

Letters in Applied NanoBioScience

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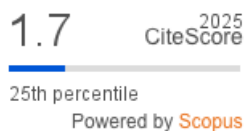
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2019-2025

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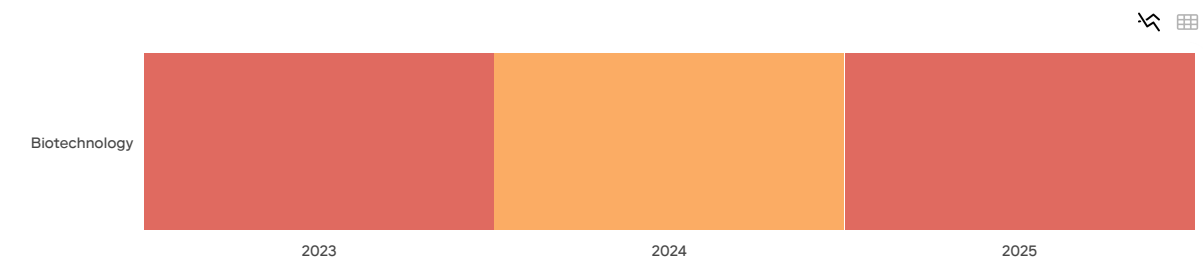
Scope

With 4 issues per year, Letters in Applied NanoBioScience is a platinum open access journal that publishes papers covering the structure, properties, and processes of nanoscale phenomena in biological and bioinspired structures and materials for a range of engineered systems. Submitted original research papers should represent a novel and important contribution to the understanding of any area at the frontier with Nano and Bio Science. Letters in Applied NanoBioScience is a peer-reviewed international journal. By covering original research works in the extended field of bio and nanoscience, our journal is expected to increase our understanding of life at the cellular and molecular levels. For this purpose, Letters in Applied NanoBioScience aims to encourage publications with original research. Letters in Applied NanoBioScience publishes Original Research papers. Letters in Applied NanoBioScience provides a comprehensive examination of topical areas in bio and nanomaterials, or biomedical research. All contributions are published in English. Independent peer-review system guarantees that all studies appearing in Letters in Applied NanoBioScience will be of a high

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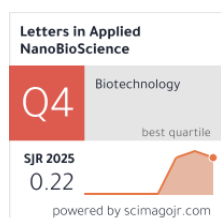
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J

Jamal Houssaini

9 months ago

Dear Editor,

I am writing to kindly inquire about the current status of our manuscript submitted to AMG Transcend Association: Manuscript ID: lianbs-4519, Title: "Structural and Functional Properties of Cellulose/Mg–Al Layered Double Hydroxide Biocomposites: Effects of Synthesis Methods and Thermal Stability".

Authors: Soumia Mekdad, Hamid Ziyat, Jamal Houssaini, Mohammed Naciri Bennani, Marwa Alaqrbeh,

Date of resubmission: 03 August 2025, We would be grateful if you could provide us with an update regarding the review process. Thank you very much for your time and assistance.

Kind regards,

Jamal Houssaini

reply



Melania Ortiz - SCImago Team

9 months ago

Dear Jamal,

Thank you for contacting us.

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H

Houssaini Jamal

1 year ago

je veut publier un article?

reply



Melanie Ortiz

1 year ago

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Dear Houssaini, 

Thank you for contacting us.

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We suggest you visit the journal's homepage (See submission/author guidelines) or contact the journal's editorial staff , so they could inform you more deeply.

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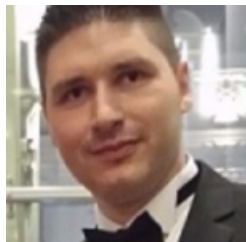
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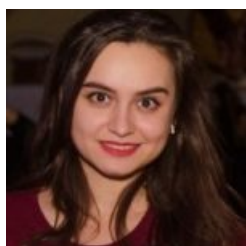
Alexandru Mihai Grumezescu

Department of Science and Engineering of Oxide Materials and Nanomaterials, Faculty of Applied Chemistry and Materials Science, Politehnica University of Bucharest, Romania

Scopus* (<https://www.scopus.com/authid/detailUri?authorId=36503987100>)

Research interests: nano and biomaterials, drug delivery and targeting, antimicrobial thin coatings, antimicrobial nanoparticles.

Managing Editor



Adelina Niculescu

Faculty of Engineering in Foreign Languages, University Politehnica of Bucharest, Romania

Research interests: synthesis of organic nanoparticles; drug delivery and targeting.

Associate Editors

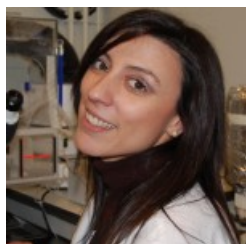


Ephraïm Suhir  

Portland State University, Depts. of Mech. and Mat., and Elect. and Comp. Engineering, Portland, OR, USA
| Technical University, Dept. of Applied Electronic Materials, Inst. of Sensors and Actuators, Vienna, Austria

Scopus* (<https://www.scopus.com/authid/detailUri?authorId=57206232654>)

Research interests: Applied Mathematics and Mechanics, Applied and Mathematical Physics; Materials Science and Engineering; Analytical (Mathematical) Modeling in Applied Science and Engineering;



Monica Cartelle Gestal

Department microbiology and immunology, Gratis Associate Professor Pediatrics LSU Health Science, Shreveport Shreveport, Louisiana USA

Scopus* (<https://www.scopus.com/authid/detailUri?authorId=56037430000>)

Research interests: antibiotic resistance, its relationship to quorum sensing (virulence and pathogenesis) and to discover new targets; development of nanotechnology coated medical devices and antibiotic

shuttle systems;

Advisory Board



Mariana Carmen Chifriuc

Department of Microbiology, Faculty of Biology, University of Bucharest, Romania

Scopus* (<https://www.scopus.com/authid/detailUri?authorId=16309032500>)

Research interests: investigation of antibiotic resistance at phenotypic, molecular and epidemiological level; phenotypic and genotypic investigation of bacterial virulence; investigation of host-infectious

agents relationships by *in vitro* and experimental pathology assays; assessment of novel chemical structures for their antimicrobial activity); nanotechnology in microbiology;



Dan Eduard Mihaiescu

Department of Organic Chemistry, Faculty of Applied Chemistry and Materials Science, Politehnica University of Bucharest, Romania

Scopus* (<https://www.scopus.com/authid/detailUri?authorId=6602674733>)

Research interests: thin coatings, laser ablation, nanomaterials, drug delivery;



Keng-Shiang Huang

The School of Chinese Medicine for Post-Baccalaureate, I-Shou University, Taiwan

Scopus* (<https://www.scopus.com/authid/detailUri?authorId=7403187825>)

Research interests: microfluidic controlling; microdroplet; microfluidic chip fabrication; antimicrobial polymers; pulsatile delivery;

Editorial Board

Marcello Iriti

Department of Agricultural and Environmental Sciences, Faculty of Agricultural and Food Sciences, Milan State University, Italy

Scopus* (<http://www.scopus.com/inward/authorDetails.url?authorID=6506548774&partnerID=MN8TOARS>)

Research interests: Bioactive phytochemicals, foods and medicinal plants.



Goutam Rath

Department of Pharmaceutics, ISF College of Pharmacy, GT Road (NH-95), Ghal Kalan, India

Scopus* (<https://www.scopus.com/authid/detailUri?authorId=35732275200>)

Research interests: Development and characterization of novel carriers for wound healing; Enzymatic debridement, a wound feedback loop for improved outcomes;



Gassan Hodaifa Meri

Pablo de Olavide University, Experimental Sciences Faculty, Molecular Biology and Biochemical Engineering Department, Spain

Scopus* (<https://www.scopus.com/authid/detailUri?authorId=35326899000>)

Research interests: Microorganism growth; Biotechnology of Microalgae; Biomass; Kinetic growth; Biochemical composition of the biomass; Enzymes technology; Advanced oxidation processes; Wastewater treatment; Pesticides removal; Nematode growth; Chemical Engineering; Food Engineering.



Li Zhou

Key Laboratory of New Processing Technology for Nonferrous Metal and Materials (Ministry of Education), College of Materials Science and Engineering, Guilin University of Technology, China

Scopus* (<https://www.scopus.com/authid/detailUri?authorId=57164679600>)

Research interests: Functional inorganic and polymer nanomaterials for biological and environmental applications.



Department of Pharmaceutical Technology, Division of Pharmacognosy, Pharmacognosy and Phytotherapy Research Laboratory, Jadavpur University, India

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=7202228971>)

Research interests: Pharmacognosy and Phytotherapy Research , Traditional Medicines & Drug Discovery;



Nima Rezaei

Children's Medical Center Hospital, Dr. Qarib St, Keshavarz Blvd, Iran

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=57204849465>)

Research interests: Paediatric Immunology and Infectious Diseases; genetics & heredity; immunology; primary immunodeficiency disorders; Cancer Immunology;



Pradeep K Sengupta

Department of Biophysics Molecular Biology and Bioinformatics, University of Calcutta, 92 Acharya Prafulla Chandra Road, India

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=7103155174>)

Research interests: Bio and nano materials; Pharmacologically active phytochemicals , and their binding to biomolecular targets, and their inclusion in nano-vehicles for drug delivery, explored via spectroscopic and computational tools.



Hrudayanath Thatoi

Department of Biotechnology, College of Engineering and Technology, Biju Patnaik University of Technology, India

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=18134726400>)

Research interests: Fermentation technology, Enzyme purification and characterisation; DNA and plasmid isolation, PCR Amplification; Metal-microbe interaction and bioremediation study; DNA fingerprinting, RFLP, RAPD analysis, Metagenomic analysis;



Hazizan bin Md Akil

School of Materials and Mineral Resources Engineering, Engineering Campus, Universiti Sains Malaysia, Malaysia

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=7102836574>)

Research Interests: Polymer Composites, 3D printing of polymers and Hydrogels



Shakeel Ahmed

Department of Chemistry, Government Degree College Mendhar, Mendhar, India

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=36659088500>)

Research interests: Green Nanomaterials; Nanocomposites; Advanced Green Materials

Deliyanni A. Eleni

Department of Chemistry, University of Thessaloniki, Greece

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=6602894786>)

Research interests: Adsorption/separation processes in environmental applications; Materials Chemistry; Synthesis and surface characterization of new adsorbent materials; Modification/impregnation of materials; Carbon materials as adsorbents; Graphite oxide based/polymer nanocomposite adsorbents; Deep desulfurization of fuels; Biomass conversion to activated carbon; Advanced oxidation processes/Catalytic oxidation;



Badal Kumar Mandal

Department of Chemistry, School of Advanced Sciences, VIT University, India

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=7102080708>)

Research interests: interaction between metal nanoparticles and toxic heavy metals, remediation of toxic heavy metals using metal nanoparticles and toxic effects of nanomaterials;



Ren-Cun Jin

College of Life and Environmental Sciences, Hangzhou Normal University, China

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=10142829600>)

Research interests: water pollution control and environmental biotechnology, which includes biological nitrogen removal technology (i.e., anaerobic ammonium oxidation) development, high-efficient bioreactor design, and optimization of wastewater treatment system for energy-saving and pollutant-reduction;



Monica Cristina Sakizlian

Department of Physical Education and Sport, University of Bucharest, Romania

Research interests: Human Motricity Sciences, Quality of Life



Rania Mohammed Hafez Mohammed Hathou

Department of Pharmaceutics and Industrial Pharmacy, Faculty of Pharmacy, Ain Shams University, Egypt

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=15730942800>)

Research interests: preparation of different drug and gene delivery carriers such as vesicles and colloidal nanoparticles whether polymeric or lipid using different methods and studying the different physico-chemical factors influencing the morphology, particle size and stability of these drug carrier; computer-assisted dosage form design is my novel approach to drug delivery involving several bio and cheminformatics tools;



Kailas L. Wasewar

Department of Chemical Engineering, Visvesvaraya National Institute of Technology (VNIT), India

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=6506156879>)

Research interests: Biotechnology, Reaction Engineering, Process Intensification, Separation Technology, Environmental Engineering, Ionic Liquids, Nanotechnology, CFD, Modeling & Simulation, and Reliability Engineering;



Amir Mohammad Mortazavian

Faculty of Nutrition Sciences, Food Science and Technology, Shahid Beheshti University of Medical Sciences, Iran

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=12792054500>)

Research interests: Dairy science and technology (esp., fermented milks)

Functional foods; Probiotics and prebiotics in food products; Food chemistry (esp., food ingredient interactions);

Poonam Tandon

Physics Department, University of Lucknow, Lucknow, India

Scopus* (<https://www.scopus.com/authid/detail.uri?authorId=36765652500>)

Research interests: Working on gas sensing applications of nano-materials, active pharmaceutical ingredients, synthetic and bio polymers, conducting polymers, biodegradable polymers. Research forté; Experimental and theoretical studies on vibrational spectroscopy, molecular dynamics, phonon dispersion, phase transition, DFT, ab initio dynamics and structural developments, structure activity relationship.

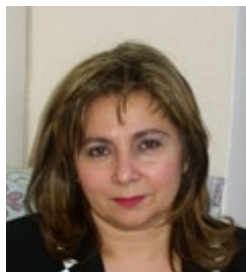


Keng-Liang Ou

College of Oral Medicine, Taipei Medical University, Taiwan

Scopus* (<https://www.scopus.com/authid/detail.uri?authorId=55660541800>)

Research interests: Biomedical Engineering; Bioengineering; Clinical Trials; Dentistry; Engineering Physics; Dental Surgery;



Eugenia Bezirtzoglou

Democritus University of Thrace Faculty of Agricultural Development, Department of Food Science and Technology, Greece

Scopus* (<https://www.scopus.com/authid/detail.uri?authorId=7003748111>)

Research interests: microbial ecology, gastrointestinal microflora, food and environmental microbiology.



Carmen Limban

Department of Pharmaceutical Chemistry, "Carol Davila" University of Medicine and Pharmacy, Romania

Scopus* (<https://www.scopus.com/authid/detail.uri?authorId=15072175400>)

Research interests: Medicinal and Pharmaceutical Chemistry; Materials Chemistry; Antimicrobials; Natural Product Chemistry; Heterocyclic Chemistry; Organic Chemistry; Chemical Synthesis; IR; Pharmaceutical Chemistry;



Goodarz Ahmadi

Department of Mechanical and Aeronautical Engineering, Clarkson University, USA

Scopus* (<https://www.scopus.com/authid/detail.uri?authorId=35547337300>)

Research interests: modeling pollutant transport, dispersion and turbulent flows of dense and dilute, solid-gas or liquid mixtures with application to coal transport and processing, spray formation, and hot-gas filtration

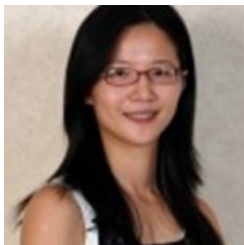


Chih-Hui Yang

Department of Biomedical Engineering Research Center, I-Shou University, Taiwan / National Applied Research Laboratories Taiwan, Taipei, Taiwan

Scopus* (<https://www.scopus.com/authid/detail.uri?authorId=35231667200>)

Research interests:



Ming-Yu Lin

Instrument Technology Research Center, National Applied Research Laboratories, Taiwan

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=55476715600>)

Research interests:



Chih-Yu Wang

Department of Biomedical Engineering, I-Shou University, Taiwan

Scopus[®]

Research interests:

Biomedical Engineering; Biomedical Devices; Biomedical Imaging; Biomedical Instrumentation; Medical

Electronics;



Yung-Sheng Lin

Department of Chemical Engineering, National United University, Taiwan

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=7406582638>)

Research interests: Implants; Tissue engineering; Biomedical Engineering; Biomedical Devices; Biomedical Imaging; Biomedical Instrumentation; Medical Electronics;



Veronica Lazar

Department of Microbiology, Faculty of Biology, University of Bucharest, Romania

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=16310319700>)

Research interests: applied microbiology; Immunology; Virology;



Mariana Chirea

Faculdade de Ciências, Universidade do Porto, Portugal

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=9940726100>)

Research interests: Electron transfer kinetics at films composed of spherical nanomaterials and polymers, thiol and nanorods, thiol and nanostars or films of nanodendrites for applications in electrochemical sensing, fuel cells or energy storage devices; catalytic activity of nanomaterials in various chemical reactions with industrial applications;



Coralia Bleotu

Stefan S. Nicolau Institute of Virology, Bucharest, Romania

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=8315543500>)

Research interests: Bacterial Cell Culture; Antimicrobials; Antibiotic Resistance; Antibiotics; Pathogens; Bacteria; Microscopy; Bacterial Antibiotic Resistance; Biofilm Formation; inflammatory Diseases;



Francesco Baino

Department of Applied Science and Technology, Politecnico di Torino, Italy

Scopus[®] (<https://www.scopus.com/authid/detail.uri?authorId=23395786300>)

Research interests: bioceramics, bioactive glasses and composite biomaterials for tissue engineering and medical implants, as well as processing and testing of advanced ceramics

**Nejat Düzgünes**

University of the Pacific, Arthur A. Dugoni School of Dentistry, San Francisco, USA

Scopus* (<https://www.scopus.com/authid/detail.uri?authorId=7005556406>)

Research interests: Gene therapy of oral cancer; Eliminating HIV-infected cells; Targeted non-viral vectors for gene delivery; Therapy of oral Candida and Porphyromonas infections;

**Oguzhan Gunduz**

Centre of Nanotechnology & Biomaterials Applied and Research at Marmara University, Turkey

Scopus* (<https://www.scopus.com/authid/detail.uri?authorId=12797373800>)

Research interests: Bone cements, Bioceramics, Drug delivery nanocarries.

**Jianlin Liu**

School of Pipeline and Civil Engineering, China University of Petroleum, Qingdao, P.R. China

Scopus* (<https://www.scopus.com/authid/detail.uri?authorId=55705987500>)

Research interests: soft matter mechanics, applied mathematics, nonlinear mechanics in structures and micro/nano-mechanics;

**Nicolae Corcionivoschi**

National Children Research Centre, Crumlin, Dublin, Ireland

Scopus* (<https://www.scopus.com/authid/detail.uri?authorId=26534062800>)

Research interests: bacterial virulence, isolation and testing of novel pre and probiotics, and the development of novel technologies for more efficient detection of foodborne pathogens

**Wameath Sh. Abdul-Majeed**

University of Nizwa, Oman

Scopus* (<https://www.scopus.com/authid/detail.uri?authorId=54402262400>)

Research interests: application of non-thermal plasma in industrial fields, and the environmental and health sectors;

**Alina Maria Holban**

Department of Microbiology, Faculty of Biology, University Politehnica of Bucharest, Romania

Scopus* (<https://www.scopus.com/authid/detail.uri?authorId=55630243600>)

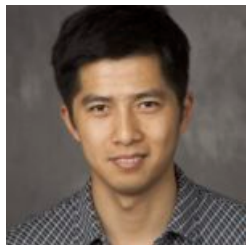
Research interests: antimicrobial therapy; nanostructured drugs; biofilms; host-pathogen interactions;

**Valentina Grumezescu**

Lasers Department, National Institute for Lasers, Plasma and Radiation Physics – INFLPR, Magurele, Romania

Scopus* (<https://www.scopus.com/authid/detail.uri?authorId=55209888700>)

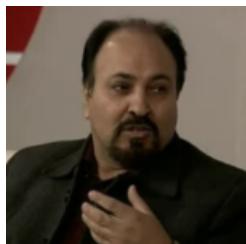
Research interests: thin coatings; modulation of microbial biofilm; drug targeting; hard tissue engineering;



State Key Laboratory of Food Science and Technology, 1800 Lihu Avenue, China

Scopus* (<https://www.scopus.com/authid/detailUri?authorId=36840373200>)

Research interests: Nutraceuticals; Functional foods; Nutrition; Food Science;



Majid Monajjemi

Department of Chemistry, Science and Research Branch, Islamic Azad University, Iran

Scopus* (<https://www.scopus.com/authid/detailUri?authorId=6701810683>)

Research interests: molecular modeling and QM/MM calculations of macro-biomolecules, electronic structure calculations of nano-biomolecules, non-bonded electronic structure of BnNn rings, NMR contour maps, and quantum investigations of non-bonded interactions

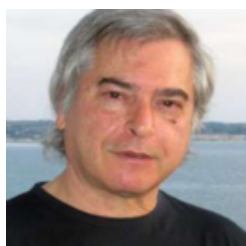


Andivelu Ilangovan

School of Chemistry, Bharathidasan University, India

Scopus* (<https://www.scopus.com/authid/detailUri?authorId=6506677005>)

Research interests: organic chemistry; natural products; biological evaluation of organic compounds; crystal structure; biomimetic structures;



Elias C. Aifantis

Aristotle University of Thessaloniki, Greece / Mechanics and Optics University ITMO, Saint Petersburg, Russian Federation

Scopus* (<https://www.scopus.com/authid/detailUri?authorId=34871245600>)

Research interests: dislocation patterning and material instabilities, gradient elasticity and plasticity, chemomechanics and nanomechanics.

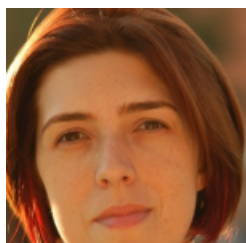


Tadeusz Hryniewicz

Department of Engineering and Informatics Systems, Koszalin University of Technology, Poland

Scopus* (<https://www.scopus.com/authid/detailUri?authorId=6604026438>)

Research interests: Machine technology, Surface technology, Surface electrochemistry studies, Hydrogen embrittlement cases, Electrochemical corrosion studies, Plasma Electrolytic Oxidation.



Iola Melissa Fernandes Duarte

CICECO – Aveiro Institute of Materials, Department of Chemistry, University of Aveiro, Portugal

Scopus* (<https://www.scopus.com/authid/detailUri?authorId=7007025414>)

Research interests: immune metabolic deregulations in chronic inflammatory diseases; tumour metabolism, anticancer drugs and nanomedicines, biological responses to nanomaterials.



Mustafa Turkyilmazoglu

Department of Mathematics, University of Hacettepe, Turkey

Scopus* (<https://www.scopus.com/authid/detailUri?authorId=6603562364>)

Research interests: Fluid mechanics, Hydrodynamic stability theory, Rotating-disk flow, High-Reynolds number flows, Triple-deck asymptotic theory of compressible viscous flows, Numerical simulation.

**Javed Ali**

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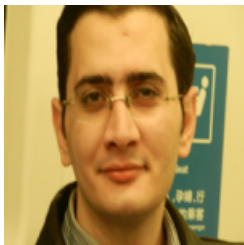
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Stress Influence on the Adverse Events Emergence after Coronavirus Disease (COVID-19) Vaccination

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Abstract: An individual's response to a threatening alteration is called stress, whereas a stressor is defined as a personal reaction to an external event. Since the COVID-19 disease pandemic was first announced, vaccination has become one of the government's controls and prevention measures to overcome the pandemic. Prolonged stress can lead to the inefficacy of the vaccine, thus promoting more immediate and transient vaccine adverse events. This study aimed to seek the relationship between stress and adverse event incidence after COVID-19 vaccination. The cross-sectional study was conducted on 244 respondents (18 – 40 years old) in Depok City, Indonesia. Stress levels were assessed by the Perceived Stress Scale, while Side Effects of COVID-19 vaccination and Opinion Survey were collected immediately after the vaccination. The data were analyzed using the Chi-Square test regarding stress on the adverse events after COVID-19 vaccination with a significance level of $p < 0.05$, p -value = 0.000. The relationship between sex and age with the incidence of the adverse event after COVID-19 vaccination obtained p -values of 0.951 and 0.490, respectively. This study showed that the incidence of the adverse event after COVID-19 vaccination was statistically related to stress but not sex and age.

Keywords: stress level; COVID-19 vaccine; side effects.

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1. Introduction

Since 2020, the world has struggled to overcome a viral respiratory disease, called coronavirus disease 2019 (COVID-19), caused by SARS-CoV-2. The world started focusing on Hubei province in the People's Republic of China in October 2019, as this was the first encounter, even though later, scientists found coronavirus in several wastewater samples in Spain in March 2020 [1]. Control efforts to sluggish the transmission of COVID-19 disease and reduce soundness impacts have been carried out by various countries in the world, including Indonesia [2], by implementing social distancing, partial and or complete lockdowns, school or work activities were done from home, closing places of business, and the urge to wear masks in public places [3].

Forms of COVID-19 that spread rapidly have emerged over the last two years. An increase in the incidence of COVID-19 has been reported as soon as the re-opening of community and economic activities, and other new variants are likely to emerge in the future [4]. Therefore, there is an urgency for long-range prevention efforts, and vaccination is one of

the effective and efficient means to protect the public from the effects of SARS-CoV-2 [5,6]. In January 2021, Indonesia began implementing the COVID-19 vaccination program, and almost all developed vaccine types, such as inactivated whole virus, protein subunit, or viral vector, are used nowadays [7,8]. The vaccine's efficacy sometimes is lower than expected, as it may depend on the person who accepts the vaccine [9,10].

As the pandemic was declared by WHO in March 2020, this disease has already spread through more than 200 countries, thus causing confusion and stress to the population worldwide. Stress is the body's reaction to tension or stressors often set off while encountering new, unforeseen, or compromising circumstances [11]. Stressors can incorporate mental, social, and psychological factors that may extensively impact the immune response to the vaccine [12]. Psychological factors yield a counteracting agent reaction toward immunizations, especially in younger people [10,13]. There is proof that as well as lessening the viability of immunizations, stress can set off extra brief and transitory secondary effects, including fatigue and a terrible attitude [9,14]. One study from the University of Ohio revealed that when an individual is more worried and restless about getting a COVID-19 inoculation, it might take more time for antibodies to create, and incidental effects might happen after immunization [10,15].

Regarding the limited data about the effect of stress on adverse events after COVID-19 vaccination, we aim to carry out this research on adult people confirming the occurrence of adverse events after vaccination as the recipients went through the process of vaccination under stress.

2. Materials and Methods

2.1. Study population and ethics.

The research was conducted for 3 months, from August until November 2021. As many as 244 persons, 85 men and 158 women aged 18–40 years old, and have received two doses of the COVID-19 vaccine from four villages in Limo sub-district, Depok city, Indonesia, were recruited as respondents. This study received ethical approval from the Trisakti University Medical Research Ethics Commission (protocol code 56/KER-FK/IX/2021).

2.2. Methods.

The stress level was assessed using questionnaires according to Hary & Pricianee [7], including the perceived stress scale. Meanwhile, the events subsequent to getting a COVID-19 vaccination were assessed Side Effects and Opinions Following COVID-19 Vaccination.

2.3. Statistical analysis.

The data were statistically analyzed using the Chi-square test to see whether there is a relationship between stress and adverse events after COVID-19 vaccination. Statistical analysis was performed using SPSS 25.0 for Windows software with a 95% confidence level ($\alpha = 0.05$). Results were considered statistically significant at $p < 0.05$.

3. Results and Discussion

As of 2nd February 2022, more than 4.3 million people in Indonesia have been diagnosed with coronavirus 2019 (COVID-19), and over 144,000 of them passed away [16]. A

powerful and effective vaccine to save many lives consistently is one method to overcome this pandemic [17]. Accepting vaccines in the community is an important component of achieving high vaccination coverage [18]. Table 1 shows that women and the middle-aged population are more likely to comply with the government's regulation in receiving a full vaccination package.

It has been known widely that sex differences stand as one factor that may affect the immune response [19], in addition to natural elements and psychosocial factors [20]. We found no significant relationship between sex and the incidence of adverse events after COVID-19 vaccination ($p = 0.951$). The Centers for Disease Control and Prevention (CDC) reports that most responses to COVID-19 immunization are not serious, and over 79% of those happen in females [21].

Table 1. Characteristic of Respondents.

Variables	SE positive (%)		SE negative (%)		Total N (%)	p-Value
Sex						
- Male	31	35,23	57	64,77	88 (36,07)	0,951 ^a
- Female	54	36,1	102	65,38	156 (63,93)	
Age						
- 18- 39	27	28,12	69	71,87	96 (39,34)	0,490*
- 40-59	65	45,77	77	54,22	142 (58,20)	
- >60	5	83,33	1	16,67	6 (2,46)	
Stress Level						
- Low	40	58,82	28	41,18	68 (27,87)	0,000*
- Moderate	48	27,91	124	72,09	172 (70,49)	
- Severe	1	25,0	3	75,0	4 (1,64)	

^a Chi-Square test, $p < 0,05$

* Mann-Whitney test, $p < 0,05$

Vaccination is a way to activate the body's immune system by introducing a weakened pathogen or a part of the pathogen to the human's body, but sometimes there would be side effects following vaccination. This situation happens when the inflammatory response is exceeding than expected. Various studies showed that women generally have stronger and healthier immune systems, which leads to higher antibody production, making women more susceptible to the side effects of the COVID-19 vaccine than men [20,21]. A study by Gee et al. [22] analyzed the safety data of more than 13 million doses of the first COVID-19 vaccine administered in the United States of America (USA) alone. This study concluded that side effects appeared more in women than men, even though the vaccine was given to only 61 women. Ilardi et al. [23] concluded in a research report that COVID-19 infection risk factors also comprised sex and age.

Age is one important factor determining vaccine response, as age triggers immune response modification. This study's findings showed no statistically significant relationship ($p = 0.490$) between age and adverse events. Unfavorable occasions that happen after COVID-19 immunization at all ages are generally similar, and there is no distinction in either onset or severity. We also found a smaller portion of the respondents aged > 60 who experienced adverse events after the COVID-19 vaccination compared to younger adults. Beatty *et al.* also reported the same results, as adverse events were more common in younger respondents [24].

Another significant characteristic of the maturing immune system is a low-level pro-inflammatory cytokine, as can be seen in older people, contributing to the vulnerability of infection. This phenomenon also leads to a lack of response to vaccination [21,25]. Younger adults generally have a more robust immune system, resulting in a firmer immune response to vaccines and a higher-up of adverse events. In contrast, one study concluded that the frequency of adverse events was the same across the age groups, but the tendency increased along with

age [18]. Another preceding study further stated that there was no relation between age and the incidence of adverse events after COVID-19 vaccination [26].

Albeit the security and viability of several COVID-19 immunizations have been validated, the people in the community have many considerations regarding the adverse effects. Those concerns greatly impacted public readiness to have vaccines, thus lowering vaccination coverage [27,28].

Even though stress is a normal defense mechanism in humans, excessive stress could harm physical health by inhibiting the human immune response [29]. Psychological stress or anxiety interfacing with COVID-19 immunization needs to be lowered for self-confidence boosting and forbearance of vaccination [30,31]. Some studies showed that stress is one of the variables that can repress the immune reaction in vaccination, thus simultaneously triggering side effects following COVID-19 vaccination from mild to moderate levels [10,15]. One foregoing study stated that stress is related to the beginning of adverse effects after the COVID-19 vaccination [26], as another study revealed that the adverse effects might be varied from lower efficacy to nocebo effect [32] due to disruption and unbalanced binding of hormones and receptors, which leads to glucocorticoid receptor resistance, and at the end which will affect the body's immune system. The nocebo impact is a negative response characterized by hostile side effects and mostly triggered by a negative mindset that an undesirable event will occur following vaccine management or other clinical intervention. Nocebo effect could be systemic or just local symptoms, including local pain at the injection site, fatigue, and headache [32,33].

Similar to the past report, the respondents' anxiety in this examination showed a huge relationship with the occurrence of unfriendly occasions after COVID-19 immunization. Stress and negative contemplations can influence the immunization reaction, particularly the lower neutralizer reaction after inoculation, which can fortify and stretch out the intense provocative response to the antibody, thus invigorating the beginning of unfavorable occasions after COVID-19 inoculation [11,34,35].

4. Conclusions

This research reaffirms that stress is related to the frequency of adverse events following COVID-19 vaccination. Sex and age are believed to have a role in influencing the immune system response; however, in this research, there was no significant relationship between sex and age with the incidence of adverse events after COVID-19 vaccination. A better understanding of other psychological factors is needed to adjust the vaccination implementation strategy to get high coverage of any vaccination.

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Conflicts of Interest

The authors declare no conflict of interest.

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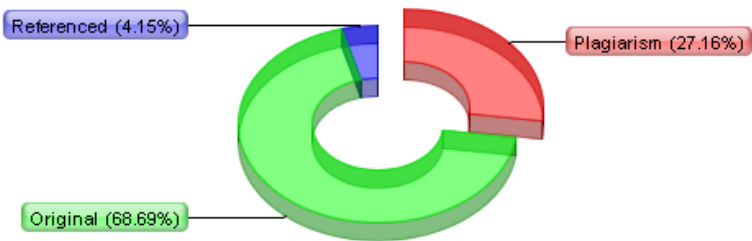
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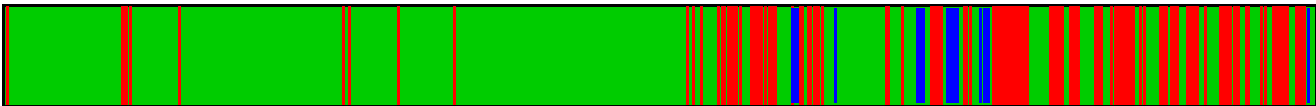
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33263/LIANBS120.000 Stress Influence on the Adverse Events Emergence after Coronavirus Disease (COVID-19) Vaccination Machrumnizar machrumnizar 1,2, Rania Marwa Dinar Arif 3, Suriyani Tan 1,2,*1

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Abstract:

An individual's response to a threatening alteration is called stress, whereas stressor is defined as personal reaction to an external event. Since the COVID-19 disease pandemic was first announced, vaccination has become one of the government's controls and prevention measures to overcome the pandemic. Prolonged stress can lead to inefficacy of the vaccine, thus promoting more immediate and transient vaccine adverse events. This study aimed to seek the relationship between stress and the adverse events incidence after COVID-19 vaccination. The cross-sectional study was conducted on 244 respondents (18 - 40 years old) in Depok City, Indonesia. Stress levels were assessed by Perceived Stress Scale, while Side Effects of COVID-19 vaccination and Opinion Survey were collected immediately after the vaccination. The data were analyzed using the Chi-Square test regarding stress on the adverse events after COVID-19 vaccination with a significance level of $p = 0.05$, p value = 0.000. The relationship between sex and age with the adverse events incidence after COVID-19 vaccination obtained p -values of 0.951 and 0.490, respectively. This study showed the adverse events incidence after COVID-19 vaccination was statistically related to stress, but not to sex and age. **Keywords:** stress level; COVID-19 vaccine; side effects.

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1. Introduction

Since 2020, the world was struggling to overcome a viral respiratory disease, so called coronavirus disease 2019 (COVID-19), which caused by SARS-CoV-2. The world start focusing to Hubei province in People Republic of China in October 2019, as this was the first encounter, even though later, scientist found coronavirus in several samples of wastewater in Spain in March 2019. [1]. Control efforts to sluggish the transmission of COVID-19 disease and reduce soundness impacts have been carried out by various countries in the world, including Indonesia [2], by implementing social distancing, partial and or complete lockdowns, school or work activities were done from home, closing places of business, and the urge to wear masks in public places [3]. New form of COVID-19 that spread rapidly have emerged over the last two years.

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An increase in the incidence of COVID-19

has been reported as soon as the re-opening of community and economic activities, and other new variants are likely to emerge in the future [4]. Therefore, there is an urgency of long-range

prevention efforts and vaccination is one of the effective and efficient means to protect the public from the effects of SARS-CoV-2 [5,6]. In January 2021 Indonesia began the implementation of COVID-19 vaccination program and almost all types of vaccines that have been developed, such as inactivated whole virus, protein subunit or viral vector, are used nowadays [7,8]. The efficacy of vaccine sometimes is lower than expected, as it may depends on the person who accept the vaccine [9,10]. As pandemic situation declared by WHO in March 2020, this disease has already spread through more than 200 countries, thus causing confusion and stress to the population all over the world. Stress is the body's reaction to tension or stressors that are much of the time set off while encountering new, unforeseen, or compromising circumstances [11]. Stressors can incorporate mental, social, and psychological factors that may extensively impact the immune response to vaccine [12]. Psychological factors yield a counter acting agent reaction toward immunizations, especially in younger person [10,13]. There is proof that as well as lessening the viability of immunizations, stress can likewise set off extra brief and transitory secondary effects, including fatigue and a terrible attitude [9,14]. One study from University of Ohio revealed that when an individual is more worried and more restless about getting a COVID-19 inoculation, it might take more time for antibodies to create and incidental effects might happen after immunization [10,15]. Regarding the limited data about the effect of stress with adverse events after COVID-19 vaccination, we aim to carry out this research in adult people confirming the occurrence of adverse events after vaccination as the recipients went through the process of vaccination under stress.

2. Materials and Methods

2.1. Study population and ethics. The research was conducted for 3 months from August until November 2021. As many as 244 persons consisted of 85 men and 158 women were collected from four villages in Limo sub-district, Depok city, Indonesia that has received two doses of the COVID-19 vaccine, age 18 - 40 years old, were recruited as respondents. This study was received ethical approval from the Trisakti University Medical Research Ethics Commission (protocol code 56/KER-FK/IX/2021). **2.2. Methods.** Stress level was assessed by using questionnaires according to Hary & Pricianee [7], inclusive of perceived stress scale, meanwhile the events subsequent to getting a COVID-19 vaccination was assessed Side Effects and Opinions Following COVID-19 Vaccination. **2.3. Statistical analysis.** The data were statistically analyzed using the Chi-square test to see whether there is a relationship between stress and adverse events after COVID-19 vaccination.

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Statistical analysis was performed using SPSS

25.0 for Windows software with 95% confidence level ($\alpha = 0.05$). Results

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were considered statistically significant

at $p = 0.05$.

3. Results and Discussion

As per 2

nd February 2022, more than 4.3 million people in Indonesia have been diagnosed with coronavirus 2019 (COVID-19) and over than 144,000 of them passed away [16]. Powerful and effective vaccine to save a large number of lives consistently is one method to overcome this pandemic [17]. The acceptance of vaccine in the community is an important component to achieve a high vaccination coverage [18]. Table 1 showed that women and middle-aged population more likely to comply with government's regulation in receiving full package of vaccination. It has been known widely that sex differences stand as one factor that may affect the immune response [19], in addition to natural elements and psychosocial factors [20]. We found no significant relationship between sex and the incidence of adverse events after COVID-19 vaccination ($p = 0.951$).

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The Center for Disease Control and Prevention (CDC

) reports that most responses to the COVID-19 immunization are not serious and over 79% of those happened in females [21].

Table 1.

Characteristic of Respondents. Variables

SE positive (%)

SE negative (%)

Total

p-Value

Sex

N (%)

0,951

aMale 31

35,23

57

64,77

88 (36,07)

Female 54

36,1

102

65,38

156 (63,93)

Age

18- 39

27

28,12

69

71,87

96 (39,34)

0,490*

40-59 65

45,77

77

54,22

142 (58,20)

60

5

83,33

1

16,67

6 (2,46)

Stress Level

Low 40

58,82

28

41,18

68 (27,87)

0,000*

Moderate 48

27,91

124

72,09

172 (70,49)

Severe 1

25,0

3

75,0

4 (1,64)

/w:t /w

a Chi-Square test, p 0,05 /w:t

* Mann-Whitney test, p 0,05 Vaccination is a way to activate body's immune system by introducing weaken pathogen or the part of the pathogen to human's body, but sometimes there would be side effects following vaccination. This situation happened when the inflammatory response is exceeding than expected. Various studies showed that women in general

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have stronger and healthier immune systems

which lead to higher antibodies production, making women more susceptible to the side effects of the COVID-19 vaccine than men [20,21].

A study by Gee et al. [22] analyzed the safety data of more than 13 million doses of the first COVID-19 vaccine administered in United States (USA) alone. This study concluded that side effects appeared more in women than men, even though the vaccine was given to only 61 women. Ilardi et al. [23], concluded in a research report that COVID-19 infection risk factors also comprised of sex and age. Age is one important factor that determine vaccine response as age is a trigger for immune response modification. The findings in this study showed that there was no statistically significant relationship ($p = 0.490$) between age and the adverse events. Unfavorable occasions that happen after COVID-19 immunization at all ages are generally similar and there is no distinction in either onset or severity. We also found that there were smaller portion of the number of respondents aged 60 years who experienced adverse events after the COVID-19 vaccination, if compared to younger adults. Beatty et al, also reported the same results as adverse events were more common in younger respondents [24]. Another significant characteristic of the maturing immune system is a low-level pro-inflammatory cytokine as can be seen in elder people, which contribute to vulnerability of infection. This phenomenon also leads to lack of response in vaccination [21,25]. Younger adults generally have a more robust immune system, resulting in a firmer immune response to vaccines and a higher-up of adverse events. In contrast, one study concluded that the frequency of having adverse events was the same all across the age groups, but the tendency was increasing along with age [18]. Another foregoing study further stated that there was no relation between age and the incidence of adverse events after COVID-19 vaccination [26]. Albeit the security and viability of several COVID-19 immunizations have been validated, there are many considerations of the people in community regarding the adverse effects. Those concerns had huge impact in lowering public readiness in having vaccine thus lowering the vaccination coverage [27,28]. Even though stress is a normal defense mechanism in human, excessive stress could be harmful for the physical health, one of which is by inhibiting the human immune response [29]. Psychological stress or anxiety interfacing with the COVID-19 immunization needs to be lowered for the self-confidence boosting and forbearance of vaccination [30,31]. Some studies showed that stress is one of the variables that can repress the immune reaction in vaccination, thus simultaneously triggering side effects following COVID-19 vaccination from mild to moderate level [10,15]. One foregoing studies stated that stress is related to the beginning of adverse effects after the COVID-19 vaccination [26], as another study revealed that the adverse effects may varied from lower efficacy to nocebo effect [32], due to disruption and unbalanced binding of hormones and receptors, which leads to glucocorticoid receptor resistance, and at the end which will affect the body's immune system. The nocebo impact is a negative response characterized by hostile side effects and mostly triggered by a negative mindset that an undesirable event will occur following vaccine management or other clinical intervention. Nocebo effect could be systemic or just local symptoms, including local pain at the injection site, fatigue, headache [32,33]. Similar with the past report, the respondents' anxiety in this examination showed a huge relationship with the occurrence of unfriendly occasions after COVID-19 immunization. Stress and negative contemplations can influence the immunization reaction, particularly lower neutralizer reaction after inoculation, which can fortify and stretch out the intense provocative response to the antibody, which thus will invigorate the beginning of unfavorable occasions after COVID-19 inoculation [11,34,35].

4. Conclusions

This research reaffirms that stress is related to the frequency of adverse events following COVID-19 vaccination. Sex and age believed to have a role in influencing the immune system response, however, in this research,

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there was no significant relationship between

sex and age with the incidence of adverse events after COVID-19 vaccination. A better understanding

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of other psychological factors is needed to

adjust the vaccination implementation strategy in getting high coverage of any type of vaccination

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Conflicts of Interest

The authors declare no conflict of interest

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