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Home (<https://jrtd.com/index.php/journal/index>)  
/ Archives (<https://jrtd.com/index.php/journal/issue/archive>)  
/ Vol. 6 No. 9s (2023): (Articles in Press)

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## Articles

The Psychological Perspective of Emotional Intelligence: Nurturing Connections and Fostering Success among the Youth (<https://jrtd.com/index.php/journal/article/view/986>)

Ida Merlin J., Prabakar S.  
01-09

PDF (<https://jrtd.com/index.php/journal/article/view/986/670>)

Cognitive Linguistics to Upskill English Survival Vocabulary to the Malayali Tribal Students Inhibited by Psychological and Environmental Factors (<https://jrtd.com/index.php/journal/article/view/987>)

Ida Grace A., Sneha Mishra  
10-24

PDF (<https://jrtd.com/index.php/journal/article/view/987/671>)

An Assessment of the Relation between Quality of Life and Satisfaction in Domains of Life in Chennai City – An Empirical study (<https://jrtd.com/index.php/journal/article/view/988>)

Mookambika BA, D. Jayanthi  
25-48

PDF (<https://jrtd.com/index.php/journal/article/view/988/672>)

The Autistic Child During Circumcision Based on Parents Experience (<https://jrtd.com/index.php/journal/article/view/989>)

Cau Kim Jiu, Jaka Pradika, Tuter Kardiaturun  
49-57



(<https://wa.me/message/XOK744YC6Z5311>)

## Submissions

Submission instructions  
(<https://jrtd.com/index.php/journal/instruction-for-authors>)

Manuscript formatting requirements  
(<https://jrtd.com/index.php/journal/jrtd-manuscript-formatting-requirements>)

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([https://jrtd.com/downloads/JRTDD\\_paper\\_template](https://jrtd.com/downloads/JRTDD_paper_template))

## INDEXING



PDF (<https://jrtd.com/index.php/journal/article/view/989/673>)

**Hypoalbuminemia on Admission in Covid 19 pandemic in Iraq: An Initial Analyst of Mortality and Adverse Events**  
(<https://jrtd.com/index.php/journal/article/view/990>)

Wasim T. Mahdi Al Masoodi, Hayder B. Abbas Al-Ghreaty, Hussein Hazim AL-Ghanimi, Abdul Amir H. Kadhum, Ahmed A. Al-Amiery  
58-65

PDF (<https://jrtd.com/index.php/journal/article/view/990/674>)

**Impact of Internet Addiction on Mental Health and Sleep Quality of Adolescents** (<https://jrtd.com/index.php/journal/article/view/995>)

Piyush Aggarwal, Anviti Gupta  
66-72

PDF (<https://jrtd.com/index.php/journal/article/view/995/675>)

**Lived Experiences of Teaching Interns in the Online Delivery of Instruction: A Psychological Study**  
(<https://jrtd.com/index.php/journal/article/view/996>)

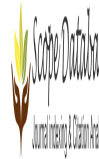
Feleeh L. Enanoza  
73-82

PDF (<https://jrtd.com/index.php/journal/article/view/996/676>)

**Group Reminiscence for Treating Geriatric Depression in Rural Community: A Randomized Controlled Trial**  
(<https://jrtd.com/index.php/journal/article/view/997>)

David Ratna Paul Talagathoti, Varalakshmi Manchana  
83-92

PDF (<https://jrtd.com/index.php/journal/article/view/997/677>)



Virtual Reality as a Tool in the Classroom: What is the Perception of Students of the Public Accounting Program?

(<https://jrtd.com/index.php/journal/article/view/1011>)

Orlando Carmelo Castellanos Polo, Yessica Del Carmen Torres Copete, Carlos Horacio Salas Riviere, David Alberto García Arango  
93-100

PDF (<https://jrtd.com/index.php/journal/article/view/1011/678>)

Employability and Psychological Study of the BSIT Graduates of CPSU – Main Campus: Basis for Curriculum Enhancement

(<https://jrtd.com/index.php/journal/article/view/1013>)

Chester L. Cofino, Ryan B. Escorial, Debbie Lou B. Enquilino, Benjamin G. Alijado  
101-110

PDF (<https://jrtd.com/index.php/journal/article/view/1013/679>)

Psychological Impact of Internet Addiction on Mental Health and Sleep Quality of ADOLES Student

(<https://jrtd.com/index.php/journal/article/view/1014>)

Piyush Aggarwal, Anviti Gupta  
111-117

PDF (<https://jrtd.com/index.php/journal/article/view/1014/680>)

Understanding the Dynamics of Triarchic Intelligences and Instructors Competence in the Landscape of Science Education: A Psychological Approach

(<https://jrtd.com/index.php/journal/article/view/1015>)

Diobein C. Flores  
118-126

PDF (<https://jrtd.com/index.php/journal/article/view/1015/681>)

Effects of Matrix Rhythm Therapy in Patients with Supraspinatus Tendinitis

(<https://jrtd.com/index.php/journal/article/view/1016>)

Tushar J. Palekar, Preeti Shrisunder, Soumik Basu, Pramod Palekar, Sneha Nemade  
127-134

PDF (<https://jrtd.com/index.php/journal/article/view/1016/682>)

Examining the Resilience of Families of Autistic Children in a Sociocultural Lens

(<https://jrtdd.com/index.php/journal/article/view/1017>)

Bablu Kumar Gaur, Uma Warriar, Prateeti Barman  
135-144

PDF (<https://jrtdd.com/index.php/journal/article/view/1017/683>)

Effect of Matrix Rhythm Therapy (MaRhyThe©) On Bronchial Hygiene: A Pilot Randomized Control Trial

(<https://jrtdd.com/index.php/journal/article/view/1018>)

Saumya Jitendra Kine, Varun Chandrakant Naik  
145-159

PDF (<https://jrtdd.com/index.php/journal/article/view/1018/684>)

A Comparative Study on Social Competency of Adolescents Living with and Without Grandparents

(<https://jrtdd.com/index.php/journal/article/view/1019>)

Ranjini Karthikeyan, Amiya Bhaumik  
160-163

PDF (<https://jrtdd.com/index.php/journal/article/view/1019/685>)

Social and Life Cycle Perspectives on Teenager Pregnancy's Psychological Effects

(<https://jrtdd.com/index.php/journal/article/view/1020>)

Happy Baglari, Astha Lalwani, Krishna Koppa B  
164-171

PDF (<https://jrtdd.com/index.php/journal/article/view/1020/686>)

Developing Resilience in Managing Stress for Cancer Parents: A Clinical Study (<https://jrtdd.com/index.php/journal/article/view/1021>)

Bandana Deuri, Ashok Kumar Singh, Sanjana Samaddar  
172-182

PDF (<https://jrtdd.com/index.php/journal/article/view/1021/687>)

Factors Related to Mathematics Anxiety among Senior High School Students in Basic and Pre-Calculus: A Descriptive CROSS-Sectional Psychological study  
(<https://jrtdd.com/index.php/journal/article/view/1022>)

Cristobal A. Rabuya  
183-190

PDF (<https://jrtdd.com/index.php/journal/article/view/1022/688>)

Institutional Management Strategy for the Improvement of Service Quality in a Systems Engineering School of a University in Peru  
(<https://jrtdd.com/index.php/journal/article/view/1023>)

Julissa Elizabeth Reyna-González, Gladys Montalico Ruiz, Evelyn Patricia Zavala Zavala, Fiorela Anaf Fernández-Otoya  
191-198

PDF (<https://jrtdd.com/index.php/journal/article/view/1023/689>)

Resilience's Impact on the Mental Well-Being of Individuals with Physical Disabilities  
(<https://jrtdd.com/index.php/journal/article/view/1024>)

Simi Gogoi, Prerana Gupta, Lakshmi Sevukamoorthy  
199-208

PDF (<https://jrtdd.com/index.php/journal/article/view/1024/690>)

Psychological Well-Being and Life Satisfaction among Rural Island Community in Langkawi, Malaysia  
(<https://jrtdd.com/index.php/journal/article/view/1025>)

Muhamad Khalil Omar, Norashikin Hussein, Nor Intan Adha Hafit, Nor Azian Abdul Rahman  
209-216

PDF (<https://jrtdd.com/index.php/journal/article/view/1025/691>)

Psychological Analysis of the Perspectives on Stigma among Teenagers with Mental Disorders  
(<https://jrtdd.com/index.php/journal/article/view/1026>)

Rajgun Handique, Manish Tyagi, Jaykumar Padmanabhan  
217-225

PDF (<https://jrtdd.com/index.php/journal/article/view/1026/692>)

Establishing a Milestone in Knowledge Delivery by Examining How Academicians' Engagement in Their Job at a Private Higher Educational Institution in Malaysia Is Affected by Work from Home (WFH) Experience

(<https://jrtdd.com/index.php/journal/article/view/1027>)

Thilageswary Arumugam, Shamini Arumugam, Deeparechigi Vashu, Sharmila Sethumadavan  
226-235

PDF (<https://jrtdd.com/index.php/journal/article/view/1027/693>)

Perspectives on Intersectionality and Healthcare-Related Stereotypes from Indonesians with Stigmatized Health Problems  
(<https://jrtdd.com/index.php/journal/article/view/1028>)

Abhinav Tiwary, Desai Ishita Dilipkumar, Desai Ishita Dilipkumar  
236-244

PDF (<https://jrtdd.com/index.php/journal/article/view/1028/694>)

Assessing the Physical and Mental Impact of a Healthcare Specialty Encampment: An Analysis through Self-Determination Theory  
(<https://jrtdd.com/index.php/journal/article/view/1029>)

Irum Khan, Manjusha Saikia D, Salim Khan  
245-252

PDF (<https://jrtdd.com/index.php/journal/article/view/1029/695>)

Consequences of the COVID-19 Quarantine on the Quality of Life of Individuals with Chronic Pain  
(<https://jrtdd.com/index.php/journal/article/view/1030>)

Uma Swadimath C, Happy Baglari, Deepankar Shivam  
253-261

PDF (<https://jrtdd.com/index.php/journal/article/view/1030/696>)



Research on Improving People's Well-Being and Quality of Life in the  
Hospitality and Tourism Industries  
(<https://jrtdd.com/index.php/journal/article/view/1031>)

Vijayalakshmi, Fariza Saidin, Anand Joshi  
262-272

PDF (<https://jrtdd.com/index.php/journal/article/view/1031/697>)

A Psychological Investigation on the Influences of Employment,  
Personal Life, and Policies on the Wellness of China's Domestic  
Workers (<https://jrtdd.com/index.php/journal/article/view/1032>)

Minerva Das, Banasmita Nath, Mohit Rastogi  
273-283

PDF (<https://jrtdd.com/index.php/journal/article/view/1032/698>)

An in-Depth Study of the Psychological Impact of Disinformation and  
the COVID-19 Threat on Employees Working from Home  
(<https://jrtdd.com/index.php/journal/article/view/1033>)

Shaji Thomas, Manimugdha Medhi, Vibhor Jain  
284-292

PDF (<https://jrtdd.com/index.php/journal/article/view/1033/699>)

A Psychological Analytical Method for Improving Patient Well-Being in  
Pakistan's Governmental and Private Sectors  
(<https://jrtdd.com/index.php/journal/article/view/1034>)

Anurag Jain, Happy Baglari, Anushi Singhh  
293-300

PDF (<https://jrtdd.com/index.php/journal/article/view/1034/700>)

The Psychological Influence of the Implementation of Quality Measures  
on the Satisfaction of Patients  
(<https://jrtdd.com/index.php/journal/article/view/1035>)

Shashank M Hiremath, Bandana Deuri, Nazia Hasan  
301-311

PDF (<https://jrtdd.com/index.php/journal/article/view/1035/701>)

Proposing an Integrative Perspective in Palliative Care Regarding Psychological Factors and Prosocial Behavior as Determinants of Grief Reactions (<https://jrtdd.com/index.php/journal/article/view/1036>)

Premalatha KP, Fariza Saidin, Prerana Gupta  
312-321

PDF (<https://jrtdd.com/index.php/journal/article/view/1036/702>)

A Psychological Study Exploring Mental Health Concerns, Alcohol Consumption, and Changes in Social Support Following College Closures during the COVID-19 Pandemic (<https://jrtdd.com/index.php/journal/article/view/1037>)

Jigar Manilal Haria, Xavier VK, Bijoy Das  
322-327

PDF (<https://jrtdd.com/index.php/journal/article/view/1037/703>)

Application of Artificial intelligence Assisted Robots to Improve the Educational Outcome for Special Children in Disability Education (<https://jrtdd.com/index.php/journal/article/view/1038>)

Baig Muntajeeb Ali, M. Maheswari, P V V S D Nagendrudu, D. Leela Rani, Arshad Hashmi  
328-337

PDF (<https://jrtdd.com/index.php/journal/article/view/1038/704>)

The Psychological Effects of Social Seclusion on the Mental and Physical Health of Chronic Pain Patients (<https://jrtdd.com/index.php/journal/article/view/1039>)

Seema Singh Parmar, Yogananthan S, Bandana Deuri  
338-345

PDF (<https://jrtdd.com/index.php/journal/article/view/1039/705>)

Photographic Assessment to Evaluate Effectiveness of Low-Level LASER Therapy in Wound Healing: A Randomized Controlled Trial (<https://jrtdd.com/index.php/journal/article/view/1040>)

Siya Sakhardande, Varun Naik, Amit Ammanagi  
346-352

PDF (<https://jrtdd.com/index.php/journal/article/view/1040/706>)

### Psychological Importance of ICT Factors in the Use of Mobile Learning in Postgraduate Students

(<https://jrtdd.com/index.php/journal/article/view/1041>)

Carlos Luis Euribe Solorzano, Hugo Vega-Huerta, Julissa Elizabeth Reyna-González, Víctor Pedro Cuadros Ojeda, Lourdes Lucila Céspedes Aguirre  
353-365

PDF (<https://jrtdd.com/index.php/journal/article/view/1041/707>)

### A Cross-Sectional Psychological Study Investigating the Impact of Social Isolation on Individuals Experiencing Chronic Pain During the COVID-19 Pandemic

(<https://jrtdd.com/index.php/journal/article/view/1042>)

Saubhagya Mishra, Selvi S, Bandana Deuri  
366-373

PDF (<https://jrtdd.com/index.php/journal/article/view/1042/708>)

### Psychological Issues and Challenges of Hotel as Quarantine Facility: Policy and Guidelines

(<https://jrtdd.com/index.php/journal/article/view/1043>)

Rhodora D. Lintot, Madonna M. Siniguan  
374-383

PDF (<https://jrtdd.com/index.php/journal/article/view/1043/710>)

### The Psychological Impact of Attachment Anxiety on Childhood Trauma and Schizophrenia-Spectrum Psychosis

(<https://jrtdd.com/index.php/journal/article/view/1044>)

Baljeet Maini, Monoo John, Happy Baglari  
384-392

PDF (<https://jrtdd.com/index.php/journal/article/view/1044/711>)

### Neuroplasticity and Functional Gains with Task-Specific Circuit Training

in Stroke Patients (<https://jrtdd.com/index.php/journal/article/view/1045>)

K. Kamatchi, Jibi Paul, Jagatheesan Alagesan, N. Harikrishnan  
393-400

PDF (<https://jrtdd.com/index.php/journal/article/view/1045/712>)

Implementation of Machine Learning Algorithms in IoT Smart Shoe  
Helping Rehabilitation for Visually Challenged People  
(<https://jrtdd.com/index.php/journal/article/view/1046>)

Aparna S Hambarde, Shailesh M Hambarde, Chandraprabha A Manjare, Poonam D  
Lambhate, Sandip D Satav  
401-406

PDF (<https://jrtdd.com/index.php/journal/article/view/1046/713>)

The Psychological Effect of a COVID-19 Pandemic-Related Stress  
Reduction Program on Educator's Mental Health, Resilience, and  
Degrees of Burnout  
(<https://jrtdd.com/index.php/journal/article/view/1047>)

Hare Krishna, Salma Begum, Manjusha Saikia D  
407-418

PDF (<https://jrtdd.com/index.php/journal/article/view/1047/714>)

Impact of Digital Learning Environment on Satisfaction of Customers in  
view of Learning Outcome of their Children  
(<https://jrtdd.com/index.php/journal/article/view/1048>)

Purvi Makwana , Gayathri Band  
419-424

PDF (<https://jrtdd.com/index.php/journal/article/view/1048/715>)

A Psychological Strategy to Foster Resilience and Peer Interaction for  
Flood Impacted Youngsters  
(<https://jrtdd.com/index.php/journal/article/view/1049>)

Anushi Singh, Sarangapani Nivarthi, Manjusha Saikia D  
425-435

PDF (<https://jrtdd.com/index.php/journal/article/view/1049/716>)

An Exploration of Collaborative Learning Strategy in Mathematics: A Psychological Case Study  
(<https://jrtdd.com/index.php/journal/article/view/1050>)

Fabiana P. Peñeda  
436-443

PDF (<https://jrtdd.com/index.php/journal/article/view/1050/717>)

Digital Skills of Mathematics Education Students in a State University: Psychological Basis for an Action Plan  
(<https://jrtdd.com/index.php/journal/article/view/1051>)

Cristobal A. Rabuya  
444-454

PDF (<https://jrtdd.com/index.php/journal/article/view/1051/718>)

Disputes at Work and the Perceived Effects of Social Assistance on Worker Health (<https://jrtdd.com/index.php/journal/article/view/1052>)

Suparna Dhar, Shipra Agarwal, Yavana Rani S  
455-463

PDF (<https://jrtdd.com/index.php/journal/article/view/1052/719>)

The Impact of Psychological Intelligence Coursework on Australian Elderly Care Professionals' Job Performance  
(<https://jrtdd.com/index.php/journal/article/view/1053>)

Richika Bordoloi, Manish Tyagi, Praveen Gujjar  
464-472

PDF (<https://jrtdd.com/index.php/journal/article/view/1053/720>)

Impact of Programs Eliminating Negative Perceptions About HIV to Benefit Patients' Health and Wellbeing  
(<https://jrtdd.com/index.php/journal/article/view/1054>)

Bijoy Das, Amit Mishra, Sudershan Reddy  
473-484

PDF (<https://jrtdd.com/index.php/journal/article/view/1054/721>)

Communication Topics of Uncle Ho Soldiers in Official Communication  
According to Documents about the Anti-French Period  
(<https://jrtdd.com/index.php/journal/article/view/1055>)

Nguyen Thi Hong Chuyen  
485-496

PDF (<https://jrtdd.com/index.php/journal/article/view/1055/722>)

A Photovoice and Psychological Study on the Realities of Teachers in  
Simultaneous Onsite-Online Teaching-Learning Modality  
(<https://jrtdd.com/index.php/journal/article/view/1056>)

May B. Tubang-Delgado  
497-503

PDF (<https://jrtdd.com/index.php/journal/article/view/1056/723>)

Readiness and Competence of Public and Private Employees in the  
Philippines Under the Fourth Industrial Revolution  
(<https://jrtdd.com/index.php/journal/article/view/1057>)

John Michael M. Dela, Catherine E. Dela  
504-514

PDF (<https://jrtdd.com/index.php/journal/article/view/1057/724>)

The Psychological Relationship Model of Factors Affecting Digital  
Literacy among the Academic Personnel in the Thai Higher Education  
Institutions Ranked in the World University Rankings  
(<https://jrtdd.com/index.php/journal/article/view/1058>)

Aphisit Kunnaworapanya, Somboon Sirisunhirun, Phut Ploywan, Krish Rugchatjaroen,  
Somsak Amornsiriphong  
515-529

PDF (<https://jrtdd.com/index.php/journal/article/view/1058/725>)

Effect of Visceral Manipulation in Obese Older Adults with Frozen  
Shoulder (<https://jrtdd.com/index.php/journal/article/view/1059>)

Sonali Vispute, Ayushi Kshatriya, Dipti Shinde, Revati Kanade, Vaishnavi Gore, Satyam  
Bhodaji  
530-541

PDF (<https://jrtd.com/index.php/journal/article/view/1059/726>)

**A Design for Developing an Interactive Academic Student Advising System using Smart Personal Assistant Platform**  
(<https://jrtd.com/index.php/journal/article/view/1060>)

Kamarul Faizal Hashim, Sami Miniaoui  
542-550

PDF (<https://jrtd.com/index.php/journal/article/view/1060/727>)

**Psychological Factors Affecting the Degree of Binge Drinking in the Elderly in Korea Using the Eighth Korea National Health and Nutrition Examination Survey (KNHANES VIII), 2019 -Focusing on General Variables and Mental Health Variables**  
(<https://jrtd.com/index.php/journal/article/view/1061>)

Young Sun Park, Young Ju Jee, Sun Hee Bae  
551-564

PDF (<https://jrtd.com/index.php/journal/article/view/1061/728>)

**Health-Related Quality of Life and Psychological Wellbeing Among Residents in a Rural Area - 2019 Community Health Survey**  
(<https://jrtd.com/index.php/journal/article/view/1062>)

Jeongju Hong, Jae-hee Kim  
565-582

PDF (<https://jrtd.com/index.php/journal/article/view/1062/729>)

**Intergenerational Conflict Experienced by Elderly Parents on Their Children in South Korea**  
(<https://jrtd.com/index.php/journal/article/view/1063>)

Sojin Kim  
583-592

PDF (<https://jrtd.com/index.php/journal/article/view/1063/730>)

**Consumer Psychological Satisfaction based on Skin Scuba Diving Lifestyle, Equipment Purchase Decision-Making Factors, and Marketing Strategy Suggestion**

(<https://jrtd.com/index.php/journal/article/view/1064>)

Beak Hye-Kyung, Choi Hwa-Yeol  
593-601

PDF (<https://jrtd.com/index.php/journal/article/view/1064/731>)

Mediation Effect of Perception of Parenting Efficacy on Relationship  
between Smartphone Use Level and Parenting Behavior of Mothers of  
Infants and Children

(<https://jrtd.com/index.php/journal/article/view/1065>)

Sun Mi Kim, Jae Won Oh, San Lee, Nak-Hoon Son  
602-612

PDF (<https://jrtd.com/index.php/journal/article/view/1065/732>)

Factors on Lecture Immersion among College Students in Online  
Learning Environments- A Physocological Behavioural Study  
(<https://jrtd.com/index.php/journal/article/view/1066>)

Jiwon Yoon, Namjoo Je, Meera Park  
613-628

PDF (<https://jrtd.com/index.php/journal/article/view/1066/733>)

Caring Needs and Caring Efficacy in Nursing Students :The Mediating  
Effects of Compassion

(<https://jrtd.com/index.php/journal/article/view/1067>)

Sook Lee, Ae Sook Choi, So-Youn Yim, Yeol-eo Chun  
629-641

PDF (<https://jrtd.com/index.php/journal/article/view/1067/734>)

Psychological Factors Influencing Self-directed Learning Ability of 3rd  
Year Nursing Students at a University

(<https://jrtd.com/index.php/journal/article/view/1068>)

Kyungmi Woo, Young-Ju Jee, Hyun Kyoung Kang  
642-652

PDF (<https://jrtd.com/index.php/journal/article/view/1068/735>)



A Study on the Quality of Life and Psychological Stress of Glaucoma Patients (<https://jrtd.com/index.php/journal/article/view/1069>)

Jung Un Jang  
653-659

PDF (<https://jrtd.com/index.php/journal/article/view/1069/736>)

Psychological and Occupational Study of The Labor of Film Korean Production Workers– Focus on Interviews (<https://jrtd.com/index.php/journal/article/view/1070>)

Kyuha Ryoo  
660-673

PDF (<https://jrtd.com/index.php/journal/article/view/1070/737>)

Relationship between Self-Regulation Ability, Self-Esteem and on School Adjustment of Children with ADHD Symptoms: Mediating Effect of Social Support (<https://jrtd.com/index.php/journal/article/view/1071>)

Minkyong Kim  
674-683

PDF (<https://jrtd.com/index.php/journal/article/view/1071/738>)

Predictive Relationship among Perceived Parental Efficacy, Bullying Victimization and Depressive Symptoms in Adolescents (<https://jrtd.com/index.php/journal/article/view/1072>)

Maria Shahbaz, Sana Daud, Ravindra Kumar Prajapati, Dharmendra Sharma  
684-694

PDF (<https://jrtd.com/index.php/journal/article/view/1072/739>)

Psychological Impacts of Environmental Degradation: A Comprehensive Study (<https://jrtd.com/index.php/journal/article/view/1629>)

S. Thangamayan, Asha Sundaram  
695-699

PDF (<https://jrtd.com/index.php/journal/article/view/1629/1127>)

Analysis of Health and Sports Performance-Associated Psychological Factors of Kabaddi Players with Hearing Impairment: A Comparison with Hearing Kabaddi Players

(<https://jrtdd.com/index.php/journal/article/view/1630>)

Sakthivel S., Giridharan R., Sathiya Moorthy A., Karthikeyan N., Rajavarman S.  
700-705

PDF (<https://jrtdd.com/index.php/journal/article/view/1630/1128>)

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1239-1245

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1312-1321

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1322-1331

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1332-1339

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1340-1348

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1349-1358

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1359-1370

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1371-1386

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Suebsiri Saelee  
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1411-1418

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1419-1424

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1425-1431

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1432-1436

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1450-1454

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1460 - 1468

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## Hypertension in Dental Health Care and their Management in Dentistry

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### ABSTRACT

Hypertensive patients deserve special attention because of the possible complications during dental treatment. This article describes safe approaches for hypertensive patients, indications for local anaesthesia, treatment risks, hypertensive crises, drug interactions, and oral manifestations of antihypertensive drugs. It aims to review the literature regarding safe dental approaches for hypertensive patients, such as indications for local anaesthesia, surgical risks, hypertensive crisis, drug interactions, and oral manifestations of antihypertensive drug use. Several preventive measures must be taken to treat hypertensive patients, including taking an anamnesis. This action is very important to evaluate systemic changes. In addition, measuring blood pressure at the beginning and during the intervention is necessary. Minimizing sitting time in the dental unit must also be done to minimize patient anxiety. Stress control and selecting appropriate anaesthetic agents also need to be done. Solutions with low concentrations of vasoconstrictors, paying attention to dosage, and following the principles of the anaesthetic technique must be observed. The use of nonsteroidal anti-inflammatory drugs should be avoided. These precautions will avoid serious iatrogenic events and improve and ensure patient safety and quality of service.

**Keywords:** Anesthetics, antihypertensive agents, anxiety, hypertension, vasoconstrictor agents.

### INTRODUCTION

Hypertension is a multifactorial clinical condition characterized by a sustained increase in blood pressure  $\geq 140$  and  $90$  mmHg.<sup>1,2</sup> This condition is a serious medical condition in which pressure in the blood vessels that is too high will significantly increase the risk of heart, kidney, brain, and other diseases. Under normal conditions, blood is pumped by the heart to all parts of the body through the blood vessels, so the force of the blood pushing against the walls of the arteries when pumped by the heart causes blood pressure to rise. If blood pressure is higher, it will cause the heart to have difficulty pumping.<sup>3-5</sup>

Arterial hypertension (AH) is a disease with a high prevalence that tends to increase with age and becomes a global health problem. According to the World Health Organization (WHO), AH is one of the main risk factors for cardiovascular disease. According to the American Dental Association (2023), hypertension is one of the most common chronic cardiovascular conditions in the US. Hypertension affects more than one billion people, with a ratio of more than 1 in 4 men and 1 in 5 women, and is the main cause of premature death worldwide. Two-thirds of cases are found in low- and middle-income countries, largely due to increased risk factors in these populations in recent decades.<sup>1,3,6-9</sup>

Hypertension is a silent killer for adults aged over 20 years and this condition is estimated to reach 1.56 billion hypertension sufferers worldwide by 2025.<sup>10-14</sup> The increase in the prevalence of hypertension in society is very worrying because a person's life expectancy can be reduced by 10-20 years due to untreated hypertension.<sup>10,15</sup>

Children or adults can experience this condition.<sup>16</sup> Blood pressure with systolic >140 mmHg and diastolic >90 mmHg is called a person with hypertension.<sup>4</sup> Hypertension is divided into 2 categories, namely primary hypertension and secondary hypertension, with 90%-95% of hypertension cases being primary hypertension with an unidentified cause and only in 10% of cases, hypertension is secondary. Secondary hypertension can be caused by diabetes, kidney disease, pregnancy, or endocrine disorders.<sup>1,4,10,13,17</sup>

Concerning hypertensive patients, dentists must know how to determine the severity and stability of hypertension.<sup>11</sup> Dentists must have extensive knowledge regarding oral health care in the hypertensive patient population, regarding difficulties in treating it, prevention, and management options and treatment until the results of the treatment.<sup>10,11</sup> In this case, dentists also have an important role in screening for undiagnosed and untreated hypertension because they are often the first medical practitioners to encounter symptoms.<sup>4,16,18</sup>

Current recommendations require dentists to measure blood pressure in children (over 3 years) and adults at every visit, whatever the purpose. Therefore, there is a need to educate dental staff about how to measure blood pressure properly and correctly. For pediatric patients, dentists must study the child's health history and focus on obtaining information about the medicines the child is taking or their diet. This information can help paediatricians determine potential blood pressure problems in the child. It should be emphasized that in younger patients, particularly those diagnosed with hypertension, especially those who are untreated or poorly treated, local anaesthetics containing vasoconstrictors should not be used.<sup>16</sup>

Side effects of hypertension treatment can mainly be seen on the skin, around the mucous membranes in the oral cavity, telangiectasia (around the skin of the cheeks), gingival hyperplasia, tongue enlargement, and edema. This can lead to increased dental caries, ulceration of the oral mucosa, taste disorders, or gingival disease. Because of the possible side effects of the drugs used, it is very important to carry out regular periodontological control in this group of patients.<sup>11,16</sup>

Assessing a patient's medical history is the first step of any dental treatment. Medical status can change dental treatment plans and, if ignored, can lead to severe and sometimes fatal consequences.<sup>19</sup> Therefore, it is essential to find adequate dental care protocols for patients suffering from hypertension.<sup>11</sup>

## **ORAL MANIFESTATION CAUSED BY ANTIHYPERTENSIVE DRUG**

Hypertension does not appear to have any recognized orofacial manifestations.<sup>11,20</sup> Antihypertensive medication, an option for hypertensive treatment, can occasionally result in orofacial side effects.<sup>20,21</sup> These drugs can have several oral side effects within a few weeks of taking them.<sup>21,22</sup> Antihypertensive medications may cause oral side effects such as dry mouth, altered taste, taste loss, angioedema, gingival bleeding, gingival enlargement, erythema multiforme, and lichenoid reactions.<sup>11,13,19,22</sup> The side effects and drugs causing it can be seen in Table 1. Typically, a clinical examination and taking a history allow for the detection of oral mucosal lesions. They may, however, go unnoticed in some instances because of the lesions' clinical similarity.<sup>21,22</sup> It is easier to manage patients when physicians are aware of these medications' potential side effects.<sup>19</sup>

### **- Lichenoid reaction**

The oral lichenoid reaction typically manifests as white striations or papules and frequently appears on the buccal mucosa, tongue, and gingiva. They are frequently accompanied by erythema, erosion, and ulcers.<sup>23</sup> Lichenoid reactions resemble lichen planus lesions clinically and histologically but are unilateral and have a traumatic pattern.<sup>22</sup> Acanthosis, basal cell degeneration, hyperparakeratosis, and extensive chronic inflammatory cell infiltration throughout the connective tissue, particularly the plasma cells and histiocytes, are some of their distinguishing features.<sup>24</sup> Nonsteroidal anti-inflammatory drugs (NSAIDs) and antihypertensive agents, such as b-blockers, ACE inhibitors, and diuretics (in particular hydrochlorothiazide), are the two classes of drugs historically linked to lichenoid reaction. It is frequently challenging to agree on diagnostic criteria, partly because the once well-established lichenoid reaction may persist after the drug is stopped unless rigorously treated.<sup>23</sup>



- Gingival hyperplasia

Clinically, gingival hyperplasia manifests as overgrown gingiva on the buccal, facial, lingual, or palatal aspects of the marginal gingiva that is diffuse, generalized, and frequently nodular.<sup>23-25</sup> Inflammation caused by plaque exacerbates the resulting gingival enlargement.<sup>23,25</sup> Sometimes, they may even cover the entire crown, which makes eating difficult.<sup>24</sup> Nifedipine and amlodipine, in particular, are antihypertensive calcium channel blockers that cause gingival tissue hyperplasia.<sup>2,23</sup>

- Angioedema

Angioedema is a frequent clinical symptom that is characterized by rapid, painless swelling of the lips, tongue, area around the eye, and surrounding tissues.<sup>26</sup> This sudden onset of swelling can compromise breathing and be fatal. There have been reports of medication-induced angioedema caused by various drugs, most frequently ACE inhibitors and other antihypertensive medications, such as angiotensin receptor blockers, calcium channel blockers, and hydrochlorothiazide.<sup>23</sup>

- Xerostomia

Numerous antihypertensive drugs are linked to xerostomia.<sup>2</sup>

Additional unwanted effects such as taste loss (ageusia) or taste modification (dysgeusia) are side effects of ACE inhibitors. Dysgeusia also manifests from using beta-blockers and diltiazem.<sup>2</sup>

Table 1. Antihypertensive drugs and their oral manifestation side effects.<sup>2,13,20,23,25-27</sup>

Drug class	Examples	Oral manifestation
Alpha-adrenergic blockers	Doxazosin, indoramin, prazosin, terazosin	Xerostomia
Angiotensin-converting Enzyme inhibitors (ACEIs)	Captopril, cilazapril, enalapril, fosinopril, imidapril, lisinopril, moexipril, perindopril, quinapril, ramipril,trandolapril	Lichenoid reaction (Captopril) Angioedema Xerostomia Ageusia Dysgeusia Ulceration Burning mouth Gingival bleeding
Angiotensinogen II receptor blockers (ARBs)	Azilsartan, candesartan, eprosartan, losartan, olmesartan, temisartan, valsartan, irbesartan	Angioedema Xerostomia Ageusia
Beta-adrenergic blockers	Acebutolol, atenolol, bisoprolol, carvedilol, celiprolol, esmolol, labetalol, metoprolol, nadolol, nebivolol, oxprenolol, pindolol, propranolol, timolol	Lichenoid reaction (propranolol, labetalol) Dysgeusia Xerostomia
Calcium-channel blockers (CCBs)	Phenylalkamines: Verapamil Dihydropyridines: Amlodipine, nifedipine, nimodipine Benzothiazepines: Diltiazem	Gingival enlargement (Nifedipine and amlodipine) Angioedema Diltiazem (diltiazem) Xerostomia Dysgeusia Erythema multiform
Diuretics	Thiazide: chlorthalidone, bendroflumethiazide,	Lichenoid reaction (hydrochlorothiazidem,

	hydrochlorothiazide, and indapamide Loop: furosemide, torsemide, bumetanide, and ethacrynic acid Potassium-sparing: spironolactone, amiloride, triamterene, and eplerenone	furosemide, spironolactone) Angioedema (hydrochlorothiazide) Xerostomia (thiazide, loop)
Sympatholytics	Clonidine, methyldopa	Xerostomia (clonidine) Lichenoid reaction (methyldopa)
Vasodilators	Hydralazine, minoxidil	Risk of gingival bleeding

### **THERAPY OF DISORDERS IN THE ORAL CAVITY CAUSED BY ANTIHYPERTENSIVE DRUGS.**

#### **- Xerostomia**

Dry mouth is a detrimental effect of more than 500 medications. Antihypertensive drugs such as loop diuretics, thiazide diuretics, ACE inhibitors, and  $\beta$ -blockers are often reported to cause xerostomia.<sup>2,23</sup> The consequences of xerostomia in the oral cavity include dental caries, gingivitis, difficulty chewing, speaking, and swallowing, candidiasis, dysgeusia, and oral burning syndrome.<sup>2,26,28</sup> Denture-wearing individuals with xerostomia showed worse signs and symptoms of inflammation than individuals without dentures.<sup>28</sup>

Older individuals are reported to be three times more likely to suffer from xerostomia, and patients who consume more than one type of medication have twice or more risk than people without consuming medication.<sup>23</sup> Xerostomia therapy can be done directly using parasyntomimetic agents (pilocarpine or cevimeline).<sup>2</sup> The use of saliva stimulants, saliva substitutes, oral lubricants, and non-irritating toothpaste are symptomatic management of xerostomia.<sup>26,28</sup> Another way is to drink lots of water, reduce coffee consumption, eat candy without sugar, and avoid using mouthwash that contains alcohol. To reduce the risk of dental caries, topical fluoride can be used.<sup>2</sup>

#### **- Lichenoids**

Antihypertensive drug therapy is one therapy that stimulates Lichenoid Hypersensitivity Reaction (LHR).<sup>23,29</sup> The way to treat this disorder is by changing the antihypertensive drug, but if the drug cannot be changed, then topical corticosteroid drugs can be used.<sup>2</sup> Lichenoids can be treated with systemic corticosteroids, but because of the potential for an increase in blood pressure, corticosteroids may be contraindicated in patients with hypertension.<sup>20</sup>

#### **- Gingival hyperplasia**

Antihypertensive drugs such as calcium channel blockers (diltiazem, nifedipine, amlodipine, felodipine, nisoldipine, and verapamil) cause gingiva hyperplasia.<sup>2,23,26</sup> This situation can be made worse by plaque, which causes inflammation.<sup>23</sup> Gingival hyperplasia due to calcium channel blockers is diffuse, flat, and nodular with a fibrotic consistency.<sup>26</sup> Clinically, gingival enlargement often occurs on the buccal or facial and lingual or palatal aspects of the gingiva margin.<sup>24</sup> This disorder is common in patients taking nifedipine, with an incidence of 1.7 to 38%.<sup>11</sup> Manifestations of gingival hyperplasia are pain, gingiva bleeding, and difficulty chewing. Changing antihypertensive drugs and maintaining good oral hygiene will reduce the incidence of this event.<sup>2</sup> Periodontal surgical therapy is not definitive therapy; a more effective way is to reduce the dose of the drug used if possible or replace it with another type of drug.<sup>11</sup>

#### **- Angioedema**

ACE inhibitors are drugs that commonly cause angioedema.<sup>23</sup> This type of drug also causes loss of taste sensation (ageusia) or changes in taste sensation (dysgeusia).<sup>2</sup> This change in taste is caused by a decrease in saliva flow or secretion of these drugs in saliva.<sup>29</sup> Other antihypertensive drugs, such as angiotensin receptor blockers, hydrochlorothiazide, isotretinoin, and calcium channel blockers, cause angioedema. Several studies state that lipoic acid can relatively cure taste sensation disorders, but the most effective way is to eliminate the use of drugs that cause these disorders.<sup>26</sup> In general, angioedema usually forms edema on the tongue, lips, and

face and can also affect the pharynx, larynx, and internal organs. Patients who use ACE inhibitor drugs must stop and be given alternative antihypertensive drugs. Antihistamines, corticosteroids, and adrenaline are often used in angioedema therapy.<sup>30</sup>

Knowledge of the adverse effects of hypertension drugs, such as xerostomia, gingival hyperplasia, lichenoid reactions, gum bleeding, and loss of taste sensation, will help dentists treat patients with a history of using these drugs.<sup>19</sup> Oral complications related to antihypertensive drugs can be consulted with the doctor treating the patient, and evaluation of the drugs and their side effects can be considered.<sup>13</sup> Non-pharmacological interventions can also be carried out, namely a healthy diet (consuming more fruit and vegetables, a high protein, low carbohydrate diet), physical activity (150 minutes/week), reducing salt, and maintaining an ideal body weight (normal BMI).<sup>31</sup>

## MANAGEMENT OF HYPERTENSION PATIENTS IN DENTIST PRACTICES

High blood pressure is the body's response to disease status, medications, lifestyle changes, and habits, which have a medical impact and direct and indirect manifestations on oral health.<sup>4</sup> As a dentist, knowledge Regarding hypertension is very important to know the consequences and possible complications that occur during clinical treatment or as a result of therapy.<sup>11</sup> Therefore, there are differences in dental care protocols and how to treat hypertensive patients.<sup>1</sup>

Dental care for hypertensive patients is a challenge that must be based on science to determine the best behaviour in patient care. Therefore, in treating hypertensive patients, we need to measure blood pressure, explain the best treatment plan, explain the therapy and its effects, and minimize or prevent side effects that may occur during treatment tooth.<sup>5,9,11,12</sup>

The most important step in managing hypertensive patients is to carry out an initial evaluation of hypertensive patients through anamnesis, including a complete health examination including family history, history of hypertension, medications consumed, duration and history of antihypertensive treatment, severity of disease, complications of disease, employment status, and socioeconomic status.<sup>2,4</sup> The doctor's ability to carry out a precise and in-depth history is necessary for deciding the ideal therapeutic procedures.<sup>11</sup> Diagnosis and treatment plan are the initial and very important steps in dental care to ensure the success of the treatment.<sup>4</sup>

Stress before and during dental treatment is normal for every patient. The use of pharmacological agents for relaxation and reducing stress can be given.<sup>19</sup> During dental treatment, avoiding anxiety and pain is very important. Therefore, adequate analgesia can be used to ensure that treatment does not cause pain. This condition can cause the release of endogenous epinephrine, which results in dysrhythmias.<sup>4</sup>

As dentists, we need to reduce blood pressure responses to dental treatment, such as physical stress, psychological stress, humoral factors, environment, central stimuli, and nervous reflexes. Patients with White Coat Hypertension (WCH) in the dental clinic are another determining factor. The frequency of WCH was higher in patients who experienced a greater increase in blood pressure under conditions of psychological stress, and most patients showed higher blood pressure during the clinic than outside the clinic.<sup>7</sup>

Patients with hypertension are treated in the morning because the morning is more relaxing. Likewise, if an unexpected event occurs, there is enough time to manage it.<sup>19</sup> In treating hypertensive patients, dentists must be careful not to interfere with antihypertensive treatment, limit the stress caused by treatment, ensure that the analgesia used is optimal, and administer premedication drugs.<sup>11</sup>

Health services by a dentist need to be accompanied by regular blood pressure checks of the patient.<sup>7</sup> When undergoing dental treatment, always try to measure blood pressure 2-3 times with an interval of 3-5 minutes to ensure accuracy because there is a condition called white coat hypertension where there can be dramatic changes in blood pressure when measured in a medical or dental environment that occurs due to patient anxiety.<sup>4,17</sup> Blood pressure measurements are usually reported for complex and stress-inducing dental procedures, such as long-term restorative procedures, surgical procedures, and periodontal disease treatment.<sup>7,17</sup>

When performing anaesthesia, a syringe with aspiration can be used to avoid entering the anaesthetic drug into the blood vessels.<sup>4</sup> Local anaesthetic drugs containing adrenaline are not contraindicated in controlled hypertension.<sup>11</sup> Epinephrine can be used with local anaesthesia unless the systolic blood pressure exceeds 200 mmHg and/or diastolic more than 110 mmHg. To avoid drug interactions, local anaesthetics containing epinephrine should not be given in high doses to patients taking beta blockers. If necessary, conscious sedation may be recommended.<sup>4</sup> However, recently, the potential for cardiovascular stimulation (increased heart rate and blood pressure) after intravascular injection may occur, leading dentists to reduce or avoid vasoconstrictors in individuals with cardiovascular disorders, although vasoconstrictors in local anaesthetics are rarely contraindicated.<sup>6</sup>

## CONCLUSION

Dental treatment categorized as safe can be life-threatening if performed on patients with medical problems. Dentists must identify and treat patients wisely because of any medical emergencies that may occur while the patient is under treatment. A comprehensive treatment plan must be created through good collaboration with the patient. Although no evidence suggests a direct link between dental care and hypertension complications, oral health care providers must understand the potential risks and complications when these individuals receive care in a dental office.

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## CONFLICT OF INTEREST

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