono Dwi Wibowo

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The evaluation of Acehnese people's health insurance from the welfare perspectives

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Muhammad Yani, Rachmad Suhandu, Indrita Iqbalawati, Diah Ayu Puspandari, Hafasnuddin, Aditya Candra, Teuku Muhammad Izzana, Teuku Muhammad Khaled, Cut Rizka Rahmi

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Early detection methods of chronic diabetic nephropathy in diabetes mellitus patients in primary health services

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Tripitara, Titeik Hidayati, Suny Sun, Akrom

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Evaluation of the utilization Neutrophil-Lymphocyte Ratio (NLR) and Immature-to-Total Neutrophil (I/T) Ratio in Sepsis (LONS) in 31-36 weeks preterm neonates in Indonesia

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3740>)

Ernie Setyawati, Hindra Irawan Satari, Vivi Setiawaty, Pustika Amalia

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(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3740/2635>)

ORIGINAL ARTICLE

The effect of added Transcutaneous Vagus Nerve Stimulation (tVNS) on quality of life in patients with chronic low back pain: a randomized controlled trial study

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4042>)

Muhammad Jasman Erwin Halim, Imam Subadi, I Putu Alit Pawana, Lydia Arfianti, Rwahita Satyawati, Soenarnatalina Melaniani

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The association between biofilm formation ability and antibiotic resistance phenotype in clinical isolates of gram-negative bacteria: a cross-sectional study

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4101/2653>)

Irbasmantini Syaiful, Agung Dwi Wahyu Widodo, Pepy Dwi Endraswari, Lindawati Alimsardjono, Budi Utomo, Muhammad Vitanata Arfijanto

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Mozart music stimulation effect on wistar rats' neurogenesis

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Anak Agung Ngurah Krisna Putra, Irwanto, Reny I'tishom, Bagus Setyoboedi, Muhammad R. D. Mustakim

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Single-Bundle vs. Double-Bundle ACL Reconstruction: Comparison of Functional Integrity

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3977/2418>)

Bobby Natanel Nelwan, Ismail Hadisoebroto Dilogo, Andri Lubis, Marcel Prasetyo, Muchtaruddin Mansyur

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Risk factors and clinical outcomes of ventilator associated pneumonia in neonates in the Neonatal Intensive Care Unit of Dr. Soetomo Hospital Surabaya

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4227>)

Deni Widya Ratna, Ni Made Mertaniasih, Risa Etika, Pepy Dwi Endraswari, Naritha Vermasari

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(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4227/2672>)

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Effect of Spiritual Emotional Model (SPIEM) dhikr on cortisol and IgG levels of drug abusers during rehabilitation programs

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3558/2511>)

Istiqomah, Anies, Ahmad Yudianto, Mateus Sakundarno Adi

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Effects of Tissue Flap on Expression of Vascular Endothelial Growth Factor-C (VEGF-C) as a Marker of Improved Inguinal Lymphatic Circulation on Dissected Mice

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3785>)

Sonar Soni Panigoro, Doni Kurniawan, Alban Dien, I Gusti Ngurah Gunawan Wibisana, Devina Adella Halim

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Does transcutaneous Vagus Nerve Stimulation (tVNS) reduce pain intensity in chronic low back pain patients? A randomized controlled pilot study

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3929/2508>)

Muhammad Jasman Erwin Halim, Lydia Arfianti, I Putu Alit Pawana, Soenarnatalina Melaniani

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The effect of exercise using incentive spirometry on heart rate variability in patients after COVID-19 infection

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3992>)

Hilman Harisuddin, Imam Subadi, Nuniek Nugraheni Sulistiawati, Andriati, Soenarnatalina Melaniani

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Integrated antenatal care services with breastfeeding counseling practices to improve pregnant women's knowledge, skills and breastfeeding

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4143/2675>)

Sudarmi, Baiq Iin Rumintang, Ni Putu Dian Ayu Anggreni, Siti halimatussyaadiah

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The potential role of MMP-9 and VEGF-C as predictors of lymph node involvement in papillary thyroid carcinoma

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3805>)

Sonar Soni Panigoro, Muhammad, Diani Kartini, Bob Andinata, Boy Subirosa Sabarguna, Agnes Stephanie Harahap

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Correlation between platelet distribution width and mean platelet volume with the stage of hepatocellular carcinoma based on Barcelona Clinic Liver Cancer criteria

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3942/2442>)

Fauzi Yusuf, Desi Maghfirah, Azzaki Abubakar, Teuku Irfan, Meutia Rizki Innayah

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High ratio of neutrophils to lymphocytes and high triglyceride levels in serum as risk factors for pre-eclampsia

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4407>)

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The validity and reliability of various footprint analysis in flatfoot diagnosis of competitive athletes

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4407>)



Anak Agung Ngurah Jaya Kusuma,
Endang Sri Widiyanti, Anak Agung Gde
Marvy Khrisna Pranamartha, Adytia
Theopani Bineredo Damanik

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I Putu Juniarta, Damayanti Tinduh,
Nuniek Nugraheni, I Putu Alit Pawana,
Rosy Setiawati, Soenarnatalina
Melaniani

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**Plasma marker ACTH, cortisol, and
beta-endorphins profile on
pregnant women as targeted
marker of approach for antenatal
depression**

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

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**Jatropha multifida L stem sap gel
versus Aloe vera gel to post-
gingivectomy healing process**

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3694>)

Khusnul Munika Listari, Tsarwah Az-
Zahra, Amalia Hasanah, Yessy Agistasari

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**Overview of prolactin levels in
patients with schizophrenia
during antipsychotic therapy at
HB. Saanin Mental Hospital
Padang, Indonesia**

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4071>)

Dita Hasni, Bayu Eka Surya, Mutiara
Anissa, Debie Anggraini

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**Postoperative supplementation
effect of zinc and vitamin C in
primary colonic anastomosis on
peritonitis condition: A study on
New Zealand rabbit**

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Luh Putu Neolita Pradnya Wineni, Adria
Hariastawa, Ariandi Setiawan

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**The compliance of Pasar Raya
Padang merchants in
implementing health protocol**

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Sri Siswati, Vebi Adiva, Ahmad Hidayat

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**Brain-derived neurotrophic factor
(BDNF) and the capute scales in
offspring of mothers with normal
childbirth**

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Julian Dewantiningrum, Fitri Hartanto,
Maria Mexitalia, Ariawan Soejoenes,
Annastasia Ediaty, Suharyo Hadisaputro,
Dwi Pudjonarko

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The effect of low-intensity intradialytic aerobic exercise on heart rate variability in maintenance hemodialysis patients

(https://www.balimedicaljournal.org/index.php/bmj/article/view/3957/2498)

Dilia Ratna Dewi, Damayanti Tinduh, Andriati, Mochammad Thaha, Mohammad Fathul Qorib, Soenarnatalina Melaniani

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Perception and readiness of medical students and teaching staff to implement interprofessional education

(https://www.balimedicaljournal.org/index.php/bmj/article/view/4031/2532)

I Gusti Ayu Sri Darmayani, Ida Bagus Amertha Putra Manuaba, Made Violin Weda Yani, I Gede Wikania Wira Wiguna, I Komang Wira Ananta Kusuma, I Gede Putu Supadmanaba

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The radiologic findings, positivity rate of culture method examinations, correlation with the type of lower respiratory Tuberculosis (TB) patients

(https://www.balimedicaljournal.org/index.php/bmj/article/view/4090/2676)

Dewi Yana, Ni Made Mertaniasih, Eko Budi Koendhori, Rosy Setiawati

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Administration of mesenchymal stem cell derivate secretome causes lower levels of Matrix Metalloproteinase-13, Aggrecanase-2, and Interleukin-1 β than hyaluronic acid in rabbit knee osteoarthritis

(https://www.balimedicaljournal.org/index.php/bmj/article/view/4169/2618)

Cokorda Gde Oka Dharmayuda, I Ketut Siki Kawayana, I Made Bakta, I Nyoman Mantik Astawa, Putu Astawa, Ida Bagus Putra Manuaba, I Ketut Suyasa, Anak Agung Ngurah Subawa, Heri Suroto, Luh Putu Lin Indrayani Maker

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Understanding of home care and interest level of nursing students

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Relations between the incidence of endometriosis and type 1



working as home care nurses

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Nur Chayati, Riska Adellia

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epithelial ovarian cancer at M

Djember, article view/3777

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Syamel Muhammad, Ghina

Muthmainnah

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Diabetic ulcers prevention in the elderly for improving blood circulation of lower extremities with combination foot exercise therapy and electrophysical therapy

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4099>)

Agnes Dewi Astuti, Nang Randu Utama, Bernadetta Germia Aridamayanti

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Placental apoptotic index on COVID-19 and non-COVID-19 cases: a cross sectional study

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4200/2625>)

Almira Aulia Shahnaz, Manggala Pasca Wardhana, Ernawati, Grace Ariani, Budi Utomo

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Mayo Endoscopic Score (MES) as a reference for the histological active disease of ulcerative colitis

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Agung Ary Wibowo, Hendy Buana Vijaya, Didik Dwi Sanyoto, Hendra Sutapa, Husna Dharma Putera, Kenanga Marwan Sikumbang

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Vitamin D and cathelicidin assessment in children with pneumonia

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Fatimah Arief, Retno Asih Setyoningrum, Roedi Irawan, Dominicus Husada, I Ketut Alit Utamayasa, Hartono Kahar

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The effectiveness of roll-on aromatherapy of calamansi orange peel essential oil (Citrofortunella microcarpa) on reducing anxiety and pain in labor

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4047>)

Yetti Purnama, Kurnia Dewiani, Suci Rahmawati, Linda Yusanti, Linda Yulyani

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Which are the best in protecting the upper respiratory tract, KN95® or Acchadana®-herbal masks on IL-6 perspective?

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4200/2625>)

Resti Ariani, Awal Prasetyo, Rina Puspita, Fathur Nur Kholis, Udadi Sadhana, Ika Pawitra M, Hermawan Istiadi

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Spiritual care on quality of life patients exposed to COVID-19 in the city area of Semarang

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3779>)

Tri Hartiti, Arief Yanto

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Validity and reliability of the Indonesian version of QOLIE-10

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3923/2552>)

Diah Kurnia Mirawati, Subandi, Lestari Handayani, Pepi Budianto, Hanindia Riani Prabaningtyas, Stefanus Erdana Putra, Muhammad Hafizhan, Astrida Fesky Febrianty, Fauzi Novia Isaening Tyas

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Validity test of pre-screening developmental questionnaire (PDQ) and mother and child health (MCH) handbook for determining children's readiness to enter elementary school

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3987>)

Nurani Widiandi, Ahmad Suryawan, Mira Irmawati

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Efficacy of tadalafil and l-arginine combination therapy compared with tadalafil-only for the treatment of erectile dysfunction: A systematic review and meta-analysis

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4059/2483>)

Donny Austine Wibisono, Furqan Hidayatullah, Fikri Rizaldi, Tarmono Djojodimedjo

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Association of appetite hormone levels with HbA1c in obese type-2 diabetes mellitus patients

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4134/2626>)

Edward Kurnia Setiawan Limijadi, Nyoman Suci Widyastiti, Meita Hendrianingtyas, Banundari Rachmawati

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Effects of Tourniquet Inflation on Blood Pressure, Mean Arterial Pressure, and Pulse Rate during the Maintenance of Anesthesia Using a Combination of Dexmedetomidine and Isoflurane for Patients Undergoing Lower Extremity Surgery

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4244/2650>)

Bayu Wijanarko, Christrijogo Sumartono, Belindo Wirabuana, Hardiono, Bambang Pujo Semedi, Prananda Surya Airlangga

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Triple-layered composite mesh for managing anterior abdomen wall defects in ventral hernia

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Riana Pauline Tamba, Candy, Ahmad Yani, Rizky Amaliah

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The relationship of biofilm Staphylococcus aureus with degree of severity and infection in patients with paronychia

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4069>)

Teuku Husni T.R, Karina Witary Ayu Siagian, Benny Kurnia

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Association between polymorphism loci rs7041, rs4588 in vitamin D-binding protein receptor gene with comorbid with mortality sepsis patients in intensive care unit General Hospital M. Djamil Padang, West Sumatra

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4148>)

Liliriawati Ananta Kahar, Yusrawati, Jamsari, Tinni Maskoen, Delmi Sulastri, Yusticia Katar, Raveinal, Fika Tri Anggraini, Kornelis Aribowo, Wiwi Monika Sari

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REVIEW

Evidence of Dioxin as Endocrine Disrupting Chemicals in the Development of Endometriosis: A Narrative Review

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3816>)

Shafira Meidyana

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REVIEW

Inflammatory markers for predicting severity, mortality, and need for intensive care treatments of a patient infected with covid-19: a scoping review

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3751>)

Satriya Pranata, Aric Vranada, Yunie Armiyati, Amin Samiasih, Siti Aisah, Anna Kurnia, Priyo Sasmito, Yanuan Ben Olina, Antonius Rino Chapo

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REVIEW

Low dose mannitol versus high dose mannitol to achieve brain relaxation in brain tumor surgery: a meta-analysis

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/4102>)

Gunna Hutomo Putra, Irwan Barlian Immadoel Haq, Rahadian Indarto Susilo, Joni Wahyuhadi

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REVIEW

Healthy food for pregnant mother and child

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3958>)

Gde Ngurah Indraguna Pinatih

REVIEW

Mesona palustris BL: the potential as a natural anti-inflammatory agent

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3958>)



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Rahmah, Harsono Salimo, Brian Wasita,
Eti Poncorini Pamungkasari, Risyia
Cilmiaty, Soetrisno

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(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3770/2567>)

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Achievement of Decision-to-Delivery Interval in Emergency Caesarean Section Category 1 During the Covid-19 Pandemic: a Scoping Review

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3976>)

Dimas Mardiawan, Shinta Prawitasari

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REVIEW

Revealing the artemisinin and piperazine treatment failure: a systematic review

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3976>)

Farindira Vosti Rahmasari, Malika
Imwong, Irfanul Chakim, Winny

Setyonugroho, Tri Wulandari
Kesetyaningsih, Agus Gunadi, Desto
Arisandi

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REVIEW

Curcumin, a potential oral herbal male contraceptive: a review article

(<https://www.balimedicaljournal.org/index.php/bmj/article/view/3937>)

Hilwah Nora, Rajuddin, Hafizudin,
Rachmad Suhandha, Ima Indirayani

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Effects of *Lactobacillus plantarum* IS-10506 on gastric protective mucosal factors: an ibuprofen-induced gastric mucosal injury



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ABSTRACT

Background: Gastric mucosal protective factor plays an important roles in gastric homeostasis between mucosal injury and mucosal repair. Previous study implicated probiotics in the repair of the intestinal mucosa, while probiotic role in gastric mucosa remains poorly understood. This study aims to determine the role of probiotic *L. plantarum* IS-10506 in gastric protective mucosal factors by examining the expression of cyclooxygenase-1 (COX-1), COX-2, prostaglandin E2 (PGE2), and gastric mucus production (Mucin 5AC/ MUC5AC) by surface mucous cells as gastric mucosal protective factors.

Methods: Twenty-seven male Wistar rats (*Rattus norvegicus*) were divided into 3 groups, ie. control, curative and preventive group. Ibuprofen 300mg/kgBW were given to all groups to induce gastric injury, while *Lactobacillus plantarum* IS-10506 1x10⁹ CFU/day were given into the curative (5 days) and preventive (12 days) groups. Antrum tissue with primary monoclonal antibodies against COX-1, COX-2, PGE2, and MUC5AC were examined in the day -1, -3, and -5 after necropsy.

Results: Number of cells expressed COX-1, COX-2, PGE2 and MUC5AC in curative and preventive groups were significantly higher than control group. *L. plantarum* IS-10506 showed its efficacy in gastric mucosal repair on third day in the curative group and on first day in the preventive group. *L. plantarum* IS-10506 probiotic plays a role in gastric protective mucosal factors by promoting cell expression of COX-1, PGE2, and MUC5AC. In addition, it has been determined that *L. plantarum* IS-10506 inhibits COX-2 expression, that may lead to minimize the inflammatory conditions and a deterioration of the gastric mucosal environment.

Conclusion: *Lactobacillus plantarum* IS-10506 can prevent ibuprofen-induced antral mucosal damage through gastric protective mucosal factors.

Keywords: *Lactobacillus plantarum* IS-10506, gastric, COX-1, COX-2, PGE2, MUC5AC.

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INTRODUCTION

Gastric mucosal integrity plays an important role to keep gastric homeostatic. Mucosal injury, mucosal healing, and various mucosal protective factors are in an equilibrium position under physiological condition.^{1,2} The main gastric mucosal protective factor is the presence of mucus-buffers-phospholipid layer (Mucin 5AC/ MUC5AC) as pre-epithelial barrier which is enhanced by prostaglandins and continuously renewed layer of surface epithelial cells as the second line of mucosal defense.² Prostaglandins are produced from arachidonic acid metabolism through the cyclooxygenase (COX) enzymes. In

gaster, prostaglandin E2 (PGE2) play an important role to maintain mucosal integrity by upregulating mucosal blood flow and stimulating mucus production that cover gastric epithelial layer against noxious substances.¹⁻³ Ibuprofen is one of non-selective non-steroidal anti-inflammatory drug (NSAID) that well known as common cause of gastric mucosal damage.⁴⁻⁶ NSAID plays an important role as exogenous aggressive factor in gastric mucosal injury by inhibiting prostaglandin synthesis, thereby reducing mucus production, bicarbonate secretion, and mucosal blood flow.²

Probiotics are defined as microorganisms that provide therapeutic benefits to the host when given

appropriately.⁷ Previous research has implicated probiotics in the repair of the gastrointestinal mucosa.⁴ This study chooses *Lactobacillus plantarum* IS-10506 as it has very stable viability in phosphate buffer solution (pH7) in 48 hours compared to *L. acidophilus* and *L. rhamnosus* GG.⁸ Previous study on *L. plantarum* IS-10506 has also shown the regeneration capabilities in the intestinal brush border⁹ and ileum surface structure¹⁰ and activate the intestinal stem cell in a rodent model.¹¹ While these finding suggest *L. plantarum* IS-10506 provide therapeutic benefit in intestinal mucosa, it's role in gastric mucosa remains poorly understood. This study aims to determine the role of *L. plantarum* IS-10506 in ibuprofen-induced

gastric mucosal injury by examining the cell expression of COX-1, COX-2, PGE2, and MUC5AC as mucosal protective factors.

MATERIALS AND METHODS

Samples and study design

A randomized controlled trial study used male rats *Rattus norvegicus* Wistar strain, aged 12 weeks and each weighing between 200-250 grams from The Integrated Research and Testing Laboratory, Universitas Gadjah Mada. Twenty-seven rats were divided into 3 treatment groups, i) control, ii) curative and iii) preventive group and each group consists of 9 rats. Ethical clearance of this study was approved by the Ethical Committee of Faculty of Veterinary Medicine, Universitas Airlangga (No. 2.KE.022.03.2021).

Ibuprofen

Ibuprofen were given at dose 300 mg/kgBW, diluted with 1 ml aquadest in a 1:1 ratio to induce gastric mucosal injury. On day-0, ibuprofen will be administered to all groups through an oral gavage. For control group, distilled water was given for 5 days after being given ibuprofen (day 1 – 5).

Probiotic

Microencapsulated *Lactobacillus plantarum* IS-10506 (GeneBank accession n° DQ860148) powder in 1% skimmed media given by oral gavage at a dose of 1×10^9 CFU/day. This probiotic will be dissolved in 1.5 ml of sterile water once daily. For the curative group, probiotics will be given for 5 days after being given ibuprofen (day 1 – 5). While for preventive group, probiotic given for total 12 days from 6 days before until 5 days after being given ibuprofen (day [-6] – 5).

Antrum tissue collection

All rats from all groups were surgically dissected under ether anesthesia and sacrificed on day-1, -3 and -5 after ibuprofen administered. The antrum tissue sections were excised and cleaned then fixed with a 10% formalin buffer solution for histopathology preparations. Paraffin blocks is carried out at the PathologyAnatomy Laboratory, Faculty of

Medicine, Universitas Airlangga.

Immunohistochemistry

Paraffin blocks containing antrum gastric tissue were sliced in 4 μ m, deparafinized and followed by dehydration, clearing and embedding. Obtained antrum tissues were probed with primary monoclonal antibodies against COX-1 (SC-19998, Santa Cruz Biotechnology, California, USA), COX-2 (SC-19999, Santa Cruz Biotechnology, California, USA), PGE2 (SC-514224, Santa Cruz Biotechnology, California, USA) and MUC5AC (45M1, Thermo Fisher Scientific, Massachusetts, USA). Immunopositive cells were counted by the average number of cells expressing antibody from 20 random fields at 1000 \times magnification. Histological samples were observed and counted by one independent examiner under a light microscope (CX21; Olympus, Tokyo, Japan) and photographed using a Nikon E100 microscope (Nikon Instruments Inc., Tokyo, Japan) in the Biomolecular Biochemistry Laboratory, Department of Biomolecular Biochemistry, Faculty of Medicine, Universitas Brawijaya.

Statistical Analysis

Data were presented as mean \pm standard deviation (SD) by bar chart. Statistical analysis was done by using Kruskal Wallis and Mann-Whitney U test (as the data was not normally distributed) to find differences between groups treatment on each day (day-1, -3 and -5), with $p < 0.05$ considered statistically significant.

RESULTS

Cyclooxygenase (COXs)

Both probiotic groups (curative and preventive) had an upward trend in COX-1 expression from the 1st to 5th day. On the contrary, ibuprofen group showed the lowest COX-1 expression from the 1st to 5th day between all groups. The curative group showed significantly higher COX-1 expression compared to the ibuprofen group on the 3rd and 5th day, while the preventive group already showed the difference from the 1st day (Fig. 1A). Contrast result was found in COX-2 expression between groups. Probiotic groups show downward trend in COX-2 expression from the 1st to 5th

day. Meanwhile ibuprofen group show highest and upward trend in COX-2 expression. On the 3rd and 5th day, COX-2 expression was significantly lower in the curative and preventive groups compared to the ibuprofen group (Fig. 2A). The immunohistochemical examination of COX-1 and COX-2 cell expression was figured in Fig. 1B and 2B. The COX-1/COX-2 ratio is determined to summarize the role of probiotics in cyclooxygenase expression. Both probiotic groups showed upward trend in COX-1/COX-2 ratio expression from the 1st to 5th day. On the 3rd and 5th day, the expression of the COX-1/COX-2 ratio was significantly higher in the curative group than in the ibuprofen group. The preventive group showed significantly higher COX-1/COX-2 ratio expression than the ibuprofen group on the 1st, 3rd and 5th day (Fig. 3). These findings suggest that the protective mechanisms through COXs may have began earlier in the preventive group than in the curative group.

Prostaglandin E2 (PGE2)

Ibuprofen caused a decreased expression of PGE2 from the 1st to 5th day while probiotic groups shows an upward trend. Linear to the COX-1/COX-2 ratio, the curative group showed significantly higher PGE2 expression than the ibuprofen group on the 3rd and 5th day. Meanwhile, the preventive group showed significantly higher PGE2 expression compared to the ibuprofen group from the 1st to 5th day (Fig. 4A). The immunohistochemical examination of PGE2 cell expression was figured in Fig. 4B.

Mucin 5AC (MUC5AC)

Probiotics groups show an upward trend of MUC5AC expression while ibuprofen shows a downtrend. Relevant to the COXs ratio and PGE2 result, the curative group showed significantly higher MUC5AC expression than the ibuprofen group on the 3rd and 5th day. PGE2 expression was significantly higher in the preventive group than in the ibuprofen group on the 1st, 3rd and 5th day (Fig. 5A). The immunohistochemical examination of MUC5AC cell expression was figured in Fig. 5B.

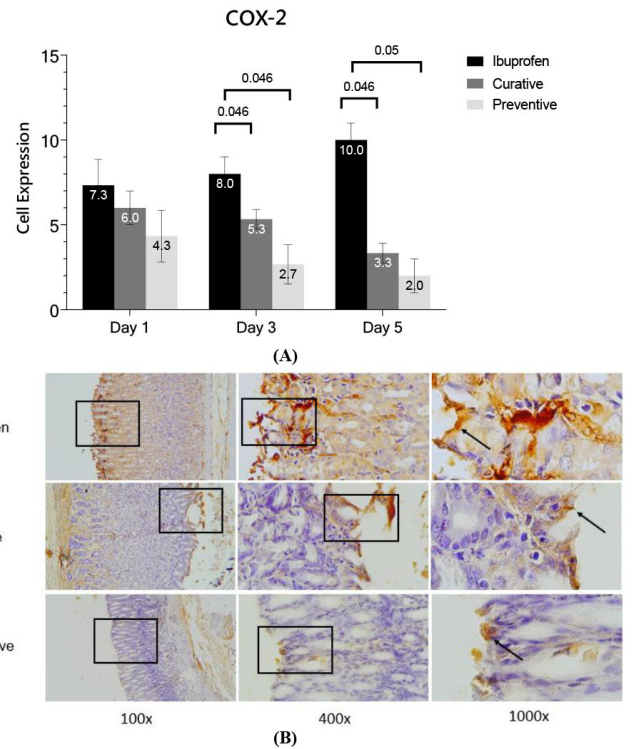
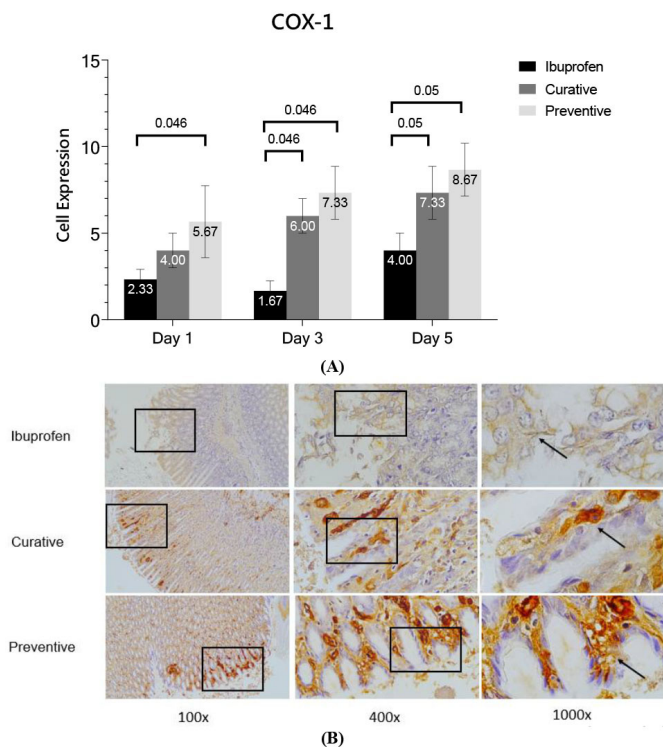


Figure 1. A. Effect of ibuprofen and probiotic on COX-1; mean \pm standard deviation (SD) B. Immunohistochemical examination of COX-1 cell expression with 100x, 400x, and 1000x magnification. Brown colored tissue (marked by arrow) shows cell parts that express COX-1 in ibuprofen, curative and preventive groups.

Figure 2. A. Effect of ibuprofen and probiotic on COX-2; mean \pm standard deviation (SD) B. Immunohistochemical examination of COX-2 cell expression with 100x, 400x, and 1000x magnification. Brown colored tissue (marked by arrow) shows cell parts that express COX-2 in ibuprofen, curative and preventive groups.

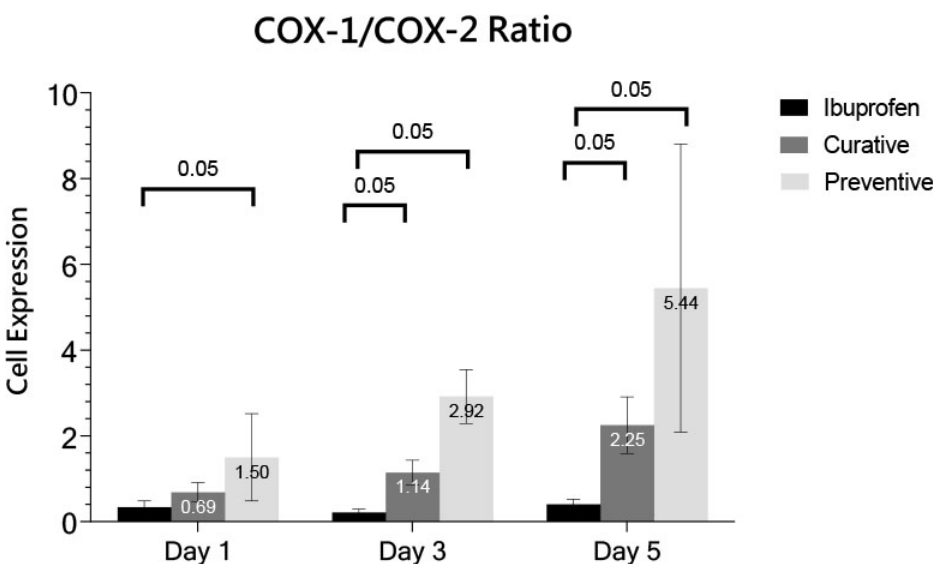


Figure 3. Effect of ibuprofen and probiotic on COX-1/COX-2 ratio expression; mean \pm standard deviation (SD).

DISCUSSION

Our study found that probiotic administration increases the expression of COX-1 and PGE2 compared to the control

group. Increased PGE-2 expression of gastric mucosa in curative and preventive is linear with increased COX-1 expression in each group, showing that in this condition

most of the PGE-2 synthesized by COX-1 as a protective factor of gastric mucous. There have been many studies on the effect of probiotics on the production of PGE2, which plays a role in the healing process of gastric injury, however knowledge of the effects of *L. plantarum* on PGE2 as a single agent is still limited. A previous study has shown that *L. rhamnosus* and *E. coli* have a therapeutic effect on gastric injury by increasing PGE2 secretion.⁴

This study also determined that probiotics decrease COX-2, that can lead to anti-inflammatory effect. Prior study by Han et al. show similar result that *L. plantarum* was linked to significant decrease in expression of COX-2 compared to lipopolysaccharide control. *L. plantarum* also show higher decrease in COX-2 expression compared to *L. rhamnosus* although failed to show statistically significant.¹² Our study also support a previous study by J. M. Otte et al. that found reduction in intestinal COX-2 expression with VSL3 probiotic which

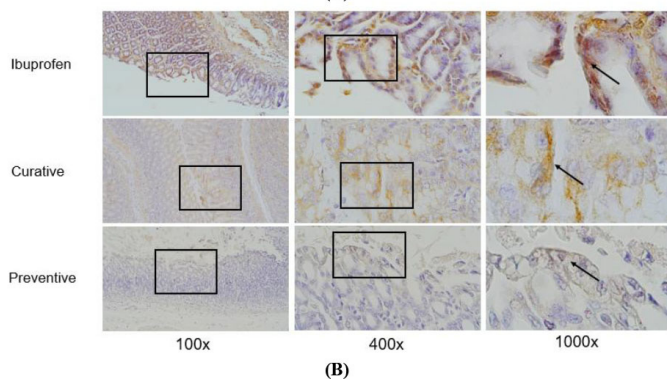
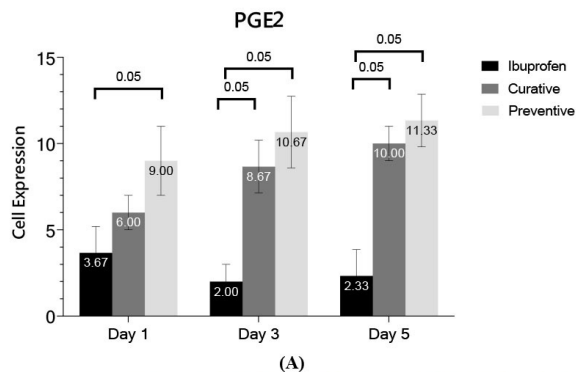


Figure 4. A. Effect of ibuprofen and probiotic on PGE2 expression; mean \pm standard deviation (SD) B. Immunohistochemical examination of PGE2 cell expression with 100x, 400x, and 1000x magnification. Brown colored tissue (marked by arrow) shows cell parts that express PGE2 in ibuprofen, curative and preventive groups.

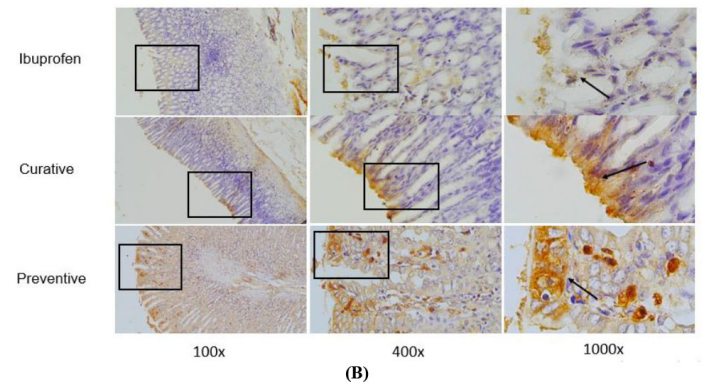
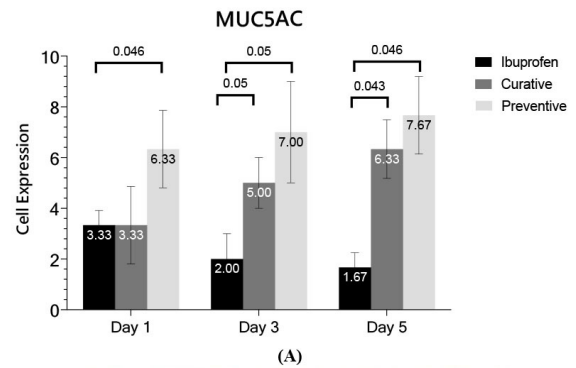


Figure 5. A. Effect of ibuprofen and probiotic on MUC5AC expression; mean \pm standard deviation (SD) B. Immunohistochemical examination of MUC5AC cell expression with 100x, 400x, and 1000x magnification. Brown colored tissue (marked by arrow) shows cell parts that express MUC5AC in ibuprofen, curative and preventive groups.

contains eight different microorganism strains, including *L. plantarum*. This study also found that VSL3 reduces inflammatory agent (gastrin and TNF- α).¹³ *Bifidobacterium lactis* share more specific result by increasing COX-1 expression while simultaneously decreasing COX-2 expression.¹⁴

Gastric mucous plays a protective role by sheltering the gastric epithelial cells from acid and noxious agents.⁴ This study show that probiotic treatment has significant role in MUC5AC expression increase. This finding support previous study that found MUC5AC expression was slightly elevated in VSL3-treated animals, although not statistically significant.¹⁵ In addition, we found linear result between COX-1/COX-2 ratio, PGE2 and MUC5AC expression, showing that COX-1-generated PGE2 plays part in MUC5AC secretion. This finding could provide additional insight into previous research indicating that

MUC5AC is primarily activated by the COX-2/PGE2 pathway.¹⁵⁻¹⁷

The interesting finding in this study is that there are significant differences in COX-1, COX-2, PGE-2, and MUC5AC expression between the ibuprofen vs curative group in the 3rd and 5th day and ibuprofen vs preventive group on the 1st, 3rd and 5th day. These results indicating that curative probiotic treatment started showing its efficacy from the 3rd day while preventive treatment provide earlier onset of efficacy on the 1st day of the study. Khoder et al summarize probiotics' prophylactic and therapeutic effects in gastric ulcers. Probiotics protect the integrity of the gastric mucosal barrier by upregulating prostaglandin E2, mucous secretion, and downregulating apoptosis. Probiotics could also accelerate healing in gastric ulcers by increasing the generation of prostaglandin E2. Pre-treatment with probiotics upregulates MUC5AC gene

expression thus increasing gastric mucus production by surface mucous cells.⁴

The limitation of this study is that we did not measure the level of COX and other markers produced but by the cells expression using immunohistochemistry methods. As a result, additional studies that include the assessment of marker levels might be necessary to support our findings.

CONCLUSION

The findings of our study show that *L. plantarum* IS-10506 plays a role in gastric mucosal protective factors by increasing cell expression of COX1, PGE2, and MUC5AC. In addition, it has been determined that *L. plantarum* IS-10506 inhibits COX2 expression, that may lead to minimize the inflammatory conditions and a deterioration of the gastric mucosal environment.

DISCLOSURE

Conflict Of Interest

All authors declare no conflicts of interest.

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Author Contribution

Conception: AD, IS, SMS; design: AD, AFA, RR, IS, SMS; Literature search: AD, KRS, AFA, RR, IS, SMS; Analysis and interpretation of the data: AD, WR, KRS, MFQ; Manuscript preparation: AD, WR, KRS, AFA; Manuscript editing: AD, KRS, AFA, RR, MFQ; Manuscript review: all authors.

ETHICAL CLEARANCE

Ethical clearance of this study was approved by the Ethical Committee of Faculty of Veterinary Medicine, Universitas Airlangga (No. 2.KE.022.03.2021).

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