

INTERNATIONAL JOURNAL OF INNOVATIVE SCIENCE AND RESEARCH TECHNOLOGY

IJISRT A DIGITAL LIBRARY

ISSN NO :- 2456-2165

RESEARCHER ID



THOMSON REUTERS

HAS BEEN PUBLISHED IN
Volume 4 | Issue 3 | March - 2019

ARTICLE DIGITAL NO.
IJISRT19MA318



EDITOR IN CHIEF IJISRT

This document certifies that the manuscript listed above was submitted by above said respected author
To verify the submitted manuscript please visit our official website: www.ijisrt.com
Or Email us: editor@ijisrt.com

INTERNATIONAL JOURNAL OF INNOVATIVE SCIENCE AND RESEARCH TECHNOLOGY

IJISRT A DIGITAL LIBRARY

ISSN NO :- 2456-2165

AUTHOR CERTIFICATE

THIS IS TO CERTIFY THAT THE MANUSCRIPT, ENTITLED
Expression of IL-10 and IL-12 Children Suffering Malaria
with Supplementation of Zink and Fe

AUTHORED BY
Laksmyn Kadir

HAS BEEN PUBLISHED IN
Volume 4 | Issue 3 | March - 2019

ARTICLE DIGITAL NO.
IJISRT19MA318



EDITOR IN CHIEF IJISRT

This document certifies that the manuscript listed above was submitted by above said respected author
To verify the submitted manuscript please visit our official website: www.ijisrt.com
Or Email us: editor@ijisrt.com

EDITORIAL BOARD

Manish Gupta (IJISRTREW100)

| Assistant professor | ECE Dept. | VIT jaipur | Rajasthan | India

HemantPurohit (IJISRTREW77)

| Professor & HOD ECE dept. | JIET | Jodhpur | Rajasthan | India

Jai Prakash Mishra (IJISRTREW13)

| Assistant Professor | ECE Dept. | VIT Jaipur | Rajasthan | India

Harsh Gupta (IJISRTREW02)

| Micro Electronics Dept. | Manipal University | Jaipur | Rajasthan | India

DiwakarGautam (IJISRTREW05)

| Assistant professor | ECE Dept. | Sharda University

TarunBadiwal (IJISRTREW09)

| Assistant Professor | Electrical Dept. | Jaggannath University | Jaipur | Rajasthan | India

Virendra Swami (IJISRTREW105)

| Assistant Professor | ECE Dept. | MaharshiArvind college | Jaipur | Rajasthan | India

Nishant Chauhan (IJISRTREW79)

| Assistant Professor | Electrical Dept. | MahershiArvind College | Jaipur |
Rajasthan | India

Prince Ja.cob (IJISRTREW91)

| Assistant Professor | Electrical Dept. | MahershiArvind College | Jaipur | Rajasthan | India

Dr.S.SairaBanu (IJISRTREW10)

| Associate Professor | ECE Dept. | Karpagam University | Coimbatore | Tamil Nadu | India

BalajiVelusamy (IJISRTREW500)

| Associate Professor | Info Institute of Engineering | Coimbatore | Tamil Nadu | India

Lalit Mohan Nainwal (IJISRTREW501)

| School of Pharmaceutical Sciences and Research | JamiaHamdard | Delhi | India

BaisNiravKishorkumar (IJISRTREW502)

| Assistant Professor | Ganpat University-Institute of Technology | Ahmedabad | Gujarat |
India

Raj Kumar Gupta (IJISRTREW503)

| Assistant Professor | Amity University | Jaipur | Rajasthan | India

Dr. Neeta Saxena (IJISRTREW504)

| Assistant Professor | Amity University | Gwalior | Madhya Pradesh | India

Dr.Nageswara Rao Moparthy (IJISRTREW505)

| Associate Professor | Velgapudi Ramakrishna Siddhartha Engineering College |
Vijayawada | Andhra Pradesh | India

R. Narendran (IJISRTREW506)

| Faculty of Marine Sciences | Annamalai University | Parangipettai | Tamil Nadu | India

Mahadeva.M (IJISRTREW507)

| Assistant Professor | Shri Pillappa College of Engineering | Bangalore | Karnataka | India

Indexing

SJIF Impact Factor : 5.15





Scientific Journal Impact Factor

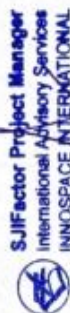
CERTIFICATE OF INDEXING (SJIF 2017)

This certificate is awarded to

International Journal of Innovative Science and Research Technology
(ISSN: 2456-2165)

The Journal has been positively evaluated in the SJIF Journals Master List evaluation process
SJIF 2017 = 5.15

SJIF (A division of InnoSpace)



SJIFactor Project

Volume 4, Issue 3 – March 2019

Migration, Culture and Religious Life the Puritan in the Colonial in America

Author Name: Dahniar Th. Musa. | Volume 4, Issue 2, February- 2019

The Effectiveness of the Nationality Visitation of Leadership Training II to Bung Karno Grave and Library in Blitar City

Author Name: Much. Taufik. | Volume 4, Issue 2, March- 2019

Research Paper on Cyber Security & Cryptography

Author Name: Divya Chanana. | Volume 4, Issue 2, March- 2019

Isolation and In-Vitro Characterization of Lactobacillus SP, From Traditionally Fermented Black Rice (Karupu Kavuni Arisi) and Brown Rice (Kai Kuthal Arisi)

Author Name: Manovina.M, Dr.B.Thamarai selvi, Gousika.T. | Volume 4, Issue 2, March- 2019

International Trade Barriers and their Effects on E-Commerce Businesses in Turkey

Author Name: Flevious Ngwang NGWANG. | Volume 4, Issue 2, March- 2019

Analysis of Accounting Information System of Sales Cycle at Marcelo Exist Using REA Approach

Author Name: Ryan David Sinaulan, Ega Hegarini. | Volume 4, Issue 2, March- 2019

A Review on Recuperative Cooling of Li-Ion Batteries in Electric Vehicles

Author Name: Prudhvy Raj Veeravarapu, Rohit Kulkarni. | Volume 4, Issue 2, March- 2019

Study on Optimization and Pigment Analysis of Beetroot (Beta-Vulgaris) and their Application as Natural Dyes

Author Name: R. Arthikha, K. Madhanasundareswari. | Volume 4, Issue 2, March- 2019

Typology Analysis of Sharks Fisheries Landed at Karangsong Fish Auction, Indramayu

Author Name: Ishmah Mardiyah Iskandar, Zuzy Anna, Achmad Rizal, Asep Agus Handaka Suryana. | Volume 4, Issue 2, March- 2019

Organize Your Social Responsibility at the Community Building in the Region of Seven Tribes PT. Freeport Papua

Author Name: MAYLEN K.P KAMBUAYA, GAGARING PAGALUNG, DARWIS SAID. | Volume 4, Issue 2, March- 2019

Cellular Light Weight Concrete Brick by using Quarry Dust

Author Name: Yash Chhatani, Shiwangi Dhawankar, Vipin Gajbhiye, Rahul kuhikar, Rohan Potpose, Devesh Rarokar, Nikeeta Dethe. | Volume 4, Issue 2, March- 2019

Survey on ML Algorithms for Medical Guidance System

Author Name: Ayush Sanklecha, Gowtham L, Harshitha D J, Krishna B M, Poornima N. | Volume 4, Issue 2, March- 2019

Network based Packet Transmission Congestion Control Using Enhanced Leaky Bucket Index Algorithm

Author Name: Monisha V., Dr. Ranganayaki T. | Volume 4, Issue 2, March- 2019

Is there an Upper Limit on Thyromental Distance ?

Author Name: Nurcan Kizilcik. | Volume 4, Issue 2, March- 2019

How Successful is Presumptive Tax in Bringing Informal Operators into the Tax Net in Zimbabwe? A Study of Transport Operators in Bulawayo

Author Name: Nurcan Kizilcik. | Volume 4, Issue 2, March- 2019

Sign Language Recognition System with Speech Output

Author Name: Vinayak S. Kunder, Aakash A. Bhardwaj, Vipul D. Tank. | Volume 4, Issue 2, March- 2019

Effect of Supplementation of Whey Protein Concentrate on Physicochemical and Sensory Properties of Lactose Hydrolyzed Kulfi

Author Name: Elizabeth Thomas, Dr. H. M. Jayaprakasha. | Volume 4, Issue 2, March- 2019

Expression of IL-10 and IL-12 Children Suffering Malaria with Supplementation of Zink and Fe

Author Name: Laksmyn Kadir. | Volume 4, Issue 2, March- 2019

A Method Study on Implementation of Material Requirement Planning (MRP-I) in Sample Bicycle Manufacturing Industry

Author Name: Vijay Prakash M, Ananth Selvakumar. Zeba Jihan. | Volume 4, Issue 2, March- 2019

Design and Simulation of Marine Propeller with Different Blade Geometry

Author Name: Ajay Baban Pawar, Tejas Santosh Petkar, Parag Sanjeev Pitale, Shibhav Shivaputrappa Salagare. | Volume 4, Issue 2, March- 2019

Analysis of Factors Affecting Consumer Purchase Decision at Online Shops

Author Name: Muhammad Fachmi, Ikrar Putra Setiawan, Andi Hidayat. | Volume 4, Issue 2, March- 2019

Development of Writing Skill Learning based Android Model

Author Name: Dr. Nia Rohayati, Dr. Iis Marwan. | Volume 4, Issue 2, March- 2019

Factors Affecting the Pricing Decisions in the Tattoo Industry

Author Name: Priya Sengupta, Shawn Langford. | Volume 4, Issue 3, March- 2019

Design of Roll Cage System for ATV

Author Name: Thombre Pradeep Bhiakji, Tambe Shubham Chandrakant, Sutkar shubham shashikant, Tapare Bhushan Gokul, Dr. Ajay Kumar G. Thakur. | Volume 4, Issue 3, March- 2019

Salon Management

Author Name: Brijinder Sokhey, Omshankar Singh, Shubh Khandhar, BadriVishal Awasthi. | Volume 4, Issue 3, March- 2019

Analysis of Print Quality Control of Canned Materials with the DMAIC Method in PT United can Company New Printing Department

Author Name: Raden Entada, Agustina Dwiyantri, Erry Rimawan. | Volume 4, Issue 3, March- 2019

The Relationship of Characteristics and Attitude of Nurses with Job Satisfaction in the Collaboration of Nurses and Doctor in Palembang Hospitals

Author Name: Nuriza Agustina, Hema Malini, Ira Kusumawaty. | Volume 4, Issue 3, March- 2019

Sensored Field Oriented Control of BLDC Motor for Pico Satellite Attitude Control

Author Name: Nikolaos Biniakos, Dr. Vasileios Iakovakis. | Volume 4, Issue 3, March- 2019

Biological Control Techniques for Chili Plant Disease by Using Streptomyces Sp. and Trichoderma Sp.

Author Name: Wahyun Astiko, Irwan Muthahanas. | Volume 4, Issue 3, March- 2019

Nurse and Patient Interaction through Therapeutic Communication

Author Name: Rusmarita, Hema Malini, Ira Kusumawaty. | Volume 4, Issue 3, March- 2019

Advanced Road Traffic Management System

Author Name: Jitul Kumar Laphong, Himanta Dihingia, Suren Borah. | Volume 4, Issue 3, March- 2019

Exposure of Human Body to Radio Frequency Electromagnetic Radiation: Effects and Precautions

Author Name: Chiejine, Chinedu Michael. | Volume 4, Issue 3, March- 2019

Attitude of College Students on Students Evaluation of Teachers and its Reliability

Author Name: Benjamin Lalrinsanga. | Volume 4, Issue 3, March- 2019

Design of High Lift Low Reynolds Number Airfoil for Micro Aerial Vehicle

Author Name: Shahid khan, Saima H Ilkal, Rekha R. | Volume 4, Issue 3, March- 2019

A Study to Evaluate the Effectiveness of Video Assisted Teaching (VAT) on Knowledge Regarding Stroke Rehabilitation among the Caregivers of Stroke Patients in Selected Hospitals, Hassan, Karnataka

Author Name: BALAJI M. S., SUJATHA LAKSHMI. | Volume 4, Issue 3, March- 2019

Power Generation System with Low Enthalpy Geothermal Source:Kalina Cycle

Author Name: J. M. Shehata. | Volume 4, Issue 3, March- 2019

Commercial Exhibition Booking and In-house Team Management System

Author Name: Saloni Kriplani, Naina Nagwani, Ankit Ghangare, Bhupesh Giripunje, Pranay Dukare, Saurabh Vyas. | Volume 4, Issue 3, March- 2019

MEDCARE

Author Name: Sanskruti Bhure, Divya Khandar, Shubham Surjuse, Shivam Raut. | Volume 4, Issue 3, March- 2019

Patient Perception and Nurse's Caring Attitudes Affect the Patient Satisfaction Level in Dr. Achmad Mochtar Bukittinggi Hospital

Author Name: Hidayati, Budi Anna Keliat, Yasmi. | Volume 4, Issue 3, March- 2019

How Family Poverty is Rooted from the Family itself in Tanzania

Author Name: SALUM HAJI HAMISI. | Volume 4, Issue 3, March- 2019

Factor Analysis of the Impact Affecting to Ecotourism Development in the Point of Views of the Host Community at Nong Han Lake, Thailand

Author Name: Suwakhon Somphaiphithak, Butsakorn Khornjamnong, Dr. Chalard Jukpim. | Volume 4, Issue 3, March- 2019

IOT Based School Bus Monitoring and Security System

Author Name: Dr. M. V. Vyawahare, Shriya Lambat, Mayuri Belsare, Kritika Latwe, Richa Vairagade. | Volume 4, Issue 3, March- 2019

A Study to Assess the Effectiveness of Planned Teaching Programme on Knowledge Regarding Effects of Consanguineous Marriage and its Prevention among Adolescent Girls in a Selected Pre University College of Bagalkot

Author Name: Daneshwari H., DR.DEELIP S NATEKAR, SHRAVANKUMAR L., RAVIKUAMAR V., SHAILA. U., MEGHA.V., MANJULA. I., KALPANA, NAGARATNA. | Volume 4, Issue 3, March- 2019

An Effectiveness of Self Instructional Module on Knowledge Regarding Effects of Computer Vision among Office Staff Working in Selected Organization of B.V.V. Sangha Bagalkot

Author Name: Shilpa N. Kugali, Dr. Deelip S. Natekar, Nandeshwar.S., Prabhu. R., Panduranga.A., Pavitra.B., Rohini, Radhika, Savita. T., Siddharoodha. | Volume 4, Issue 3, March- 2019

Survey Paper on Soldiers Health Tracking System Using Internet of Things (IOT)

Author Name: K. K. Kumbhare, Swati Umate, Suwarna Khadake, Rohini Wanjari, Mayur Shivdharkar. | Volume 4, Issue 3, March- 2019

Economic Security Assessment in Catubig Northern Samar Philippines

Author Name: Marcos E. Bollido. | Volume 4, Issue 3, March- 2019

Content Based Image Retrieval

Author Name: Roshni Sahu, Shital Zade, Sonal Kamble, Payal Bhagat, Bhaghyashri Awachat, Mayur Dakhane. | Volume 4, Issue 3, March- 2019

A Study of Work-Life Balance of Women Employee in India

Author Name: Yukta kotwal. | Volume 4, Issue 3, March- 2019

Image Fog Restoration via an Efficient Haze Removal Algorithm

Author Name: Tanmay Jain. | Volume 4, Issue 3, March- 2019

Comparative Study On The Performance of High Rise Structures Subjected to Wind and Earthquake in Andhra Pradesh

Author Name: Puligadda Sai Krishna, Malladi Phani Krishna Deepak. | Volume 4, Issue 3, March- 2019

Competitive Advantage of Going Green and Green HR Practices

Author Name: Gagandeep Singh, Kewal Singh Paneser. | Volume 4, Issue 3, March- 2019

Targeted Advertising Application using Location – based Social and Spatial Data

Author Name: Priyanka Patil, Kiran Nanda, Mariyam Sayyed, Shweta Kamble. | Volume 4, Issue 3, March- 2019

An Estimation of Salivary Survivin in Oral Leukoplakia & Oral Squamous Cell Carcinoma (Salivary Survivin in OL and OSCC)

Author Name: Dr. Seema Sharad Salve, Dr. Jyoti D Bhavthankar, Dr. M S Mandale. | Volume 4, Issue 3, March- 2019

Sentimental and Lexical Analysis in E-Learning

Author Name: Abisha Jebamalar.T, Kavana.P, Joice Vimala.G, Minju P George. | Volume 4, Issue 3, March- 2019

QR Code based Toll Gate Accessing System Reducing Manpower

Author Name: P. Ananthi, M. Narasimman, S.Thirumajari, Dr. P. Gomathi. | Volume 4, Issue 3, March- 2019

Assessment of Renewable Energies to Alleviate Power Crisis in Bangladesh: A Review

Author Name: Mohammad Ismail Hossain, MD. Rakib Ahsan, Md. Hanifuzzaman Chowdhury Shuvo, Md. Rashed, KM. Kamruzzaman. | Volume 4, Issue 3, March- 2019

Effect of Functional Ingredients on the Sensory Characteristics of Ready to Use Coffee Beverage

Author Name: Poornima. S, Dr. D. B. Puranik. | Volume 4, Issue 3, March- 2019

Governing System for Rule Breaking Vehicle at Traffic Signal

Author Name: Smita Chavan, Kajal Bhosale, P. I. Kinikar. | Volume 4, Issue 3, March-2019

Preparing of Alumina from Aluminum Waste

Author Name: Noor Abdulateef Ghulam, Mohammed Nsaif Abbas, Dawood Eisa Sachit. | Volume 4, Issue 3, March- 2019

Communication Skill of Junior High School Students in Mathematics Learning based on Double Loop Learning

Author Name: Sutama, Suyatmini, AnamSutopo, Harun Joko Prayitno, Sofyan Anif. | Volume 4, Issue 3, March- 2019

Accountability Virtue: Enhancing School Discipline Management Practices in High Schools in Embu East Sub-County, Kenya

Author Name: Dr. Wanjiru Mugai Jane J. | Volume 4, Issue 3, March- 2019

Review on ‘Big Data – Sentiment Analysis’

Author Name: Yash R Karanje. | Volume 4, Issue 3, March- 2019

HR Information System Assessment of Employee Performance Using the Balanced Scorecard Method

Author Name: Yaya Sudarya, Vidi Cahya Firmanda, Anton Irawan, Wahyu Kurnia Prambudhi. | Volume 4, Issue 3, March- 2019

Students’ Academic Stress and Study Habits: Basis for Academic Intervention

Author Name: Dr. Andrews P. Maquiling. | Volume 4, Issue 3, March- 2019

Experimental Investigation of Surface Roughness and Tool Wear of Machining Rolled AA7075 Aluminium Alloy Using Advanced Cutting Tools

Author Name: K. Prem kumar, T. Kiran kumar, S.D Ramakanth, P.S.S. Praveen, K. Phaneendra. | Volume 4, Issue 3, March- 2019

Effects of Business Intelligence on the Continuous Auditing Process

Author Name: Alaeldeen Wild Ali. | Volume 4, Issue 3, March- 2019

Structure of Corporate Governance and Financial Performance of Nigerian Quoted Banks

Author Name: OKOLO, Marvis Ndu., OKWU, Peter Ifeanyi, DR. EGBE SOLOMON, MONYEI, Francis Ezieshi. | Volume 4, Issue 3, March- 2019

Non-print Materials vs. Print Materials: Impact on the Learning Styles of the Millennials in the Kingdom of Bahrain

Author Name: Dr. Rosita Guzman Castro. | Volume 4, Issue 3, March- 2019

User Interface and User Experience for Virtual Reality Using Biopotential: A Virtual Reality System with Cross Platform and Plug-and-Play Capability

Author Name: Pavithren. T, Praveenkumar. M, Ramesh B, Dr. Sujitha. J AP(Sl.G). | Volume 4, Issue 3, March- 2019

Shuttle Service for Elderly People

Author Name: Anvaya B N, Mohit Mohan, Anand Prem Rajan. | Volume 4, Issue 3, March- 2019

Developing System for Unmanned Aerial Vehicle (UAV)

Author Name: Vaishali Jadhav, Pooja Arya, Sahil Boriwar, Paresh Kadam. | Volume 4, Issue 3, March- 2019

Management of Irritational Fibroma by Three Different Treatment Modalities – A Case Series

Author Name: Dr. Sruthy Noble, Dr. Sanjeela Guru, Dr. Nisha K.J. | Volume 4, Issue 3, March- 2019

Employer Attractiveness Dimensions: A study of Perceptions of the Management Students

Author Name: Lavina Sharma. | Volume 4, Issue 3, March- 2019

Improved Implementation of WHO Standard Tuberculosis Guidelines in Indian Health Care Facilities – A Prospective Multicenter Study

Author Name: Haripria Ramesh, Balakeshwa Ramaiah, Hiranmai Chowdary. | Volume 4, Issue 3, March- 2019

Intelligent Multitasking System for Milk and Milk Tanker

Author Name: Aishwarya Mohite, Manali Shinde, Manoj Nevge, Mrinalini Ghewari. | Volume 4, Issue 3, March- 2019

Seasonal Rainfall and Maize Yield Variability Patterns in Baringo South Sub-County, Kenya

Author Name: Ondiko H. Jakob, Maranga K. Elias, Eshiamwata W. George. | Volume 4, Issue 3, March- 2019

Earthquake Resistant Buildings Techniques: A Review

Author Name: Deepesh Panchal, Haresh Prajapati and Viral Panchal, Nikhil Sontakke. | Volume 4, Issue 3, March- 2019

Nepal India Relations: People to People Contact

Author Name: Saroj Kumar Timalina. | Volume 4, Issue 3, March- 2019

Technical Paper Presentation on Application of Cartoon like Effects to Actual Images

Author Name: Chinmay Joshi, Devendra Jaiswal, Akshata Patil. | Volume 4, Issue 3, March- 2019

Moderating Effects of the Implementation Good Corporate Governance on the Competence and the Accounting Instance System on the Quality of Accountability Financial Report's PT Pelayaran Nasional Indonesia (Persero)

Author Name: Rizal Setiawan Amin, Haliah, Mediaty. | Volume 4, Issue 3, March- 2019

New Trends in Technology & its Integration within Physical Education

Author Name: Vinay Manhas, Ankita Kangotra. | Volume 4, Issue 3, March- 2019

JET LAG DISORDER

Author Name: Priyanka.Fernandes, David.Kola. | Volume 4, Issue 3, March- 2019

Antibacterial Effects of Quercus Infectoria on Bacteria Isolated from Urinary Tract Infection Patients

Author Name: Mohamed Elshafei Eltayeb Habiballa, Mona Abdelmoneim Mohamed. | Volume 4, Issue 3, March- 2019

Use of Multi-Temporal Satellite Data for Crop Identification and Monitoring

Author Name: Tutu Sengupta, Satish Sharma, Prashant Rajankar. | Volume 4, Issue 3, March- 2019

Study on Travel and Living International Travel

Author Name: Riya Michael. | Volume 4, Issue 3, March- 2019

Medical Technology (Medtech), A Digital Innovation Transforming Healthcare Rationale to Digitize Humans to Overcome Unsustainable Healthcare System

Author Name: Ragita Ranjit. | Volume 4, Issue 3, March- 2019

Prescription Pattern of Cardiovascular Disorders in Type II DM Patients in a Tertiary Care Hospital

Author Name: S. Anandkumar, Abila T. Babu, Ancy George, Anitta Varghese, Athira S.Kumar. | Volume 4, Issue 3, March- 2019

Relationship between Population and Income Distribution in Tanzania

Author Name: Salum Haji Hamisi. | Volume 4, Issue 3, March- 2019

A Geography of Kondoa District

Author Name: Salum Haji Hamisi. | Volume 4, Issue 3, March- 2019

Restricted Algorithms System Sets Sets Your Constructive

Author Name: Ciulavu Vasile Olimpiu. | Volume 4, Issue 3, March- 2019

Real Time Train Tracking System with On-Board Colour Light Signals

Author Name: Moses Linda Maseko. | Volume 4, Issue 3, March- 2019

Comparative Study of Load Frequency Control for Interconnected Three Area Power System Using PID and FOPID Controller

Author Name: K. Jeevitha, R. Shanmugalakshmi. | Volume 4, Issue 3, March- 2019

Influence of Marketing Research on Entrepreneurial Orientation of Smaller Businesses: A Literature Review

Author Name: Francis Okyere, Edmund Owusu Amoakoh, Tankiso Makara. | Volume 4, Issue 3, March- 2019

Market Potential and Reality Application of Digital Marketing in Vietnam Enterprise during Current Period

Author Name: Trinh Le Tan, DaoThi Dai Trang. | Volume 4, Issue 3, March- 2019

Survey Paper on Analysis of Ambulance Tracking System

Author Name: J Blessy gifta, N E Janani, A Monica Cathrin, Minju P George. | Volume 4, Issue 3, March- 2019

Decentralization Autonomic Areas of Islands Characteristic

Author Name: Petrus Polyando; Mudiayati Rahmatunnisa; Budhi Gunawan. | Volume 4, Issue 3, March- 2019

Analysis of Android Applications by Using Reverse Engineering Techniques

Author Name: Soe Myint Myat, May Thu Kyaw. | Volume 4, Issue 3, March- 2019

Marital Quality, Individualism/Collectivism and Divorce Attitude in Turkey

Author Name: Dr. Fatma Gül CİRHİNLİOĞLU, Dr. Gözde Özdikmenli-Demir, Yeliz KINDAP TEPE, Dr. Zafer CİRHİNLİOĞLU. | Volume 4, Issue 3, March- 2019

Justice against Child Abuse

Author Name: Sr. Ester John Kilatu. | Volume 4, Issue 3, March- 2019

A Study on the Level of Educational Background of Owner/Manager of Small Businesses as a Factor Related to the Practice of Marketing Research: Hair Salons Perspective

Author Name: Dr Edmund Owusu Amoakoh, Dr Francis Okyere. | Volume 4, Issue 3, March- 2019

Numbers and Complex Symmetric Multiple Arguments in the Ring System

Author Name: Ciulavu Vasile Olimpiu. | Volume 4, Issue 3, March- 2019

Study of High Performance Concrete by Using Fibers

Author Name: M NAGA PRADEEP, P. UDAY KUMAR. | Volume 4, Issue 3, March- 2019

AI Enabled Smart Home Interface Using Gesture based Controls

Author Name: CH. SAI MAHITH, D. TIRUMALA, G. VAMSI KRISHNA, M. SOMASUNDARAM. | Volume 4, Issue 3, March- 2019

Study on Physico-Chemical Properties of Developed Ready to Use Health Beverage Containing Coffee

Author Name: Poornima. S. P, Dr. D. B. Puranik. | Volume 4, Issue 3, March- 2019

In Vitro Evaluation of Salt Tolerant Traits in Indigenous Rice Genotypes and Advanced Mutant Lines Using Different Concentration of NaCl

Author Name: Pronabananda Das, Md. Monirul Islam, M.H. Kabir and A.N.K. Mamun. | Volume 4, Issue 3, March- 2019

Expression of IL-10 and IL-12 Children Suffering Malaria with Supplementation of Zink and Fe

Laksmyn Kadir[#]

[#]Department of Public Health Faculty of Sport and Health of State University of Gorontalo, Indonesia
Jendral Sudirman street No. 6, Gorontalo, 96123, Indonesia

Abstract:- Over the past decade, there has often been a shortage of Zn and Fe simultaneously. In cell culture, Zn and Fe are micronutrient substances that can increase immune responses so that the number of malaria parasite cultures is decreased or negative. The presence of Zn and Fe as micronutrients in the body is influenced by nutritional status. A child can be considered to have a good nutritional status if the micronutrient elements in the body are fulfilled. This study aims to analyze the expression of IL-10 and IL-12 children suffering malaria by providing Zinc and FE supplementation to elementary school children in malaria-endemic area. This experimental study gave treatments to the research subjects, divided into four groups, including the treatment group with @ 20 mg/day Zinc (Zn), Fe @ 20 mg/day, Zn and Fe @ 20 mg/day simultaneously and the control group (placebo). The dose given in this study was 20 mg. This study employed the Randomized Controlled Trial Pre-Post Test Design by providing a Double-Blind treatment. Further, the data were statistically analyzed using one way ANOVA analysis with 5% reliance level ($\alpha = 0.05$). The results show that the level of IL-12 is increased after the treatment of Fe and Zn supplementation; meanwhile, the level of IL-10 is decreased. The approach that can describe this situation is the presence of seasonal malaria, low transmissibility, low percentage of API and the Zn levels which are up to normal in the 9 to 12-year-old children. This causes the increased protective IL-12 level so that the IL-10 level is no longer needed to re-stabilize the level of IL-12 so that the level of IL-10 in this study is decreased.

Keywords:- Zn and Fe, IL-10, IL-12, Malaria.

I. INTRODUCTION

Over the past decade, there has often been a shortage of Zn and Fe simultaneously. In the cell culture, Zn and Fe are micronutrient substances that can increase immune responses so that the number of malaria parasite cultures is decreased or can be negative. The main function of Zn is to synthesize the nucleic acids and proteins in the body while the function of Fe is on the production of the red blood cells. These red blood cells are necessary to transfer oxygen right through the body tissues.

The role of Zn in the body to this infection is widely known. Zn is the thymic hormone component that facilitates and controls the lymphocyte maturation. Zn also has a significant role in cell division and the replication of

DNA, thus helping to produce immune system cells (Wei Fu, et., al, 2013).

Iron (Fe) plays a vital role in the immune system and defense from the infection. However, how the iron substance mechanisms influence the process in the cellular levels and molecular is unclear yet. In the immune system, Fe plays a significant role. Cell-immune responses by lymphocytes-T can be disrupted because of the decreased formation of those cells, which might be caused by the decrease of DNA synthesis and ribonucleotide reductase enzyme disorders that require Fe to perform its functions. The two key cells which are involved in performing immune functions are lymphocytes and macrophages (Calder, et., al, 2002).

The presence of Zn and Fe as micronutrients in the body is influenced by nutritional status. A child can be considered having a good nutritional status if the micronutrient elements in the body are fulfilled. Zn and Fe will help the activation of the non-specific immune system or innate immunity to help the body's defense in facing the attacks of various microorganisms since it can provide direct responses to the antigen. Therefore, it influences the number of activated lymphocytes-T, the function of phagocytosis, the number of NK cells and level of IL-10 (Zhang, et al., 2012).

The increased number of NK cell will affect the total of IFN- γ levels in the serum so that it will be able to activate the function of phagocytosis macrophages. Macrophages produce IL-12 for the first time. The effect or mechanism of IL-12 is essential because IL-12 has the protective effect, either to kill or inhibit malaria parasites, and to activate phagocytosis by macrophages or to increase the destruction of nitric oxide. IL-10 level is required as the feedback to inhibit the excessive proinflammatory responses that may inhibit the work of macrophages, IL-12, and IFN- γ in order not to continue to Th-1 (Zhang, et., al, 2012).

Children in West Africa typically have anemia (low Hb) after they were born. Anemia may be associated with motor developmental obstacles and learning skills and may affect immunity. In countries that have many cases of malaria, it is recommended that FE supplementation should not be administered in areas with malaria because it may increase the risk of malaria and death. The High doses of Fe given as medicine can cause the increase of free Fe that is circulated in the blood and may enhance the chance of parasitic growth. High doses of Fe given as a drug can lead

to the increased number of free Fe circulating in the blood as well as may also extend the chance of parasitic growth. A study conducted by Ojukwu et al. (2010) find out that iron supplementation does not boost the risk of malaria disease. This is proven by the emergence of fever and the existence of parasites in human's blood and there is no increased risk of death in children treated with iron.

Regarding the existence of the conflicting reports, it is necessary to examine the role of Zn and Fe supplementation given to children after the infection of malaria. This study was conducted to explain the role of Zn and Fe in preventing the recurrence of re-infection of malaria found in children after the infection. The results of research of Zn and Fe role which have been published so far are still oriented to children who are suffering from malaria disease (Ojukwu, 2010). Meanwhile, a study about children who are considered healed from malaria has never been done. Therefore, it is necessary to study the role of Zn and Fe supplementation in children after the infection of malaria with IL-10 and IL-12 as the parameters of immune responses.

The aim of research: This study aims to analyze the results of Zn, Fe along with Zn and Fe simultaneously on IL-10 and IL-12 in elementary school children after malarial infection in endemic malaria areas.

II. MATERIAL AND METHOD

This experimental research provided treatment to the research subjects. The treatments were divided into four groups; the treatment group with @ 20 mg / day Zinc (Zn), Fe @ 20 mg / day, Zn and Fe @ 20 mg / day simultaneously and the control group (placebo). The dose given in this study was 20 mg.

This study employed the Randomized Controlled Trial Pre-Post Test Design by giving a Double-blind treatment. Further, it involved elementary school children who had got the infection of malaria in malaria and endemic area as the research population. After that, this study carried out a screening process based on the inclusion criteria, as follows:

- Group of elementary school children around 9-12 years old.
- After being infected to malaria falciparum and having been treated with anti-malarial medicines.
- Preparations of Plasmodium positive blood by ICT and microscopic.
- Willing to participate in this study after understanding the ways and purposes.
- Exclusion criteria that might cause someone to be excluded from the analysis include:
- Suffering malaria with complications.
- Taking other anti-malarial medicines before or during the treatment.

Subjects in this study were elementary school children who were infected to malaria in endemic malaria area in Dulukapa village, Sumalata subdistrict. Subjects

that are willing to be included in the study were provided information related to the study and were asked to sign the informed consent. In addition, the research sample was taken from the selected population by using the random sampling technique. Simple random sampling was utilized because the population was homogeneous.

A. Tools and Materials

Cotton, 70% of alcohol, anticoagulant EDTA, HNO₃ 5%, concentrated HNO₃, concentrated HClO₃, aquabidest, aquacleanized, acetylene gas, aluminum foil (Aluminum paper), Giemsa parent, PH 7.2 phosphate buffer, immersion oil, Sterile disposable syringe 5 ml, latex handshoe, blood lancet, object glass, masks, EDTA tubes, 5 ml and 2.5 ml disposable syringes, test tubes, 1 ml microtube for serum storage, tourniquet, centrifuge to separate serum, centrifuge tubes, automatic pipette, cooler box to bring samples (Blood and serum), AAS (Automatic Absorbent Spectrophotometer), electric stove / electric heater / coil of Maspion 600 watt, Microplate reader that is able to measure the absorbance at 450 nm with wavelength correction arranged at 540 nm or 570 nm, pipette and tip, Graduated cylinder 500 ml, Squirt bottle, manifold dispenser or Automatic microplate washer, polypropylene tube, weight scales, microtoise to measure the height.

B. Research Operational

Research and survey conducted after obtaining ETIC Certificate from UNAIR's Medical Department, recommendation letter from the Department of Health and Department of National Education of North Gorontalo region. After the study permit was granted by the principal of SDN 3 Dulukapa Sub Sumalata, socialization of the research was held for all parents and students in the school. Explanations and informed consent were requested and signed by parents as a sign of agreement that parents and children were willing to be examined for malaria, and if falciparum malaria was identified, the parents would allow the children and they were also willing to be the research subjects.

Measurement of food intake, screening of research subjects, and compliance of subjects to take the supplement were already performed through recall questionnaires and food frequency, characteristics of questionnaires sample and subject screening, questionnaires of compliance supplements consumption monitoring. Measurement of food intake used the Nutrisoft software.

Identification was conducted to determine the presence of Plasmodium falciparum parasite in the blood, and then there were thick drops and thin drops microscopic examinations and also the examination that utilized ICT (Immunochromatographic Test). After the identification results were obtained, the children who were identified having the infection were treated with ACT (Artemisinin Combination Therapy).

Treatment results were examined on day 14 after medicines distribution, and there was more identification done to check whether there were Plasmodium parasites or

negative plasmodium in their blood. Children recovered from malaria were selected as research subjects according to inclusion and exclusion criteria.

All selected subjects were split into four groups randomly. The division of the group was: group with @ 20 mg / day Zinc (Zn), Fe @ 20 mg / day, Zn and Fe @ 20 mg / day simultaneously and the control group (placebo). The blood of the selected subjects was taken for around 7 ml for laboratory examination, including hemoglobin, leukocytes, hematocrit, platelets, albumin, Zn, Fe, IL-10 and IL-12 as the first research data in the 14th day after infection or before having the Zn and Fe supplements.

After two months of supplementation treatment, the blood of the subjects was re-examined for hemoglobin, leukocyte, hematocrit, platelets, albumin, level of Zn, level of Fe, and level of immune responses (IL-10, IL-12) as the data after the treatment. The obtained data were further analyzed statistically using SPSS software 17.0. Version.

C. Data Analysis

The obtained data were analyzed statistically by using one-way variant analysis (one way ANOVA) with 5% of confidence level ($\alpha = 0.05$). If the results have significantly different effects between treatments (FH > FT), then HA is accepted, and there will be a further test by using LSD to find out which treatment in the modulation of cytokines is significantly different or stronger.

III. RESULT

The malaria examination was conducted to 105 students of Elementary School SDN 3 Dulukapa, Sumalata

Sub-district at grade II - V, aged 7-12 years old. The blood of all children was taken, and the malaria was examined microscopically and by ImmunoChromatographic Test (ICT). Out of 105 students, 79 children are positively infected by malaria falciparum. Besides, five of the children were detected to experience the growth of gametes. Positive samples counted the number of its parasites, then students who were detected with positive malaria were given a treatment with anti-malarial drugs ACT and antacids to avoid nausea as the side effect of the drugs.

After screening through the inclusion and exclusion criteria, 40 children were obtained. Those children were divided into four groups randomly; each treatment group, consisting of ten students, was differently given 20 mg of Zn, 20 mg of Fe, and 20 mg of Zn and Fe simultaneously along with the control group. The supplement was provided for eight weeks in which supplements were given each week from Monday to Saturday, so that there were 48 times in eight weeks.

There were 39 children left until the end of the study, and only one child who did not come at the time of taking the blood. All samples in each group were tested for Hb, leukocyte, thrombocyte, hematocrit, albumin, zinc, Fe and immune response measurements, i.e. IL-10 and IL-12.

➤ IL-10 levels

TABLE OF IL-10 LEVELS ON DAY 14 AFTER MALARIA INFECTIONS AND DAY 48 AFTER TREATMENT OF ELEMENTARY SCHOOL CHILDREN IN DULUKAPA VILLAGE

| Group | Average \pm SD Level IL-10 (pg/ml) | | P (Sigc) |
|----------------------|--------------------------------------|--|----------|
| | Day-14 After Malaria Infection | Day-48 After treatment (Supplementation) | |
| Control | 11,42 \pm 10,65 ^a | 0,58 \pm 0,39 ^a | 0,011 |
| Fe Supplement | 14,26 \pm 11,06 ^a | 0,27 \pm 0,34 ^a | 0,003 |
| Zn Supplement | 12,41 \pm 9,01 ^a | 0,45 \pm 0,32 ^a | 0,004 |
| Zn and Fe Supplement | 12,37 \pm 10,63 ^a | 0,55 \pm 0,40 ^a | 0,007 |

Table 1

The same superscript in the same column shows no difference; SD: Standard Deviation

➤ IL-12 levels

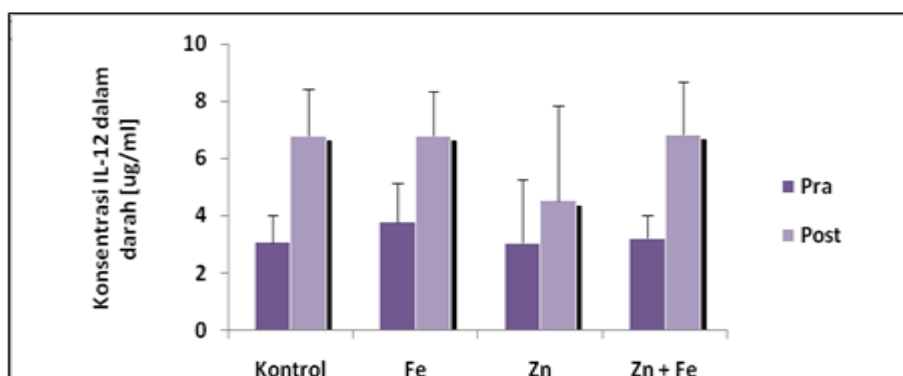


Fig 1:- IL-12 examination results; Pre: Day 14 after malaria infection; Post: Day 48 after the treatment (supplement).

IV. DISCUSSION

The results of IL-10 examination shows that in all treatment and control groups, there is a significant difference between IL-10 levels on the 14th day after malarial infection and IL-10 levels on the 48th day after supplementation. In this study, IL-10 levels in all groups experience a significant decrease. The results of the IL-12 examination reveal that the group given Zn does not show a significant difference; meanwhile, the groups provided by Fe, Zn and Fe simultaneously and the control group go through a significant difference between the IL-12 levels on the 14th day after the malaria infection and the IL-12 levels on the 48th day after supplementation.

Khanam, (2018) states that Zn may increase or inhibit immune responses so that Zn deficiency affects immune responses. Zn deficiency rapidly reduces antibodies and cell-mediated reactions in the fight against parasites and viruses in humans. A mild Zn deficiency is followed by an imbalance of Th1 and Th2 functions, causing an imbalance of endurance on transmission, so that Zn supplementation is still needed.

The results reveal that treatment groups which are given Zn supplements do not significantly increase the levels of IL-12. An approach that can describe this is that Zn supplementation is less favorable if the study subjects have the normal nutritional status of Zn (Muller et al., 2001).

Various studies on humans and animals have demonstrated the presence of cell-mediated immunity and other non-specific immunity in iron deficiency. Nevertheless, the relationship between infection and iron deficiency remains unclear. Susceptibility to infection is very complex and depends not only on Fe content but also on body, parasite and environmental factors, including, exposure to microorganisms, other nutritional deficiency factors, population types (infants, children, women, men, and parents), severity of the disease, duration of deficiency, types and doses of patients, and duration of Fe therapy and other preconditions. These factors affect susceptibility and severity of infection regardless of Fe (Lauffer, 2018).

Changes in cytokine characteristics due to stimulation of immune responses may affect the status of Fe and erythrocytes. Chronic immune stimulation is usually accompanied by a decrease in serum Fe content. Serum Fe reduction is used to reduce the availability of Fe in an attempt to stop cell proliferation, reduce radical oxygen products and or prevent the use of iron for the growth of germs. The effect of cytokines on the availability of Fe is primarily mediated by the absorption of Fe in the duodenal epithelium and inhibits the release of Fe from macrophages with the aim that Fe is not readily accessible by pathogens (Koorts et al., 2011)

At the time of infection, IL-12 proinflammatory cytokines are responsible for eliminating parasites. These results should not be the same in every geographic region;

IL-12 will shift in any acute conditions. IL-10 is not particularly needed to assist IL-12 in removing parasites during TNF- α and IFN- γ excessive production. If IL-12 is optimal to kill parasites through T regulators, it does not necessarily require IL-10 (Abdalla and Pasvol, 2004). It is known that an increase or decrease in IL-12 links with the disease severity. Lyke's study (2004) discovers a slight increase in IL-12 in severe malaria compared to uncomplicated one. The results of Abdalla S, Pasvol G. Platelets and blood coagulation in human malaria. In: Newton PN, Essien E, White NJ, editors. The Haematology of Malaria. London, UK: Imperial College Press; (2004) 249-276. This study finds out the lower IL-12 levels in severe malaria compared to mild malaria ($p < 0.001$). The results of this study show the lower levels of IL-12 in positive malaria infection status, but the statistical test cannot be performed due to the small number of samples. The little cause of IL-12 increase is probably because of the down-regulation by IL-10, or a combination of impaired phagocytic function due to the hemozoin consumption.

Malagnarnera et al. (2002) note that IL-18 and IL-12 rates in children with mild malaria are higher than the severely malarial children. These findings suggest that the production of these two cytokines (IL-18 and IL-12) may be corregulated and both have immunoregulatory effects on the immune response to *Plasmodium falciparum* infection.

The right balance between proinflammatory along with anti-inflammatory cytokines that mediate the innate and adaptive immune response is necessary for effective protection against malaria in humans and to avoid immunopathology. Macrophages release IL-12 for the first time. The IL-12 effector mechanism is very important because it has a protective effect either to kill or inhibit parasites, activate phagocytizes or increase the destruction of nitric oxide. IL-12 may also increase sequestration of adherens in parasitic vessel walls. The infected red blood cells will attach themselves to the endothelial wall.

IL-12 levels are further enhanced by IL-6 and TNF- α . So in people with increased TNF- α , the inflammatory response is weighty and is not necessarily better. As a result, it requires an inhibitor by way of feedback to prevent excessive inflammatory response by removing anti-inflammatory or anti-inflammatory cytokines, i.e. IL-10. This implies that IL-10 will block IL-12 and IFN- γ from continuing to TH1. When it goes down, it will be maintained in TH2 using TGF- β . TGF- β is an early and most noticeable cytokine response that inhibits IFN- γ . If it cannot be inhibited, hemofagocytosis will occur, and the red blood cells will be damaged constantly. Normal red blood cells will be damaged and increasing adhesion molecules. If the adhesion molecule is added, the sequestration also increases so that cerebral malaria may occur (Mbugi, 2009).

There is no difference between the treatment and the control of the possibility caused by the action of the drugs given to the children who are likely to make the parasite hide or recrudescence to provide an opportunity for the

body of the children to have improved nutrition. Lubis (2008), in his study of reticulocyte counts, states that after treatment, the reticulocyte response can be seen in 48-72 hours, with a maximum response of days 5-10. The result of this study is that in the case of malaria that is classified as seasonal, with low transmittance and low API value, produces protective levels of the IL-12. Generally, in areas with low transmittance and low API values and seasonal, malaria cases often break out due to the unstable or periodic parasite exposure, so that the body is unable to stimulate the immune system. In this study, IL-12 levels are increased after the supplementation of Fe and Zn, while IL-10 is decreased. An approach that can describe the situation is that the presence of seasonal malaria, low transmissibility, low API values and abnormal Zn levels in the 9-12-year-old children group lead to increased protective IL-12 levels, so that IL-10 is no longer needed for re-stabilizing the levels of IL-12. For this reason, the levels of IL-10 in this study are decreased.

REFERENCES

- [1]. Abdalla and Pasvol, (2004). *Platelets and blood coagulation in human malaria*. In: Newton PN, Essien E, White NJ, editors. The Haematology of Malaria. London, UK: Imperial College Press; (2004) 249-276.
- [2]. Calder, et., all, 2002, *Nutrition and Immune Function*. CABI Publishing in Association With The Nutrition Society. New York
- [3]. Koorts et al., 2011, *Pro- and Anti-Inflammatory Cytokines during Immune Stimulation: Modulation of Iron Status and Red Blood Cell Profile*. Hindawi Publishing Corporation Mediators of Inflammation Volume 2011, Article ID 716301, 11 pages doi:10.1155/2011/716301
- [4]. Lauffer.R.B, (2018). *Iron and Human Disease*. CRC Press. NMR Center and Massachusetts General Hospital and Harvard Medical School, Boston Massachusetts.
- [5]. Khanam, 2018. *Impact of Zinc on Immune Response*. Department of Biological Sciences, Yobe State University, Nigeria
- [6]. Müller O, Becher H, van Zweeden AB, et al., 2001. *Effect of zinc supplementation on malaria and other causes of morbidity in west African children: randomised double blind placebo controlled trial*. BMJ 2001;322:1–5.
- [7]. Wei Fu, et.,al, 2013. *Effects of Zinc Supplementation on the Incidence of Mortality in Preschool Children: A Meta-Analysis of Randomized Controlled Trials*. Published online. doi: 10.1371/journal.pone.0079998
- [8]. Zhang, et.,al, 2012. *Interleukin-10 (IL-10) Polymorphisms Are Associated with IL-10 Production and Clinical Malaria in Young Children* DOI: 10.1128/IAI.00261-12 · Source: PubMed