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Stunting incidents in children in the working area of Puskesmas Moncongloe，Maros Regency
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## G $\sigma^{2} \mathrm{PD}$

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国 698－708
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Review of the implementation of malaria elimination program in East Indonesia
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Improving cadre knowledge in stunting prevention through android－based application
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間 768－781
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A randamized prospective study
Po Mohamed Magdy，Naglaa A．Elnegeery，Ghada A．El Rahamawy，Mohamed A．Elgamal，Salwa M．S Hayes
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## Nutritional as a risk factors in child patients with leprosy

$0_{0}^{00}$ Dhea Medisika Hertanti，M．Yulianto Listiawan，Sawitri，Rahmadewi，Astindari，Dwi Murtiastutik，Cita Rosita Sigit Prakoeswa目 794－802
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## R PDF

N－Acetyl Cysteine in combination with vancomycin or linezolid for biofilm eradication of methicillin－resistant Staphylococcus aureus （MRSA）
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Vancomycin for methicillin－resistant staphylococcus aureus biofilm eradication is associated with the emergence of heterogeneous vancomycin intermediate staphylococcus aureus
Erizka Rivani，Muhammad Vitanata Arfijanto，Agung Dwi Wahyu Widodo
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M．Setyo Nugroho
国 832－844
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Optimization of sharia bank products for micro，small and medium enterprises（MSMEs）in Indonesia during COVID－19
Gatot Suhirman
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Risk factors of platelet refractoriness after thrombocyte concentrate transfusion in pediatric acute leukemia
Mellisa Kristanti Hosea，Mia Ratwita Andarsini，I Dewa Gede Ugrasena，Adwina Nurlita Kusuma Wardhani，Andi Cahyadi，Maria Christina Shanty Larasati
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Case report
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Endoscopic medial maxillectomy for antrochoanal polyp
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Case study on employee individual taxpayers at The Sukabumi Pratama Tax Service Office
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The lipid profile in children with type 1 diabetes mellitus
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Endoscopic closure of tympanic membrane perforations by platelet－richplasma laden cartilage with perichondrium
Amr Hamdino Youssef，Mahmoud Hamdy Alboghdady，Mohamed Salah，Ahmed Hassan Mohamed
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## Diabetic ketoacidosis in pregnancy

A case report
$0^{\circ}$ Ario Danianto，Agus Sulistyono，Hermanto Tri Joewono
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Prevalence and risk factors of latent tuberculosis infection in adolescent in Islamic boarding schools
Rizaldo Bagoes Dinatha，Retno Asih Setyoningrum
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Molecular study among burn patients infected with bacterial pseudomonas species
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## $\triangle \mathrm{PDF}$

The negative effect of COVID－19 pandemic on the different undergraduate student during 2020－2021
＊oi Mohammed Al－Mousaw，Mohsin Abdulhussein Hasan，Hujran Abed Al－Raheem Abed，Hasan Ayad Kareem，Fahad Najd Obaid且 1028－1032
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Role of organic nutrient（Tecnokel）and application methods on some productive traits of two cauliflower hybrids（Brassica Oleracea var． botrytis）
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Role of organic nutrient（Tecnokel）and application methods on some qualitative characteristics of two cauliflower hybrids（Brassica Oleracea var．botrytis）

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Effect of alcoholic extracts of Eucalyptus spp on the growth of some species bacteria isolated from mouth and nose infections in Samarra city
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Assessment of vessels endothelial dysfunction by protease－activated receptors（PARs）signaling in COVID－19 patients
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Biological treatment of hydrocarbons contaminated soil by Serratia ficaria
Nahla Shadeed Ajeel，Ahmed Jasim Mohammed
国 1071－1083
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Nahla Shadeed Ajeel，Ahmed Jasim Mohammed
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Utilization of Egyptian mulberry fruits to improvement the physicochemical and nutritional properties of ice milk
Ghanem，S．M．，M．M．Salama，A．N．Zaghlool，M．M．Kadry，A．M．Hassanin，Muhammad I．Haggag
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# Head MRI imaging profile of meningioma according to WHO 2016 grading 

Abdul Latif Kurniawan，Anggraini Dwi Sensusiati
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Health seeking behaviour during COVID－19 pandemic among general population in urban areas of Chengalpattu District A cross sectional study

Oio Suganthi．S，Jasmine．M，Nigilesh Sundar．M
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Analgesia with bupivacaine under subarachnoid block in patients undergoing lower abdominal surgeries
\％ois S．Saurav Mohan，G．Narendren，D．Fantin Joel Calingarayar
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Spectrophotometric method for the determination of chlordiazepoxide，diazepam and alprazolam drugs by using oxidation coupling reaction
Esraa Muhammad Mohsen，Abdulbari Mahdi Mahood，Aula M．Al Hindawi
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Stability of dental implants placed in healed bony sites of hyperlipidemic patients
A case series
Maie Ismaiel Mohammed Fathy，Marwa Amr Al－Nawawy，Amr Fouad Zahran
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Virtual reality versus whole body vibration on quadriceps muscle strength in children with thigh burn
aion Mohamed Ali，Hazem Nour，Naglaa A Zaky，Manal Abdel Wahab
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A cross sectional study on cytomorphological diagnosis and clinical presentation of various thyroid diseases in Tribal areas of Odisha Eo̊ Shree Kumar Chinmayananda Mishra，Rabinarayan Rout，Debasis Debadatta Behera，Binod Kumar Sahu
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Minimum relevant features to obtain AI explainable system for predicting breast cancer in WDBC
Agarwal Rashi，Revanth Madamala
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Study of infiltration patterns of lymphomas in bone marrow trephine biopsy and immunohistochemical analysis in a tertiary care institute
Mustafa Ali，Anil Meena，Fatima Bhopalwala，Neha Banseria
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Physiological and psychological variables among elite female athletes from three categories of sports and non－athletes
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Sexual education intervention for the prevention of premarried sexual behavior in early adolescents A literature review

20\％Indra Fajarwati Ibnu，Chatarina Umbul Wahyuni，Shrimarti Rukmini Devy，Hari Basuki Notobroto
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Correlation between C－Reactive Protein（CRP）and lymphocyte levels in the acute phase with spirometry test in severe Coronavirus Disease 2019 （COVID－19）survivors after twelve weeks
Agustina Dwiningtyas，Ida Bagus Ngurah Rai，Ketut Suryana，I Gede Ketut Sajinadiyasa，Ida Ayu Jasminarti，Ni Wayan Candrawati，Eka Arisanti
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Effects of moderate intensity treadmill exercise with gradual increase in speed and inclination on serum C－reactive protein in male with type 2 diabetes mellitus
Pimas Bagus Respati，Damayanti Tinduh，Indrayuni Lukitra Wardhani，Sony Wibisono Mudjanarko
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## Implementation of education to batik workers about contact dermatitis in Tanjung Bumi，Bangkalan，Madura，Indonesia

Cita Rosita Sigit Prakoeswa，Damayanti，Sylvia Anggraeni，Menul Ayu Umborowati，Sri Awalia Febriana，Katharina Oginawati，Ikeu Tanziha
탈 1383－1394
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## $\triangle \mathrm{PDF}$

## Effectiveness of selenium supplementation in children with autoimmune thyroiditis

A systematic review and meta－analysis
Pe Yuni Hisbiyah，Anang Endaryanto，Bagoes Setyoboedi，Nur Rochmah，Muhammad Faizi，Citrawati Dyah Kencono Wungu，Qurrota Ayuni Novia Putri
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A proposed model for amending tax controls in Iraq to achieve a better tax outcome
Ali Abbas Kareem Al－Khafaji，Ali Mutashar Muhammad Al－Zuhairy
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## Independent isolation of infectious waste management in the COVID－19 era

A case study in Java－Bali Indonesia
Endang Wahyuningsih，Sutaryono，Jaka Widada，Heru Subaris Kasjono
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## Changes in markers ferritin and c－reactive protein in patients with COVID－19 in Iraq

A case－control study
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To evaluate effect of three different reducing agents in recovery of bond strength to sodium hypochlorite treated dentin with composite resin
An in vitro study
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Comparative evaluation of shear bond strength of universal bonding agent and total－etch bonding agent on superficial and deep dentin An in vitro study

EO Damini Bhagwat，Ashwini Gaikwad，Varsha Pandit，Mrunal Shinde，Ruchira Bhamare，Sailee Kalyankar
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## Association of serum soluble endoglin with preeclampsia

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Role of interleukin－6 in diabetic foot ulcers patients in Thi－Qar Provence
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Differences in emotional mental disorders of junior high school students and college students during online learning
\％io Anisa Yulvi Azni，Budi Anna Keliat，Nethania Citra Susanti
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：ortha Budi Susila Duarsa，Aris Widiyanto，Hendra Dwi Kurniawan，Ayu Anulus，Trisakti Halimah，Joko Tri Atmojo
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## Correlation study between triathlon development and participation

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Relationship between hypertension and pulsatility index in acute ischemic stroke patients
Yurima Indriyani，Yahya，Sita Setyowatie，Achmad Firdaus Sani
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To evaluate clinical spectrum of megaloblastic anemia in a tertiary care hospital central India
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Pulmonary function in patient with ulcerative colitis
A cross－sectional study from North India
$0^{\circ}$ Sunita Grover，Pratibha Maan，Shankar Lal Jat
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Mustafa Thabit Oudh，Yarob Abd Baqi Daiykh
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The effect of training with rubber ropes isometric training on some bio－financial variables and achievement for the 100－meter sprint for men

Nawfal Abdul－Hussein Kamel，Qusay Muhammad Ali
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## R PDF

Novel biochemical study of the impact of trace elements（zinc \＆magnesium）in polycystic ovary syndrome（PCOS）
Amina W．Yousif，Zena A．Al－Jawadi
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Expert opinion on the implementation of e－government efforts to improve village apparatus performance in Indonesia
Opportunities and challenges
Po Yeti Rohayati，B．M．A．S．Anaconda Bangkara，Jufri Jacob，Shinta Dzauharoh，Ade Iskandar
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## Comparison of different sinus augmentation techniques for implant placements

An original research
Haripal Singh，Vini Kaila，G．Jeevan Kumar，Mohammed Ibrahim，Damarasingu Rajesh，Atul Aggarwal
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## Knowledge about different rehabilitation options in geriatric population

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Bala Bhargav Parvatham，Jiby Babu，Rajkiran Salunkhe，Kishan K Choithani，Damarasingu Rajesh，Sandeep Kumar国 1683－1689
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## P PDF

Choice of treatment options for Class II Div II cases in young adults by orthodontists
An original research
Sadef Naqvi，Lakshmi Senkumar，Madhanraj Selvaraj，Mridu Sethi，Bhranti Shah，Damarasingu Rajesh
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Self－Medication practices with analgesics among medical students
Naveen Choudary Gorantla，Lalitha Hanumanthu，Penupothu Sree Nagamani，Rajesh Kumar Manchi
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Assessment of malondialdehyde level in broiler chickens suffering from chronic heat stress and fed on a diet supplemented with bioactive substances

Kadham Hasan Abass，Wisam Raheem Atiyah，Mohammed Abdulabbas Mlaghee
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Mass Drug Administration（MDA）in elimination of lymphatic filariasis：Assessment in Part of Eastern India
An original research
Ei．Anil Kumar Agrawal，Tushar Kanti Meher，Pradip Kumar Bhue，Gurukrushna Mohapatra，Manasee Panda
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Correlation of depression，anxiety and stress level on dry eye disease severity
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## Young patients with unilateral breast cancer arising in fibroadenoma

A rare case report
Ketut Suparna，I Gede Hendra Wijaya
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Purple sweet extract activates autophagy through enhanced mTOR expression in D－galactose－induced dementia rats
Ketut Widyastuti，Anak Agung Ayu Putri Laksmidewi，I Made Oka Adnyana
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Diagnostic Value of Volumetric Histogram－Based Diffusion Analysis in the Differentiation between Benign \＆Malignant Gynecologic Lesions
Sieza Samir Abd Allah，El said Mohamed Abd El Hady，Ghada Mohamed Gab Allah，Asmaa Hafez Mahmoud，Ahmed Mohamed Tawfik
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Forms of change and institutions that affect changes in village regulation policies to become traditional villages in Siak Regency，Riau Province

Data Wardana，Utang Swaryo，Dede Srikartini，Neneng Yaniyuningsih
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Combination of standard physical therapy with partial body weight supported treadmill training in children with spastic diplegic cerebral palsy
Pos Prastiya Indra Gunawan，Lusiana，Riza Noviandi，Sunny Mariana Samosir
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Synthesis，characterization，and some pharmacological evaluation of 5－Thiocyanatouracil compound
\％og Hussein Falih Neamah，Nadheerah F．Neamah，Shaker A．N．Al－Jadaan
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## Role of RASSF1－A gene in early detection of colorectal carcinogenesis

Thaer Ali Hussein，Ahmad Shandookh Hameed，Mohamed Hussein Amer
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Occupational contact dermatitis among healthcare workers in the COVID－19 Isolation ward
Pio Cita Rosita Sigit Prakoeswa，Damayanti，Sylvia Anggraeni，Menul Ayu Umborowati，Sawitri，Astindari，Andre Yuindartanto
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Analysis of the ZNT8，GAD65，HLA－DQA1，HLA－DQB1，and C－peptides in Indonesian children with type 1 diabetes mellitus
\％ig Nur Rochmah，Muhammad Faizi，Yuni Hisbiyah，Rayi Kurnia Perwitasari，Tyas Maslakhatien Nuzula，Anang Endaryanto，Soetjipto Soetjipto
탑 1927－1936
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\％ois Fouad M．Hussein，Ali S．Ismail
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## Study of spectroscopic analysis performed of laser produced Sn and $\mathrm{Sn}: \mathrm{Cr}$ plasma <br> eio Raghad T．Ahmed，Ala F．Ahmed，Kadhim A．Aadim <br> －－ㅜㅇ 1974－1982 <br> तí Abstract viewed： $\mathbf{3 5}$ witl PDF downloaded： 32 <br> （6）DOI：10．53730／ijhs．v6nS9．12839 <br> TPDF

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目 1983－1997
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国 1998－2011
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Bo Budheshwar Prasad Singhraul，Yashasvi Batwe
图 2012－2024
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## Genomics in oral cancer

A systematic review
Shrikanth Muralidharan，Swapna Patankar，Yashodhara Shah，Prashant Rao，Prasad Karande
国 2025－2037
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The impact of family－based nutrition education intervention program on eating habit among obese school age children in Rania city／Iraq
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A quasi－experimental
Renas Mohammed Khidhir，Hamdia Mirkhan Ahmed
턐 2083－2094
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Macronutrient intake pattern among type 2 diabetic adults visiting a tertiary care hospital of rural Vadodara
A cross sectional study
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Improving the quality of counseling services for students based on digital applications in line with the implementation of the Merdeka Curriculum
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턐 2100－2114
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Screening of catharanthus roseus stem extract for anti－ulcer potential in wistar rat
Suraj Mandal，Sweta Goel，Monika Saxena，Polly Gupta，Jyoti Kumari，Prashant Kumar，Mukesh Kumar，Rahul Kumar，Km．Shiva
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The glycemic control among type 1 diabetes children pre and during COVID－19 pandemic
A systematic review and meta－analysis
Wika Y．Deakandi，Farahdina Farahdina，Qurrota A．N．Putri，Tyas M．Nuzula，Katherine Fedora，Qorri Aina，Nur Rochmah，Muhammad Faizi
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Postoperative bone defects＇reconstruction in patients with focal form of chronic post－traumatic osteomyelitis
Aleksandr G．Sonis，Evgeniy A．Stolyarov，Jean Geringer，Denis G．Alekseev，Sergey V．Ladonin，Maria Yu．Sefedinova，Maria A． Bezrukova
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Effect of probiotic mouthwashes in comparison to chlorhexidine on periodontal health
Systematic review and meta－analysis
Yion Swetha Alahari，Ramasubbareddy Challa，Krishna Chaitanya，Lamea Afnan，Ankita Khandelwal，Sunnypriyatham Tirupathi国 2213－2228
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## $\triangle \mathrm{PDF}$

The impact of strategic foresight on achieving competitive advantage
A field study in a number of private colleges
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## Quality of life among CKD patients

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Using deep water culture as one of the important hydroponic systems for saving water，mineral fertilizers and improving the productivity of lettuce crop
Hamza，A，Abdelraouf，R．E．，Y．I．Helmy，S．M．M．El－Sawy
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Physiological studies on eggplant（Solanum melongena）grown under drought conditions
Sayed F．El－Sayed，Shahein M．M，Mohamed A．Abdrabbo，Asmaa S．Hafez
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Evaluation of biofilm formation and associated slime encoding determinants in Staphylococcus aureus isolated from clinically diseased pets
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## Association of PDE8B gene polymorphisms with thyroid disorders

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Salim Khan，Mohd Yunus，Imteyaz Ahmad，Anita Yadav，Ranjan Gupta
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Sustainability policies and strategies for Indonesian millennials and the role of environmental law experts
Tamaulina Br Sembiring，Irma Rachmawati Maruf，B．M．A．S．Anaconda Bangkara，Endang Fatmawati，Yuli Purbaningsih目 2381－2393
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## APDF

Inheritance，fusion，development thoughts of Confucianism，Buddhism，Taoism and Vietnam culture tradition in the educational ideas of the Ly－Tran period
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Efficacy and safety of specific immunotherapy with aeroallergens in the management of atopic dermatitis
A systematic review and meta－analysis
Sylvia Anggraeni，Damayanti，Menul Ayu Umborowati，Cintya Dipta Riswanto，Sholahuddin Rhatomy，Hari Basuki Notobroto，Anang Endaryanto，Isaak Effendy，Cita Rosita Sigit Prakoeswa
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A systematic review on serum retinol binding protein 4 （RBP4）and interrelated iron status in type 2 diabetes mellitus patients
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A case report
Ankita Gidwani，Tushar Tanwani，Gaurav Tripathi，Sudeepti Soni，Ankita Srivastava，Juhi Thadlani
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Comparison of the dynamic HIP screw to PFN（proximal femoral nail）for unstable peri trochanteric femur fracture
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Karim Obeis Mohammed，Abdullah Mohammed Alwan
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A paediatric English linguistics intervention on spoken language for English－speaking parents of deaf children having hearing problems Nawaf Al Anazi，Muhammad Khalid Mehmood Sajid，Khaled Aljarrah，Zafar Iqbal
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Khushbu Patil，Rohini Tayde，Sachin Rane，Mahesh Nemade，Rajesh Chaudhari，Avinash Bhosale，Vijay Sable，Lokesh Barde，Abhishek Meher
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TNF－$\alpha$ and IL－10 levels in hipoxic ischemic rat brain receiving stem cell
Prastiya Indra Gunawan，Riza Noviandi，Purwati Purwati
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The effect of patient＇s characteristics on CYP2C19 polymorphisms based on weight and gender groups of epileptic seizure patients taking divalproex sodium
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Frequency distribution of hepatitis $B$ virus（HBV）genotypes in Iraqi patients
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Cytokine profile associated with fungal infections in patients with otitis media
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## Assessment of the acceptable length of right internal jugular central venous catheters for Indian population

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## TPDF

Evaluation of the impact of successful percutaneous balloon mitral valvuloplasty on the left ventricular twist and untwist mechanics by the two dimensional speckle tracking imaging
Comparative study between Inoue and multi－track balloon mitral valvuloplasty techniques
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## Periodontitis and systemic diseases

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Predictive values of first trimester ultrasound screening for twin－to－twin transfusion syndrome and selective intrauterine growth restriction in monochorionic twin pregnancies
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Diagnostic \＆prognostic impact of $18 \mathrm{~F}-\mathrm{NaF}$ PET／CT versus $99 \mathrm{mTc}-\mathrm{MDP}$ bone scan in detection of bone metastases
Initial and follow up assessment
Salma AbdelAziz Badr，Hosna Moustafa，Walid Omar，Ibrahim Siddiq，Mai Amr Elahmadawy
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Selective approaches to synthesize a new series of fused 4－amino pyrimidine derivatives by using of 4－amino nicotino nitrile as an effective precursor
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Effect of empowerment program on parents＇self competence regarding care of their children with cochlear implantation
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Ayurvedic management of allergic conjunctivitis in 30 years old patient

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## Dentigerous cyst enucleation

## A conervative approach

Sanika Gokhale，Sanket Kunte，Krishna Patil，Rohan Shah，Laxmi Lakade，Shweta Chaudhary
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Estimation of radon－gas，uranium－ 238 concentrations in the surface soil samples and alpha risk index at many Northern Iraqi Refineries
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Multiple cranial palsy in pasein with cerebral cavernoma malformations on the brain stem
A rare case report
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## Antenatal screening for hemoglobinopathies with HPLC and their fetomaternal outcome

Bandita Priyadarsini，Kirtirekha Mohapatra，Madhushree Naik，Sasmita Behuria
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Nanocomposite based drug delivery for periodontal disease
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## Buccal drug delivery system

A review
Ramdas T．Dolas，Abhijeet D．Kulkarni，Vishal S．Gulecha，Amar G．Zalte，Swati G．Talele，Gayatri N．Bedarkar
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Harendra Singh Jadon，Jitendra Mourya，Sachin Singh Yadav
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Comparison of functional status，outcome of patient and complications in dynamic compression plating \＆interlocking nail in fixation of fracture shaft humerus

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## R PDF

Organization of administrative institutions and notions as a complete factor for the state

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% Petrit Nimani, Arsim Dragaj, Artan Maloku
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Pankaj Singh，Vivekanand
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Assessment of nutritional status and adequacy of fiber intake in a group of obese children and adolescents
Marwa Ahmed Sedkey，Hannah Mohamed Aboulghar，Hend Mehawed Abdel Latif Soliman，Radwa Marawan Abdel Halim，Shrouk Moataz Abdallah
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Assessment of impact of fluoride on mechanical properties of NiTi and Cu NiTi orthodontic archwires
Shailesh B Dongre，Varsha Merani，Waseem Khan，Suyog Shendage，Arun Mhaske
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A pediatric research
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Transurethral resection of the prostate（TURP）and laparoscopic inguinal hernioplasty as combined versus separate procedures in the Era of COVID 19
Hesham Abdelaziz Elmellgy，Emad Esmat，Mahmoud Rady，Khaled Elesialy，Tarek Elleithy，Mohamed Hussien Badawy国 3179－3190
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A prospective study of role of MRI evaluation in knee injuries in a tertiary care hospital
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Effect of respiratory muscle training on ventilatory function in women post mastectomy
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Effect of lower limb sensory training on postural stability in stroke patients
A randomized control trial
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## Audiometric studies in type 2 diabetes mellitus

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Clinicopathological study of head and neck swellings in patients attending ENT OPD
Navin Agrawal，Chhavi Agrawal，Vishal Hansrajani，Shivam Narang，Raksha Wadhwani，Harsh Dudhat，Tanmay Singhai，Rishi Mahor国 3233－3240
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## GPDF

Impact of maternal determinants in rural areas influencing birth weight of newborn
Ramyaa Rajendiran，Brethis C．S，Hemalathaa R，Ramamani，Amalnath．A，Dinesh Kumar
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The effect of a rehabilitation approach for the anterior rectus femoris tear injury and its impact on developing the range of motion of the hip joint for football players
Saif Saeed AI Sudani，Luay Kadhim Mohamad，Ali A Ahmed AL Iedan
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Comparative evaluation of gingival displacement produced by three different gingival retraction materials
An in－vivo study
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Hind Salih Muhammid，Alaa Jawad Hassan，Hussein Naji Abdulla
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Evaluation of class 1， 2 and 3 integrons among multidrug resistant isolates of acinetobacter baumannii
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Case study from Jordan
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Asma Abdulelah Abdulrahman，Maha Ammar Mustafa，Fouad Shaker Tahir
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Differences in the degree of awareness of graduate students in Jordanian universities of the importance of using internet of things（IoT） technology in the educational process
Shireen Mohammad Okleh Albanadreh，Mohd Habib Samkari
国 3410－3422
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Phytochemical investigation of some active constituents from $\mathbf{N}$－Butanol fraction of Tropaeolum majus L．cultivated in Iraq
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Predictors of congenital diaphragmatic hernia in newborns
A case control study
E0\％Ahmedov Y．M，Akhmedov I．Y，Fayzullayev F．，Mirmadiyev M
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## Predictors of postpartum hemorrhage in vaginal deliveries

Retrospective observational study
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Socket shield technique versus conventional immediate implant placement in thin buccofacial bone to evaluate buccal bone resorption
A randomized controlled trial
Abdullah Abdou Mattar，Mona Aly Shoaib，Hany El Nahass，Hakem El Sayed
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Attitude and beliefs about hypnosis among health care professionals
A cross sectional study
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The risk of low birth weight in pregnants with hypertension
A case－control study
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## Biliary peritonitis in cholelithiasis

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Arziyev Ismoil，Zafar Kurbaniyazov，Mannon Baratov
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Ardian Berisha，Valon Pukaj，Qemajl Sejdija
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d6 DOI ：10．53730／ijhs．v6nS9． 13364

Congenital goitre and respiratory distress as rare presenting features of congenital hypothyroidism in the newborns

## Khalid A．Makki

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d DOI：10．53730／ijhs．v6nS9．13365

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Polymeric nanoparticles loaded with Paclitaxel for improved cancer therapy
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国 3551－3565
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Isolated and combined effect of hydraulic and ladder training on TCL，LDL and HDL cholesterol among college women students
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Extraction，isolation and identification of bioactive compound from extract of Euphorbia thymifolia Linn
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国 3596－3602
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Detection of the ADAM proteins in the ejaculated bovine sperm
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A comparative assessment of the CO2 assimilation potentials of Simarouba glauca（D．C．）and Syzigium cumini（L．）skeels
Aparna Sreekumar，Sashna N．C，Harilal C．C．
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## $\triangle \operatorname{sDF}$

Hybrid ML and DL models for flood level prediction
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Tensile and flexural properties of ramie fiber and synthetic fiber reinforced with epoxy polymer composite Sachudhanandan．S，Rajashekar Patil，R Vara Prasad Kaviti，Bharath V G
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## Long－term wound complication management after surgery

Clinical study
Mansour Talip Mansour AI－Rifai，Saad Hussein Murad
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## 2－Metro domination number of slanting ladder graph

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On the k－metro domination number of cartesian product of $\mathbf{C} 3 \times \mathbf{C n}$
$\because$ G C Basavaraju，Praveen B M，Yogalashmi S，Vishukumar M
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Synthesis，characterization of some derivationes of 3－Nicotinc acide

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Ethics verses between legislation and the legalization of deterrence
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A modern tech－driven approach to prognosis powered by realtime health care record updates from the patients

[^1]
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Performance assessment of fly－ash aggregates in concrete
Usha S，Shivaraju G D，T V Mallesh，Prathibha Reddy T，Navya shree M
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A cross sectional study on the relationship between serum calcium level and severity of dengue fever
Raveen Titus Thomas，P Sanghamithra
턐 3865－3873
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Efficacy of simplified Kundalini yoga practices on low－density lipoprotein and high－density lipoprotein among Middle－aged menopausal women
T．Valli，P．Arunachalam
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A S Arunkumar，Sunetra Chatterjee，Sunil Kunchoorj Basavaraju，Basavaraju G C
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## TPDF

Effect of 2－Thioxo Imidazolidin－4－Ones derivative copper complex on the oxidative state on the male rats exposed to hydrogen peroxide
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## Dexamethasone and olmesartan as potential antiremodelling agents of valvular interstitial cell into myofibroblast

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# Dexamethasone and olmesartan as potential antiremodelling agents of valvular interstitial cell into myofibroblast: In vitro study on $\alpha$ smooth muscle actin expression 

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#### Abstract

Rheumatic heart disease is a late complication of valvular inflammation caused by rheumatic fever. Studies have shown that the differentiation of valvular interstitial cells (VIC) into fibroblasts plays an important role in valvular remodeling and fibrosis. Various strategies to minimize valvular fibrosis has increased recently. This study aims to analyze the effect of dexamethasone, olmesartan, and its


[^4]combination in inhibiting TGF- $\beta 1$-induced VIC differentiation into myofibroblast. In vitro laboratory experimental-posttest only control group design was conducted. Isolated VIC of Oryctolagus cuniculus was pretreated using $2,5 \mathrm{ng} / \mathrm{mL}$ of TGF- $\beta 1$ and divided into groups of dexamethasone ( $0.1 \mathrm{uM} / \mathrm{L}$ ), olmesartan ( $100 \mathrm{nmol} / \mathrm{L}$ ), and its combination. Inhibition of myofibroblast differentiation was quantified by the expression of a-SMA levels detected by immunofluorescence. Dexamethasone, olmesartan, and its combination administration were significantly reduced TGF- $\beta 1$-induced VIC differentiation into myofibroblast expressed by a-SMA levels (dexamethasone $6823 \pm$ 1735.3, olmesartan 6683.7 $\pm$ 2795.05). Combination of dexamethasone and olmesartan exhibit the most potent inhibition compared to control ( $5051.87 \pm 1612.210$ vs $22286.73 \pm 2780.2 ; p<$ 0.000). In conclusion, dexamethasone, olmesartan, and the combination can significantly reduce the differentiation of VIC into myofibroblasts. The greatest potential is the combined effect of dexamethasone and olmesartan, while dexamethasone and olmesartan have the same potential.

Keywords---Valvular interstitial cell, myofibroblast, a-Smooth muscle actin, dexamethasone, Olmesartan

## Introduction

Rheumatic heart disease (RHD) is a sequela of acute rheumatic fever with serious long term complication and morbidity which still a significant public health problem with 33.4 million cases and mortality rate up to 319,400 in 2015.(Guilherme \& Kalil, 2020; Ordunez et al., 2019; Watkins et al., 2017) One of the serious sequela of RHD is the progression of mitral valve damage in $50-60 \%$ of cases, multivalvular and mixed lesions are found in $20 \%$, with the most common pathology being stenosis ( $34 \%$ mitral; $9 \%$ aortic). The long-term effectiveness of mitral valve surgery, both mitral valve replacement and mitral valve repair, has not shown satisfactory results with 10-year survival rate of $62 \%$ in the mitral valve replacement group and $46 \%$ in the mitral valve repair group.(Thourani et al., 2003) Meanwhile, in individuals undergoing percutaneous mitral commissurotomy (PMC), prior prospective cohort study showed a survival rate of $68 \%$ at 20 years and only $16 \%$ of patients did not require reinvention.(Bouleti et al., 2013)

The use of PMC and valve replacement or repair surgery as the currently available standard therapy, shows the low long-term effectiveness of valve intervention measures. Interventions using surgery and minimally invasive procedures are practically only focused on the valve leaflets and annulus, even though the pathological process also occurs at the cellular level, especially fibrosis in the sub-valvular apparatus, ventricular, and atrial myocardial remodeling due to pressure/volume overload exposure and chronic inflammation.(Yankah et al., 2011) Intervention in the early inflammatory phase using antifibrotic agents is a new hope to break the bridge of acute rheumatic fever into valvular pathology in RHD. Chronic inflammatory exposure involving TGF- $\beta 1$ in valve interstitial cells
(VIC) due to cross-reactivity of group A streptococcal M protein, induces activation of the Smad signaling pathway, mitogen-activated protein kinase (MAPK), and extracellular signal-regulated kinase $1 / 2$ (ERK1/2) will cause myofibroblastic differentiation, induction of extracellular matrix synthesis resulting in fibrosis and distortion of valve architecture.(Vaideeswar \& Butany, 2016)

Valve stenosis is a terminal process of the acute phase of valvular disease inflammatory response. Various methods of treating valve stenosis surgically and minimally invasive methods have been developed, but limitations in terms of longterm benefit, survival, patient selection, and complications limit the application of this method. This issue has recently attracted interest to find novel antiremodelling agents. The antifibrotic effect of angiotensin receptor blockers (ARBs) are demonstrated through antagonism of the angiotensin II type I receptor (AT1R) on local Ang II exposure in inflamed tissues, resulting in inhibition of myofibroblast growth and induction of extracellular matrix synthesis.(Yang et al., 2005) In addition, early studies revealed that glucocorticoids also may exert some anti-atherosclerosis effects with reduced atherosclerosis severity in animal model.(Asai et al., 1993; Makheja et al., 1989) The onset of atherosclerosis is triggered by proinflammatory mediators, which induce adhesion molecules in endothelial cells by activating MAPK, especially p38 MAPK.

Furthermore, inhibition of fibrogenesis via transforming growth factor (TGF- $\beta 1$ ) pathway using various agents has been investigated in pulmonary alveolar cells (Guzy, 2020), renal glomerular cells (Isaka, 2018), hepatocytes(Masuda et al., 2020), myocytes (Parichatikanond et al., 2020), and fibroblasts ventricles(Peng et al., 2010; Zhou et al., 2015). However, to the best of our knowledge, there have been no studies examining the antifibrotic properties of ARBs and steroids on VIC. Based on these considerations, this study aimed to assess the effectiveness of dexamethasone and olmesartan in inhibiting fibrogenesis of VIC in the early inflammatory phase, so that the process of valve fibrosis can be prevented in the acute phase of the disease and patients can avoid long-term sequelae.

## Method

### 1.1 Study design and animal model

This in vitro post-test control group only study was conducted in Institute of Tropical Disease, Universitas Airlangga, Surabaya, Indonesia. Some of the interventions given were (1) Dexamethasone; (2) Olmesartan; (3) DexamethasoneOlmesartan combination. The experimental subject used in this study was valvular interstitial cell (VIC) induced by TGF- $\beta 1$. The experimental unit was obtained from VIC cultures taken from the valves of New Zealand rabbits (Oryctolagus cuniculus), aged 12-13 weeks with weight of $2.5-3 \mathrm{~kg}$. The model then divided into three groups, namely the dexamethasone group, olmesartan group, and a combination group. The sample size calculated using the Higgins and Klinbaum formula was 6 replications.

### 1.2 Isolation, culture, and characterization of VIC

Isolation of rabbit VIC was performed as previously described by Linn et.al with some modification on animal model selection.(Lin et al., 2017) Rabbits which met the standardized inclusion criteria were terminated by lethal injection using midazolam $5 \mathrm{mg} / \mathrm{kg}$ and phenytoin $125 \mathrm{mg} / \mathrm{kg}$ intraperitoneally. Surgically extracted rabbit leaflets were then separated from myocytes and valvular endothelial cells by digestion method using collagenase II enzyme followed by centrifugation and seeding of cell suspensions. Adhered cells after centrifugation at 100 g were transferred to culture media.

Disintegrated VIC cells were cultured in Dulbecco's Modified Eagle Medium (DMEM; Gibco BRL, Grand Island, NY, USA) with supplementation of $10 \%$ foetal bovine serum (FBS), and $1 \%$ penicillin/streptomycin solution at $37^{\circ} \mathrm{C}$ with $95 \%$ humidity and $5 \% \mathrm{CO}_{2}$. After reaching $80 \%$ confluency, cells from the second passage were then transferred to non-coated six wells with DMEM and 10\% FBS at a density of 2600 cells/dish. After 24 hours, the media was replaced with new DMEM containing $10 \%$ FBS and TGF- $\beta 1(2.5 \mathrm{ng} / \mathrm{ml})$ and then incubated for one to seven days.

Characterization of VIC was done through measuring vimentin expression. After washing with phosphate buffer saline (PBS), cells were fixed with $3 \%$ formaldehyde for 15 minutes. In order to inhibit non-specific binding, PBS containing $1 \%$ serum was added for 15 minutes and washed again using PBS. Subsequently, the fluorescein isothiocyanate (FITC)-labeled anti-vimentin from Thermo Fisher Scientific (Schwerte, Germany) reagent was added, and washed again with PBS. Vimentin expression was documented by fluorescent microscopy.

### 1.3 Intervention and myofibroblast differentiation assessment protocol

After the cells reached 80-90\% confluency, the medium was replaced with serum free DMEM. Afterwards, pre-treatment condition was carried out with Olmesartan 100 nM , Dexamethasone 1000 nM , along with antifibrotic combination for 3 hours followed by incubation with TGF $\beta 12.5 \mathrm{ng} / \mathrm{ml}$ for 24 hours. Myofibroblast characterization was carried out by fixation with $2 \%$ paraformaldehyde/PBS and $1 \%$ Triton X-100/PBS for 30 minutes. Then the cells were blocked with $2 \%$ BSA/PBS and incubated with mouse monoclonal antibody against FITC-labeled $a$-SMA, then washed again with PBS. $a$-SMA expression was documented by fluorescent microscopy.

### 1.4 Statistical analysis

After each experiment was carried out six times, the data were then collected and tabulated using Microsoft Office Excel 2016 and were further processed using IBM SPSS ver. 26 for Windows (SPSS Inc, Chicago, IL). After the data cleaning, descriptive analysis was performed to calculate the mean, standard deviation, and box-plot diagrams for each group. In addition, unpaired numerical comparative statistical analysis in both groups was carried out using unpaired T-test for normal distributed data, otherwise the Mann-Whitney test was used. For comparison among three or more groups, one way analysis of variance (ANOVA)
with post hoc Bonferroni was conducted for the same variance, otherwise ANOVA with post hoc Games Howell was performed, but if the data not normally distributions then Kruskal-Wallis with post hoc Mann-Whitney will used. p-value <0.05 was considered as statistically significant.

## Discussion

The results of the cultured and isolated rabbit Oryctolagus cuniculus valvular' cells in this study showed islands of cuboidal-spindle shape elongated cells with regular cell membranes that visually under light microscope, as demonstrated in figure 1. The characterization of VIC was carried out with positive markers of vimentin through immunocytochemical examination. Immunocytochemical analysis showed that there was a positive expression (luminescence above $95 \%$ of cell luminescence per field of view) of vimentin. Immunocytochemical staining results showed positive markers for vimentin which is a marker of valve interstitial cells (figure 2). The vimentin marker expression in the process of VIC isolation after incubation on the $9^{\text {th }}$ day was detected with median of $6,585.4$ (384 $-16,909$ ).


Figure 1 Valve Interstitial Cell Morphology A) Magnification $4 \times 10$; B) Magnification 10x10. The spindle-elongated cells are seen as valve interstitial cells.


Figure 2 Vimentin Expression in Valve Interstitial Cells A) Magnification $4 \times 10$; B) Magnification $10 \times 10$. Valve interstitial cells appeared evenly distributed across the visual field tightly with strong luminescence

Subsequently, after exposure to TGF- $\beta 1$, VIC differentiated into myofibroblasts with characterized as irregular surfaces and cytoplasm filled with stress fibers. The Wilcoxon test results showed in the group exposed to TGF- $\beta 1$ were significantly different ( $p<0.001$ ) compared to the control group. This suggests TGF- $\beta 1$ as a potent cytokine that induce VIC differentiation into myofibroblasts. Furthermore, immunocytochemical staining after exposure to TGF- $\beta 1$ showed a significant increase in a-SMA expression (fluorescence above $95 \%$ luminescence of cells per field of view) when compared to controls. This indicates the process of differentiation of VIC into myofibroblasts (figure 3). The median quantity value of a-SMA expression in VIC exposed to TGF- $\beta 1$ as an inductor of myofibroblastic differentiation obtained a median of $23,474(18,452-25,671)$, whereas in the control group the median expression of a-SMA was only $1,075(118-7,696)$.


Figure 3 A) Myofibroblast Cell Morphology and $a$-SMA Expression in Immunocytochemistry with TGF- $\beta 1$ Induction B) Myofibroblast Cell Morphology and $a$-SMA Expression in Control Group Immunocytochemistry

Quantity of a-SMA expression in VIC exposed to TGF- $\beta 1$ and treated with dexamethasone, olmesartan, and combination showed that the lowest a-SMA expression was observed in the combination group of dexamethasone and olmesartan with a mean of $5,051.8 \pm 1,612.2$. The a-SMA expression in the dexamethasone group was $6,823 \pm 1735.3$ and the a-SMA expression in the olmesartan group was $6,942.7 \pm 2,455.9$. Statistical analysis using Kruskal-Wallis showed significant difference in these groups (p-value < 0.001).

Visual expression of a-SMA were shown in figure 4. These data were further analyzed by the Mann-Whitney post hoc test, and it was found that there were significant differences between the dexamethasone and control groups ( $\mathrm{p}<0.001$ ), dexamethasone in combination ( $\mathrm{p}<0.001$ ), olmesartan with control ( $\mathrm{p}<0.001$ ), olmesartan with combination ( $\mathrm{p}<0.004$ ) and combination with control ( $\mathrm{p}<0.001$ ), but there was no difference between the dexamethasone and olmesartan groups ( $\mathrm{p}<0.705$ ) (figure 5). According to these results, it demonstrated that the combination of dexamethasone and olmesartan can significantly reduce the
differentiation of rabbit VIC into myofibroblasts based on the expression of aSMA, while dexamethasone and olmesartan alone have same potential


Figure 5 (A) Dexamethasone Group in Phase Contrast. (B) a-SMA Immunofluorescence Expression Group in the Dexamethasone Group. (C) Olmesartan Group in Phase Contrast. (D) Expression of a-SMA Immunofluorescence in the Olmesartan Group. (E) Combination Group in Phase Contrast. (F) Expression of a-SMA Immunofluorescence in the Combination Group. (G) Control Group on Contrast Phase, (H) Expression of a-SMA Immunofluorescence on contrast phase microscope.


Figure 4 Comparison of each intervention treatment group on $a$-SMA expression. It can be seen that there is a significant difference between the groups against the control.

To the best of our knowledge, this is the first research that used rabbit VIC to make in vitro fibrosis models with single induction using TGF- $\beta$ 1. This study proved the role of TGF- $\beta 1$ as an inductor of VIC differentiation as evidenced by changes in cell morphology and the presence of significant quantity of a-SMA luminescence. TGF- $\beta 1$ can activate the small-mothers-against-decapentaplegic (Smad) transduction pathway and initiate transcription of myofibroblastic prodifferentiation genes.(Cucoranu et al., 2005) TGF- $\beta 1$ has been shown to act as a key profibrogenic cytokine in vitro and in vivo studies(Bujak, 2001; Calderone et al., 2001; Frangogiannis et al., 2000), as well as an increase in TGF- $\beta 1$ levels in fibrotic heart organs.(Kim et al., 1995; Kupfahl et al., 2000) Prior study also revealed the effect of TGF-1 exposure on ventricular fibroblast cells to induce the fibrosis process through induction of collagen production by fibroblasts, myofibroblasts, and induction of fibroblast differentiation into myofibroblasts.(Lijnen et al., 2000; Petrov et al., 2002) Our study was successfully able to produce VIC isolates similar to the method used by Lin et al (2017), but with a lower potential for contamination of ventricular or atrial myocytes and fibroblasts through rational selection of experimental animals.(Lin et al., 2017)

TGF- $\beta 1$ as one of the main profibrotic cytokines is widely involved in the pathogenesis of RHD. This cytokine has the ability to stimulate myofibroblastic differentiation which will functionally increase the upregulation of a-SMA, to produce inflammatory mediators, growth factors, and increase the production of extracellular matrix such as the secretion of collagen I, III, and fibronectin which amplify the fibrosis process. Induction of TGF- $\beta 1$ will initiate signaling cascades through cell membrane and intracellular protein receptors Smad 2/3, the Mitogen-Activated Protein Kinase (MAPK) pathway, and the c-Jun N-terminal kinase (JNK) pathway.(Du et al., 2020; Heldin et al., 1997) The characteristics of myofibroblast cells that we found were similar to previous result reported with high content of exocytic vesicles, irregular cell membranes, and stress fibers in the cell cytoplasm. (Baum \& Duffy, 2011; Petrov et al., 2002)

Myofibroblastic differentiation is a physiological response of VIC after exposure to pathological injury. This induces TGF- $\beta 1$ expression and initiates smooth muscle actin transcription. Myofibroblasts will increase the ability of collagen production and molecular adhesion (paxilin, tensin, ED-A fibronectin).(Frangogiannis et al., 2000; Gabbiani, 2003) Myofibroblasts also have high levels of microfilaments with abundant extracellular fibronectin, which can cause traction on histological tissue structures.(Gabbiani, 2003) The transformation of VIC into myofibroblasts will then cause excessive collagen deposition, thereby increasing the distance between functional VIC and disrupting cell-cell adhesion junctions (Connexin 43 and Connexin 45), as well as the effect of tissue contraction, which will bind to impaired valve function at the macroscopic level.(Baum \& Duffy, 2011)

This study demonstrated the potential antiremodelling properties of dexamethasone and olmesartan as well as their combination in successfully inhibit VIC differentiation into myofibroblastic. Previous study has shown that dexamethasone treatment resulted in high extracellular matrix deposition.(Lo et al., 2003) It was also described that several components of the myofibroblast process could be inhibited by dexamethasone as well as inhibit a-SMA
amplification in endothelial injury.(Gu et al., 2010) Actin has been implicated as a major element in cellular movement and is associated with increased cellular migration.(Christian et al., 2001) Consequently, it is reasonable to assume that decreased expression of one of its isoforms would lead to decreased cell motility. In the study by Tsai et.al, cell migration decreased in parallel with decreased aSMA expression after administration with dexamethasone.(Tsai et al., 2003) These findings demonstrate a direct relationship between cell migration and a-SMA expression and suggest that this protein plays a crucial role in driving cell migration. Moreover, the antifibrotic properties of dexamethasone can also be achieved through the induction of the MKP-1 pathway through increased levels of 15-deoxy-delta -12,14-PGJ2 (15DPGJ2), an endogenous MKP-1 ligand, via the p38-MAPK pathway. Activation of the MKP-1 pathway then act as an inhibitor of NF-kB pathway activation.(Almawi et al., 1996)

Angiotensin receptor blocker (ARB) drugs, one of which is olmesartan, has an antiremodelling effect through inhibition of the RAAS system which suppresses the production of AngII. AngII has the role in enhancing the process of fibrogenesis in various organs has been demonstrated in various studies. Likewise, inhibition of the RAAS hormone using ARB has been shown to provide benefits in the process of organ fibrosis.(Kim et al., 1995) This Inhibition effect can be an intervention target to suppress the process of fibrosis and inflammation in VIC. Our results also in accordance with a previous study revealed that administration of 10 nM olmesartan was shown to reduce the levels of TGF- $\beta 1$ and a -SMA in cardiac fibroblasts.(Zhou et al., 2015) In addition, olmesartan administration $5 \mathrm{mg} / \mathrm{kg} /$ day in rats showed changes in profibrotic parameters, including: decreased activation of the TGF-1/Smad signaling pathway, increased levels of ACE2 and TNF- Converting Enzyme (TACE), and inhibition of apoptotic effects characterized by decreased levels of Caspase 3, BAX, Bcl-2.(Suh et al., 2019) The study using ARB as an inhibitory agent of fibroblast cell differentiation and its equivalent, is similar to the findings in this study, which showed that administration of olmesartan at a dose of 10 nanomol/L could significantly inhibit the differentiation of VIC.

In this study, the strongest potential in inhibiting myofibroblastic differentiation of VIC was found in the dexamethasone-olmesartan combination group. This is because the combination mechanism of action through different pathways that mutually potentiate each other. Olmesartan inhibits the interaction of ATII molecules at the ATII type 1 receptor, thereby reducing the synthesis of Ras molecules and activation of the JAK/STAT pathway, while dexamethasone acts as a negative inhibitor and regulator of Smad 2/3, TNFa, IL-1 and downstream NFkB signaling pathways. pro-myofibroblast differentiation. The combination of these different working points is mutually potentiating so that it provides the most potent inhibition effect of myofibroblast differentiation compared to the use of a single agent.

To date, there is no combination tested in the context of in vitro VIC model with TGF- $\beta 1$ induction. The finding of this potential inhibitory effect of VIC differentiation into myofibroblasts, especially the dexamethasone-olmesartan combination that we chose with in-depth consideration of its simultaneous and potentiating effects through various cell differentiation pathways, can be a
reference for further research in exploring more deeply the antifibrotic potential of dexamethasone, olmesartan, and dexamethasone. The combination in order to be an alternative to pharmacological therapy to inhibit the fibrosis process in RHD.

## Conclusion

Dexamethasone and olmesartan has inhibitory effects on the differentiation of rabbit VIC induced by TGF- $\beta 1$ into myofibroblasts based on the expression of aSMA. The combination of both drugs has a better potentiating effect in the ability to inhibit VIC differentiation into myofibroblasts. The combination of these two agents has great potential as an antiremodelling agent, especially in valvular disease due to RHD.

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