ASSOCIATION OF DEPRESSION WITH COVID-19 IN DIFFERENT COUNTRIES AMONG DIFFERENT CATEGORIES OF PEOPLE

Zarqa Iqbal¹, Muhammad Akram², Momina Iftikhar², Kingsley Erhons ENERIJIOFI³, Francisco Garcia-Sierra⁴, Md. Al Hasibuzzaman⁵, Fethi Ahmet Ozdemir⁶, Gaweł Sołowski⁶, Najmiatul Fitria⁷, Marcos Altable⁸, Adonis Sfera⁹

¹National University Of Sciences And Technology

²Department of Eastern Medicine, Government College University Faisalabad-Pakistan
³Department of Biological Sciences, Glorious Vision University, Ogwa, Edo State, Nigeria
³Department of Community Medicine, Sri Venkateshwaraa Medical College Hospital & Research
Centre (SVMCH&RC) Puducherry, India

⁴Department of Cell Biology, Center of Research and Advanced Studies of the National Polytechnical Institute, Mexico City, Mexico.

⁵Department of Nutrition and Food Science, University of Dhaka, Dhaka 1000, Bangladesh ⁶Department of Molecular Biology and Genetics, Faculty of Science and Art, Bingol University, Bingol, 1200, Türkiye

⁷Department of Pharmacology and Clinical Pharmacy, Universitas Andalas, Indonesia ⁸Department of Neurology, Neuroceuta, (Virgen de Africa Clinic), Spain ⁹Department of Psychiatry, Patton State Hospital, USA *Corresponding author email: makram 0451@hotmail.com

Abstract:

COVID-19 affected to the people all around the world. As its first and second wave has been passed and we are facing currently to third wave, but all around the world no one can overcome to this viral infectious disease. Likewise it is affecting to people like a viral disease physically but along with its effect, its huge effect on mental health worldwide. The significant academic research has shown that there is a correlation of mental issues and covid-19 pandemic. Among all people it has seen that mostly students are affected. Recent studies have suggest that psychiatric problems, includes nervousness, depressive symptom, disappointment in students due to exposure of covid-19. However the mental health strategies of lockdown are unknown. In addition, illness perceptions and relevant consequences facing the pandemic have played role due to restrictions. Survey type studies are conducted for the investigation of anxiety and depression during pandemic lockdown. All people like adults, men, women, students are invited for survey through social media.



Corresponding Author: Dr. Muhammad Akram Department of Eastern Medicine. Government College University Faisalabad.

E-Mail:makram_0451@hotmail.com

Women and people with financial difficulties faced more emotional problems during pandemic. The symptoms of depression were higher in young generation, students, those who were isolated due to symptoms, and those overexposed to news related to covid-19. Depression was lower in people taking preventive measures and treatment control. Studies for depression due to covid-19 were conducted at almost every country in the world. In United Kingdom, a survey was conducted during lockdown in which total of 12.8%, 7.8% men and 17.3% women was affected with depression. Those single/widowed/divorced, reported poor sleep, feeling of loneliness, and reported living alone were more likely to develop depression. Some studies conducted surveys to compare the anxiety and depression in pregnant women during covid-19. So, there was a great influence on pregnant women due to social distancing and restrictions related to delivery between countries around the world.

Key words: Corona virus, Depression, Anxiety

Introduction

The corona virus disease (covid-19) left psychological disorders as well as physiological illness. Instead from this severe and lethal disease with no specific treatment, there is a great population affected with mental health due to the strategies of social distance and lockdown, which increases the mortality. Covid-19 pandemic related coping behaviors are considered to be important factors to develop anxiety disorders and depressive disorders. Previous studies shown that, there is a relation between the perceptions for this viral infection and psychological responses to pandemic outbreaks. However, this infection was spread to all countries in the world including Italy, France, Spain etc. In Greece news, they declare it as 'uniqueness of the Greek case'. All countries were imposed lockdown and restriction about social gathering with little opposition from the public. Online surveys were conducted in Pakistan and other countries as well. Anxiety and depressive disorders were assessed greatly [1]

The mental wellbeing of old people regarding to the strategies of social isolation, greatly concern with covid-19. According to previous studies, older people and women are at greater risk of developing anxiety and depression. The influence of severe acute respiratory syndrome on mental health was reported within the general public among different populations. The United Kingdom also imposed lockdown in country in which restrictions include, ban on travelling, closing of shops, ban on gathering and quarantine for those who have symptoms of infection. So, there was a negative effect on mental health conditions like depression, anxiety, stress and insomnia due to long period of social isolation.[2] Anxiety is a feeling of fear associated with body's natural response to stress, as there was no specific treatment for this corona virus disease, due to this unpredictability, pandemic makes people more likely to develop anxiety. Surveys were also conducted among pregnant women, hence in their outcome, risk factors for anxiety were similar than general population including bad experiences in children, overprotection and punishment etc. People with low socioeconomic status were more prone to develop anxiety and depression, because due to lockdown, there

was no option about source of income, peoples are sitting at their homes, shops and offices were closed, so peoples are worried about expenditures, those with no bank balances and active source of income. In addition, perinatal depression was found from previous studies in 10% women, untreated this perinatal depression may result in severe obstetrical complications and postnatal depression.[3]

The base of emerging of covid-19 is in Wuhan, China, in the month of November 2019, but it spread to worldwide by the start of 2020. Among the affected countries, Italy is most affected country of them. A study was conducted on 19March2020 at Italy to confirm the covid-19 cases, and other psychological disorders concerned with this pandemic. Psychological effects of quarantine compared during past epidemic and pandemics (for example, influenza, Ebola, SARS, MERS) with nonquarantine, previous are more likely to show psychological distress. However, quarantined persons were high prevalence of psychological symptoms, including depression, anxiety, stress by quantitative studies. A self-report questionnaire, circulated among the Italian population for Depression, Anxiety to measure psychological distress during pandemic, aimed at demonstrating the prevalence of psychiatric symptoms and preventive factors and identifying factors for psychological distress.[4]

Apart from the SARS-COV-2 pandemic disease itself, people around all over the world are encountering anxiety, stress, depression due to different causes, like financial issues, isolation, restrictions from social gathering, outing, and maintaining social contact with their loved ones. Hence, the restrictions were imposing on personal, social and occupational functioning. Actually, studies performed from starting of 2020 have shown much interest in internet mental health symptoms searches, even an extension of request for mental health services. According to Country specific data there is a high level of stress, anxiety, depression, due to developing loneliness leads to suicidal ideation. Several agents are linked with stress and mental health, for example loss of sleep has a known relation with anxiety and depression.[5] So, there is a need to overcome on these health issues by providing mental health services among individuals.[6]

INFLUENCE OF COVID-19 ON PAKISTANI STUDENTS

Surveys were conducted to rule out the nervousness, disappointment, and depression disorders present in students along with COV-19 pandemic lockdown and correlation of perception and mind health in Pakistani students. However, they found positive response of perception with nervousness and depressive symptoms present in students during the duration of lockdown. About 500 people were participated in survey including public and private universities. That study was based on online survey, which includes questions about duration of illness, beliefs for the effectiveness of treatment, presence of symptoms, overcome of disease. The study findings shown that depression is still negatively associated with perceptions but anxiety is positively associated with perception illness in Pakistani students during COVID-19 lockdown.[7]

Types	Anxiety	Depression
Normal	43.20%	65.90%
Mild	20.50%	9.11%
Moderate	14.6%	10.1%
Severe	27.7%	16.9%

This is the level of anxiety and depressive disorders in students.

This studies shown that mental health issues are promptly increasing among students along with covid-19 lockdown pandemic. These mental issue are growing due to several factors like, as in lockdown all schools, colleges and universities were closed and institutes were conducting online classes, students those from northern areas of Pakistan or not proper facility areas (for example Kashmir, KPK, Gilgit, Sindh) where was poor internet connection, even not 4G internet in their areas, that was main anxiety and depressive issue in students, because they were faced poor education. Another one great issue during covid-19 which was student faced, that is financial issue, due to lockdown, mostly people lost their jobs, as all offices and income sources were closed, students were experienced financial issue, as they were unable to pay their fee. However, perceptions have lessened association with mental stability because its high ranking is associated with depression among students throughout the COVID-19 lockdown. Besides, there is need to conduct studies to measure the psychological illness in students throughout the third peak of COVID-19.[8]

INFLUENCE OF COVID-19 ON BANGALADESH STUDENTS

A Survey was conducted to rule out the widespread of anxiety and depression in universities at Bangladesh. That was a web based survey. They used goggle form and circulate it to the university's official portal. Many students were participated in this survey. Their aim was to identify the relationship of anxiety and depression with covid-19 outbreak in students.[9] About 476 universities student, those were living in Bangladesh participated in this web base survey. However from analysis, they role out that 15% severely depression was present in those students, and 18% were severely suffered from anxiety. That survey was also suggests that older students have greater depression which was the consideration of, students who were paying tuition fee during pandemic had suffer from depression. So, its can be expected that both Universities and Government could work for financial problems of students to decrease the level of depression among university students.[10]

INFLUENCE OF COVID-19 ON US (UNITED STATE) PEOPLE

When Novel Corona virus entered into United States, China has been already given reports that fatality rate is higher with older age. Generally, older age is associated with less negative

emotions and presenting lower level of anxiety and depression. When Covid-19 spread in March 2020 in United States, A study was conducted to examined, whether older age was associated with lower risk of Covid-19 and with less depression and anxiety. About 6,666 invited members of University of California understanding American study were participated in survey among which all age group people (1-100), and males are included. For collecting data they were generated online forms on internet. After analysis, Study show that mostly people were depressed, as they depressed, hopeless, a little interest in doing things and lack of pleasure in them, and prone to developing of anxiety, nervousness and uncontrolled worry. There found warning sign of scale ≥6 to develop depression.[11]

INFLUENCE ON ITALIAN PEOPLE

Novel Corona virus spread to all over the world and affected greatly to population. So, this pandemic led to every country to conduct online surveys about people mental health. Due to loneliness, social distance, restrictions, fear of disease, as it has no proper treatment and increase burden of fatality rate, there was a great chances of developing mental health issues. So, Italian people also conducted online survey to rule out the mental health issues associated with Covid-19. Italy was one of the country that badly affected due to pandemic. The online questionnaire was prepared which includes, working life, those who were affected with covid-19, those are guarantined with symptoms of covid-19, whose loved one affected with covid-19, presence of previous disease (cardio or cancer related pathologies); previous stressed situations, and those suffering from psychological issues like depression and anxiety. However, mental health was measured according to scale-21 items (DASS-21).[12] It is a set of three selfreport scales which was designed to measure the depression and anxiety. Scale was set according to mild, moderate and severe. Their outcome scores are (10-12) mild, (13-20) moderate, and (21-27) severe for depression. The depression level in participants is 67.3% had an average level, 17% which of them were high in range, and 15.4% were in extremely high range. Depression level were found high in those people who have low level of education, females, jobless, who were infected with covid-19 and history of stressful condition and medical issues.[4]

INFLUENCE ON YOUNG GENERATION

The arrival of Corona virus pandemic in the month of December 2019 has led to unhappy interchange in our lives with intense strategies for physical and mental health. Instead of fatality of disease itself, this disease led people to more prone to develop mental issues like depression and anxiety because of economic issues, social distancing, staying in etc. It is predicted that will face mental issues in future even, after proper and effective treatment. Country specific data has disclose an increase level for nervousness, disappointment, sadness, anxiety, isolation and suicidal attempts. There was an extension of request for providing mental stability services. About 2555 people opened the survey from 63 countries.[13] Out of them

902 were not completed the measure of mental health. Thus, 1653 people were included in final analysis. Currently 89% were in lockdown, 61% are working from home. So, 18% of them were diagnosed with depression in which 35% with moderate or severe level due to Covid-19 pandemic. Sleep disturbance are a risk factors of developing depression. China reports that insomnia and nervousness are directly related with higher level of depression in younger adults during pandemic.[14] This suggest that by improving sleep and providing social closeness may decrease the level of stress, depression and anxiety after pandemic. These observations were similar to an Australian survey performed in the month of April 2020, according to that, people less than the age of 45 were more prone to develop psychiatric issues.[7] So, Government and industries should consider the consequences that decrease the stress level, improve sleep for well being during Pandemic. As, this pandemic affected mainly to economy, some approaches may be performed to decrease the burden of depression level among youngers. Public health should initiates employment for individuals, that arbitrate the links between stress and mental health.[6]

INFLUENCE ON PREGNANT WOMEN

Recent studies are conducted at different countries to examine the relationship between stress and Covid-19 pandemic, shown that females are more prone to depressive disorders, among them mostly were pregnant. A web based survey was conducted which was developed by different Professionalist includes; doctors, psychologists, midwives and sociologists. All experts developed questions from their field. A pilot study was performed among Chinese and English spoken pregnant ladies, feedback was obtained from them and analyzed them.[15] Survey form was included; 60 questions, whether she is pregnant or not, consent form and PHQ-9 scale to measure the level of depression in pregnant ladies. The sample size was 500 for each country. One of the main maternal concern is fetal well being. The vertical transmission of covid-19 was yet not confirmed but women are mainly concern with risk of infection of the newborn in the peripartum period. Pregnancy is a time period which increased the medical observations and follow up, that facility was difficult due pandemic lockdown. So, there was a difficulty to access doctors, may be a source of anxiety and avoiding to access medical facility due to exposure of SARS-COV-19.[3]

Conclusion and Future Prospects

A previous review of the literature highlights the relationship of psychological illness among different categories of people in quarantined people includes, depressive symptoms, nervousness, anxiety. However the present study conducted a survey from previous literature among different countries and different genders. Thus, the present study sought out that there is great correlation of psychological illness, like depression and nervousness with Covid-19 outbreak, present at different countries like Italy, UK, US, China, Pakistan, Australia, Bangladesh among younger, older people, pregnant ladies and students. In Italy, result shows that 6% of

population between 18-69 were affected with depressive symptoms among them, mostly were female. The female gender has increased level of psychological distress. The present history also found an association of depression with past medical history. The persons who were already suffering from any kind of disease like heart issues and cancer, those are immunocompromised were at great risk of developing SARS-COV-19 infection, so they were greatly in depressive situation. Psychological illness was found greatly in both younger and older age of people.

The findings from this world wide survey shows that psychological distress were greatly present during the first stage of pandemic. In addition, in one survey, 20% of participants with depression were related to their financial issues, which was the cause of their mental illness and poor sleep. About, 77% individuals were faced high level stress, 60% of them with anxiety, and 35% were with depressive symptoms with mild to moderate in range. Younger age was a remarkable arbitrator to develop the anxiety and stress during pandemic. Younger adults fear the bad with consideration to depression, stress and nervousness symptoms. By measuring scale older were at lower risk of developing depressive symptoms. Among younger age, mostly were students. From previous studies, we concluded that Pakistani student were faced most problems like, internet issues in northern areas of Pakistan, they were unable to take online classes, great loss of their education system, as they were paying fee to universities but in reward, little education acquired, their GPAS were affected, these issues were the leading cause of depression during Covid-19 pandemic lockdown that's why depression was rapidly increased in students. However Pakistan government has been taken some better national steps at intense situation of pandemic to avoid further spiral of Covid-19 outbreak related to studies. However this study rule out that depression and anxiety are greatly associated with Corona virus infection and those experiencing the exposure of covid-19 are at high risk for the development of mental illness. Our information suggests that there were great influence of mental health at Greece in association with Covid-19. According to this study, there is high prevalence of mental issues due to pandemic, so, every country should take step forward to organize the mental health services to avoid or decrease the load of mental issues.

REFERENCES

- Alapati, N., Prasad, B. V. V. S., Sharma, A., Kumari, G. R. P., Bhargavi, P. J., Alekhya, A., ... & Nandini, K. (2022, November). Cardiovascular Disease Prediction using machine learning. In 2022 International Conference on Fourth Industrial Revolution Based Technology and Practices (ICFIRTP) (pp. 60-66). IEEE.
- 2. Rao, S. D. P. (2023). RANSOMWARE DEFENSE IN THE CLOUD ENVIRONMENTS: ADAPTIVE STRATEGIES FOR EVOLVING THREATS.

- 3. Bharathi, G. P., Chandra, I., Sanagana, D. P. R., Tummalachervu, C. K., Rao, V. S., &Neelima, S. (2024). Al-driven adaptive learning for enhancing business intelligence simulation games. Entertainment Computing, 50, 100699.
- 4. Rao, S. D. P. (2024). SOLVING CLOUD VULNERABILITIES: ARCHITECTING AIPOWERED CYBERSECURITY SOLUTIONS FOR ENHANCED PROTECTION.
- 5. Rao, S. D. P. (2024). HARNESSING AI FOR EVOLVING THREATS: FROM DETECTION TO AUTOMATED RESPONSE.
- 6. Rao, S. D. P. (2022). PREVENTING INSIDER THREATS IN CLOUD ENVIRONMENTS:

 ANOMALY DETECTION AND BEHAVIORAL ANALYSIS APPROACHES.
- 7. Rao, S. D. P. (2022). THE SYNERGY OF CYBERSECURITY AND NETWORK ARCHITECTURE: A HOLISTIC APPROACH TO RESILIENCE.
- 8. Rao, S. D. P. (2022). MITIGATING NETWORK THREATS: INTEGRATING THREAT MODELING IN NEXT-GENERATION FIREWALL ARCHITECTURE.
- 9. Kanth, T. C. (2024). AI-POWERED THREAT INTELLIGENCE FOR PROACTIVE SECURITY MONITORING IN CLOUD INFRASTRUCTURES.
- 10. Kanth, T. C. (2023). ADVANCE DATA SECURITY IN CLOUD NETWORK SYSTEMS.
- 11. Kanth, T. C. (2023). SECURING DATA PRIVACY IN CLOUD NETWORK SYSTEMS: A COMPARATIVE STUDY OF ENCRYPTION TECHNIQUES.
- 12. Kanth, T. C. (2023). EFFICIENT STRATEGIES FOR SEAMLESS CLOUD MIGRATIONS USING ADVANCED DEPLOYMENT AUTOMATIONS.
- 13. Kanth, T. C. (2024). OPTIMIZING DATA SCIENCE WORKFLOWS IN CLOUD COMPUTING.
- 14. Kanth, T. C. (2023). CONTEMPORARY DEVOPS STRATEGIES FOR AUGMENTING SCALABLE AND RESILIENT APPLICATION DEPLOYMENT ACROSS MULTI-CLOUD ENVIRONMENTS.
- 15. Kanth, T. C. (2023). EXPLORING SERVER-LESS COMPUTING FOR EFFICIENT RESOURCE MANAGEMENT IN CLOUD ARCHITECTURES.
- 16. Nagarani, N., et al. "Self-attention based progressive generative adversarial network optimized with momentum search optimization algorithm for classification of brain tumor on MRI image." Biomedical Signal Processing and Control 88 (2024): 105597.

- 17. Reka, R., R. Karthick, R. Saravana Ram, and Gurkirpal Singh. "Multi head self-attention gated graph convolutional network based multi-attack intrusion detection in MANET." Computers & Security 136 (2024): 103526.
- 18. Meenalochini, P., R. Karthick, and E. Sakthivel. "An Efficient Control Strategy for an Extended Switched Coupled Inductor Quasi-Z-Source Inverter for 3 Φ Grid Connected System." Journal of Circuits, Systems and Computers 32.11 (2023): 2450011
- 19. Karthick, R., et al. "An optimal partitioning and floor planning for VLSI circuit design based on a hybrid bio-inspired whale optimization and adaptive bird swarm optimization (WO-ABSO) algorithm." Journal of Circuits, Systems and Computers 32.08 (2023): 2350273.
- 20. Jasper Gnana Chandran, J., et al. "Dual-channel capsule generative adversarial network optimized with golden eagle optimization for pediatric bone age assessment from hand X-ray image." International Journal of Pattern Recognition and Artificial Intelligence 37.02 (2023): 2354001.
- 21. Rajagopal RK, Karthick R, Meenalochini P, Kalaichelvi T. Deep Convolutional Spiking Neural Network optimized with Arithmetic optimization algorithm for lung disease detection using chest X-ray images. Biomedical Signal Processing and Control. 2023 Jan 1;79:104197.
- 22. Karthick, R., and P. Meenalochini. "Implementation of data cache block (DCB) in shared processor using field-programmable gate array (FPGA)." Journal of the National Science Foundation of Sri Lanka 48.4 (2020).
- 23. Karthick, R., A. Senthilselvi, P. Meenalochini, and S. Senthil Pandi. "Design and analysis of linear phase finite impulse response filter using water strider optimization algorithm in FPGA." Circuits, Systems, and Signal Processing 41, no. 9 (2022): 5254-5282.
- 24. Karthick, R., and M. Sundararajan. "SPIDER-based out-of-order execution scheme for HtMPSOC." International Journal of Advanced Intelligence paradigms 19.1 (2021): 28-41.
- 25. Karthick, R., Dawood, M.S. & Meenalochini, P. Analysis of vital signs using remote photoplethysmography (RPPG). J Ambient Intell Human Comput 14, 16729–16736 (2023). https://doi.org/10.1007/s12652-023-04683-w

- 26. Selvan, M. A., & Amali, S. M. J. (2024). RAINFALL DETECTION USING DEEP LEARNING TECHNIQUE.
- 27. Padgul, A. V., & Patil, R. N. A Study on the Impact of Performance Management Systems on Employee's Performance in Degree Institutions in Kalaburagi.
- 28. Kumaresan, G., Vijayakumar, P., Ravikumar, M., Kamatchi, R., & Selvakumar, P. (2019). Experimental study on effect of wick structures on thermal performance enhancement of cylindrical heat pipes. Journal of Thermal Analysis and Calorimetry, 136, 389-400.
- 29. Faizal, U. M., Jayachitra, R., Vijayakumar, P., & Rajasekar, M. (2021). Optimization of inbound vehicle routes in the collection of bio-medical wastes. Materials Today: Proceedings, 45, 692-699.
- 30. Vijayakumar, P., Kumaresan, G., Kumar, S. G., & Eswaran, M. (2021). A review on applications of nanofluid in evacuated tube heat pipe integrated with compound parabolic concentrator. Materials Today: Proceedings, 45, 1227-1232.
- 31. Vijay, R., Vijayakumar, P., Kumaresan, G., & Kumar, S. G. (2021). Performance study of FPSC integrated with twisted tape inserts. Materials Today: Proceedings, 45, 1222-1226.
- 32. Palanivel, V., Govindasamy, K., & Arunachalam, G. K. (2022). Optimization and prediction of pulsating heat pipe compound parabolic solar collector performances by hybrid deep belief network based bald eagle search optimizer. Environmental Progress & Sustainable Energy, 41(2), e13740.
- 33. Mohanraj, K. S., Vijayakumar, P., & Senthilkumar, R. (2017). Gokul Karthika, "Design And Analysis Of Semi Automatic Paper Cum Arecanut Plate Making". International Research Journal of Engineering and Technology (IRJET), 4(05), 3546-3550.
- 34. Vijayakumar, P., Kumar, S., Sakthivelu, S., & Prakash, R. S. (2017). Comparison of evacuated tube and flat plate solar collector—A review. World Wide Journal of Multidisciplinary Research and Development, 3(2), 32-36.
- 35. Madhavan, V. M., Rahul, S., Vijayakumar, P., Dhal, P. K., Girimurugan, R., Ravivarman, G., & Joseph, J. (2023). Optimizing solar energy utilization and energy efficiency through thermal energy storage with phase change materials in a solar water heating system. In E3S Web of Conferences (Vol. 455, p. 02005). EDP Sciences.
- 36. Rajasekar, M., Faizal, U. M., Sudhagar, S., & Vijayakumar, P. (2021). Influence of heat treatment on tribological behavior of Al/ZrO2/fly ash hybrid composite. Materials Today: Proceedings, 45, 774-779.
- 37. Gokul Karthik, A., Saravanakumar, R., & Vijayakumar, P. (2021). Bald eagle search optimization on dual fueled reactivity controlled combustion ignition based engine characteristics by altering low reactive fuels. Environmental Progress & Sustainable Energy, 40(6), e13683.
- 38. Vijayakumar, P., Kumaresan, G., Faizal, U. M., Chandran, G. V., & Adharsh, K. V. (2019, September). Performance evaluation of compound parabolic concentrator with evacuated tube heat pipe. In IOP Conference Series: Earth and Environmental Science (Vol. 312, No. 1, p. 012008). IOP Publishing.

- 39. Mackerle, J. (2000). Finite element analyses and simulations in biomedicine: a bibliography (1985-1999). Engineering computations, 17(7), 813-856.
- 40. Mohanraj, D., Vijayakumar, P., Kiruthiga, V., Jadhavd, D., Krishna, M., & Nanthakumar, S. (2024). Examining the Combination of a Parabolic Solar Collector with Phase Change Material (PCM) in Solar Distillation. In E3S Web of Conferences (Vol. 529, p. 02006). EDP Sciences.
- 41. Vijayakumar, P., Kumaresan, G., Sudhagar, S., Chandran, G. V., & Adharsh, K. V. (2019, September). Development of Solar Oven employed with Parabolic Concentrator. In IOP Conference Series: Earth and Environmental Science (Vol. 312, No. 1, p. 012009). IOP Publishing.
- 42. Vivek, P. (2014). Heat Recovery Steam Generator by Using Cogeneration. International Journal of Engineering Research, 3(8), 512-516.
- 43. Velavan, R., Nandhakumar, S., & Vijayakumar, P. (2017). Experiment in EDM process by using brass electrode with Inconel material in Nano powder mixed dielectric medium. Pakistan J. Biotechnol, 14, 50-53.
- 44. Govindasamy, K., Palanivel, V., Meena, R. S., Muthusamy, S., Panchal, H., Shah, M. A., & Siddiqui, M. I. H. (2024). Performance analysis of evacuated tubes with thermosyphon heat pipe solar collector integrated with compound parabolic concentrator under different operating conditions. Energy Exploration & Exploitation, 42(1), 231-249.
- 45. Vijay, R., Kumaresan Govindasamy, P. Vijayakumar, and Godson Asirvatham Lazarus. "Experimental investigation on productivity enhancement of a solar still modified with the evacuated tube heat pipe using paraffin wax." PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART C-JOURNAL OF MECHANICAL ENGINEERING SCIENCE 236, no. 21 (2022): 10865-10876.
- 46. Arulsamy, A. N., Murugesan, B., Samuel Chelladurai, S. J., Selvaraj, M. K., Palanivel, V., & Balcha, G. (2022). Experimental investigation on microstructure and mechanical properties of friction welded dissimilar alloys. Advances in Materials Science and Engineering, 2022(1), 5769115.
- 47. Ahamed, S. K., Naidu, M. M., & Reddy, C. S. R. (2015). Outliers in data envelopment analysis. International Journal of Computer Science and Security (IJCSS), 9(3), 164-173.
- 48. Ahamed, S. K., Naidu, M. M., & Subba, R. R. C. (2016). Outliers: most influential observations in variable returns to scale data envelopment analysis. Indian Journal of Science and Technology, 9(2), 1-7.
- 49. Rekha, V., Reddy, L. V., Chaudhari, S. V., Gopi, A., Nithiya, C., & Ahamed, S. K. (2023, January). Automated Deep Learning with Wavelet Neural Network based Rice Plant Classification. In 2023 International Conference on Intelligent Data Communication Technologies and Internet of Things (IDCIoT) (pp. 345-350). IEEE.

- 50. Ahamed, S. K., Krishna, B. V., & David, D. B. (2021). Brain Tumor Segmentation and Classification based on Deep Learning-Based Inception Networks. Annals of the Romanian Society for Cell Biology, 5210-5219.
- 51. Ahamed, S. K., Naidu, M. M., & Reddy, C. S. R. (2015). Most influential observations-Super efficiency. International Journal on Computer Science and Engineering, 7(9), 82.
- 52. Sirajuddin, M., Ravela, C., Krishna, S. R., Ahamed, S. K., Basha, S. K., & Basha, N. M. J. (2024). A Secure Framework based On Hybrid Cryptographic Scheme and Trusted Routing to Enhance the QoS of a WSN. Engineering, Technology & Applied Science Research, 14(4), 15711-15716.
- 53. Sharma, P., Prasad, J. S., Shaheen, & Ahamed, S. K. (2024). An efficient cyber threat prediction using a novel artificial intelligence technique. Multimedia Tools and Applications, 1-17.
- 54. Balasubramaniam, P. M., Satheesh, N., Guhathakurta, R., Ahamed, S. K., Sharma, D. K., Rangasamy, R., & Sengan, S. (2022). Design of Automotive Accident-Avoidance System at Speed Limit Zone Using GPS. In Innovations in Computer Science and Engineering: Proceedings of the Ninth ICICSE, 2021 (pp. 271-279). Singapore: Springer Singapore.
- 55. Singuluri, P. K., Basha, S. L. J., Ahamed, S. K., & Nithya, M. (2021, July). An Educated Peer Discovery Expanding Blockchain Framework. In Journal of Physics: Conference Series (Vol. 1964, No. 4, p. 042091). IOP Publishing.
- 56. Hussain, S. A., & khaleel Ahamed, S. (2020). SCALABLE AND SECURE DATA SHARING OF SENSITIVE INFORMATION PRESERVATION WITH EFFECTIVE SEARCH MECHANISM. INTERNATIONAL JOURNAL, 5(11).
- 57. Vaid, A. K., Parmar, M., Srikkanth, G. R., & Meera, K. L. (2023). Intellectual Property Rights And Business Security. AG Publishing House (AGPH Books).
- 58. Seshanna, S., & Seshanna, M. (2016). The impact personality traits, role conflict and work family conflicton customer orientation: a review of extant literature. International Journal of Research in Social Sciences, 6(2), 466-480.

- 59. Bhargavi, V. S., Choudhary, A., Gangadharan, S., Gambhir, V., KL, M., & Gupta, S. (2023). Social Sciences in Management Research: Interdisciplinary Approaches for Sustainable Business Practices. Journal of Informatics Education and Research, 3(2).
- 60. Vembu, N. R., Meera, K. L., Suganthi, C., Sawant, R., Ravichand, M., & Pathak, P. (2023).

 Differential Education as an Approach for Improving Future Specialist's General

 Competence. Journal of Informatics Education and Research, 3(2).
- 61. Lal, S., Mani, H., KL, M., Sharma, A., Sasidharan, A., & Radha, T. (2023). Developing a strategic planning framework for Small and Medium Enterprises (SMES). European Chemical Bulletin, 12(5), 460-469.
- 62. Seshanna, M., Periasamy, P., & Seshanna, S. (2021). ART AS AN ALTERNATIVE INVESTMENT ASSET CLASS IN EMERGING ECONOMIES: A STUDY LINKING PERSONALITY FACTORS TO INVESTOR BEHAVIOUR. Turkish Online Journal of Qualitative Inquiry, 12(6).
- 63. Seshanna, M., Kumar, H., Seshanna, S., & Alur, N. (2021). THE INFLUENCE OF FINANCIAL LITERACY ON COLLECTIBLES AS AN ALTERNATIVE INVESTMENT AVENUE: EFFECTS OF FINANCIAL SKILL, FINANCIAL BEHAVIOUR AND PERCEIVED KNOWLEDGE ON INVESTORS'FINANCIAL WELLBEING. Turkish Online Journal of Qualitative Inquiry, 12(4).
- 64. Seshanna, M. INVESTORS BEHAVIOURAL STUDY ON ART AS AN ALTERNATIVE INVESTMENT ASSET CLASS.
- 65. Seshanna, S., & Seshann, M. (2017). The applied experiential learningmethod in entrepreneurship education: A conceptual approach. International Journal of Research in Social Sciences, 7(5), 481-488.
- 66. Seshanna, S., & Seshanna, M. (2015). Learning Inclusiveness and Under-served Communities in India. International Journal of Physical and Social Sciences, 5(10), 142-147.
- 67. Seshanna, S., & Seshanna, M. (2018). Midas Ventures A case of a financial services aggregator. International Journal of Research in Social Sciences, 8(4), 159-162.
- 68. Lakhekar, G. V., Waghmare, L. M., & Roy, R. G. (2019). Disturbance observer-based fuzzy adapted S-surface controller for spatial trajectory tracking of autonomous underwater vehicle. IEEE Transactions on Intelligent Vehicles, 4(4), 622-636.

- 69. Roy, R. G. (2019). Rescheduling based congestion management method using hybrid Grey Wolf optimization-grasshopper optimization algorithm in power system. J. Comput. Mech. Power Syst. Control, 2(1), 9-18.
- 70. Baidya, D., & Roy, R. G. (2018). Speed control of DC motor using fuzzy-based intelligent model reference adaptive control scheme. In Advances in Communication, Devices and Networking: Proceedings of ICCDN 2017 (pp. 729-735). Springer Singapore.
- 71. Lakhekar, G. V., Waghmare, L. M., Jadhav, P. G., & Roy, R. G. (2020). Robust diving motion control of an autonomous underwater vehicle using adaptive neuro-fuzzy sliding mode technique. IEEE Access, 8, 109891-109904.
- 72. Lakhekar, G. V., & Roy, R. G. (2014, March). A fuzzy neural approach for dynamic spectrum allocation in cognitive radio networks. In 2014 International Conference on Circuits, Power and Computing Technologies [ICCPCT-2014] (pp. 1455-1461). IEEE.
- 73. Roy, M. R. G. (2020). Economic dispatch problem in power system using hybrid PSO and enhanced bat optimization algorithm. J Comput Mech Power Syst Control (JCMPS), 3(3), 27-33.
- 74. Lakhekar, G. V., & Roy, R. G. (2014, March). Heading control of an underwater vehicle using dynamic fuzzy sliding mode controller. In 2014 International Conference on Circuits, Power and Computing Technologies [ICCPCT-2014] (pp. 1448-1454). IEEE.
- 75. Roy, R. G., & Ghoshal, D. (2020). Search and rescue optimization algorithm-second order sliding mode control: AUV error tracking. Journal of Computational Mechanics, Power System and Control, 3(1), 10-20.
- 76. Roy, R. G., & Ghoshal, D. (2021). A novel adaptive second-order sliding mode controller for autonomous underwater vehicles. Adaptive Behavior, 29(1), 39-54.
- 77. Gupta Roy, R., & Ghoshal, D. (2019). Adaptive second-order sliding-mode controller for shank-foot orthosis system. International Journal of Control, 92(7), 1580-1589.
- 78. Roy, R. G., Lakhekar, G. V., & Tanveer, M. H. (2023). Designing of neural network-based SoSMC for autonomous underwater vehicle: integrating hybrid optimization approach. Soft Computing, 27(7), 3751-3763.

- 79. Tanveer, M. H., & Roy, R. G. (2021). Real-time machine learning control for robotic manipulator by LNB: Lion Naïve Bayes algorithm. Journal of Computational Mechanics, Power System and Control, 4(4), 17-22.
- 80. Roy, R. G., Ghorai, P., Eskandarian, A., & Kasi, V. R. (2022, December). Design of a new nonlinear predictive PI controller for cascaded control system applications. In 2022 Eighth Indian Control Conference (ICC) (pp. 109-114). IEEE.
- 81. Roy, R. G., & Ghoshal, D. (2020). Advanced heavy water reactor control with the aid of adaptive second-order sliding mode controller. Engineering Computations, 37(4), 1237-1259.
- 82. Tanveer, M. H., Koduru, C., Roy, R. G., Lakhekar, G. V., & Chun, C. (2023, November). A Robust Control Technique for Pitch Control of an Aeropendulum. In 2023 6th International Conference on Robotics, Control and Automation Engineering (RCAE) (pp. 257-261). IEEE.
- 83. Roy, R. G. Design and Development of Adaptive Second Order Sliding Mode Controller for Industrial and Robotic Applications.
- 84. P. Rajendran, Lavakush Singh, D. Barani, & Meera K. L. (2024). IoT AND MACHINE LEARNING IN NONPROFIT MANAGEMENT TRANSFORMING SOCIAL AND ECONOMIC DEVELOPMENT PRACTICES. In COMMUNITY PRACTITIONER (Vol. 21, Number 06, pp. 637–648). Zenodo. https://doi.org/10.5281/zenodo.11615948
- 85. Thangapalani, L., Dharini, R., & Keerthana, R. (2023, May). Securing Medical Image Transmission using Memetic Algorithm. In 2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI) (pp. 1-8). IEEE.
- 86. Hemalatha, P. (2015). A Clinical Study for the Role of Eustachian Tube Function for Successful Mastoidectomy and Middle Ear Surgeries (Doctoral dissertation, Thanjavur Medical College, Thanjavur).
- 87. Vennila, D., Vinotha, C., Shanthakumari, A., & Thangapalani, L. Convex Optimization Algorithm for Product Recommendation Using Microblogging Information. Journal of Data Mining and Management, 2(1).
- 88. Dinesh, A. (2019). Collaborative Language Learning (CLL) in Indian ESL Classrooms: A Study of Regional Medium ESL Learners.

- 89. Ramarajan, M., Dinesh, A., Muthuraman, C., Rajini, J., Anand, T., & Segar, B. (2024). Al-Driven Job Displacement and Economic Impacts: Ethics and Strategies for Implementation. In Cases on AI Ethics in Business (pp. 216-238). IGI Global.
- 90. JPP, J., & Amali, S. M. J. (2023). Secure and low PAPR OFDM system using TCCM. Annals of Telecommunications, 78(7), 459-474.
- 91. Kumar, V. S., Thansekhar, M. R., Saravanan, R., & Amali, S. M. J. (2014). Solving multi-objective vehicle routing problem with time windows by FAGA. Procedia Engineering, 97, 2176-2185.
- 92. Sudha, S., Baskar, S., Amali, S. M. J., & Krishnaswamy, S. (2015). Protein structure prediction using diversity controlled self-adaptive differential evolution with local search. Soft Computing, 19, 1635-1646.
- 93. Sivananaithaperumal, S., Amali, S. M. J., Baskar, S., & Suganthan, P. N. (2011). Constrained self-adaptive differential evolution based design of robust optimal fixed structure controller. Engineering Applications of Artificial Intelligence, 24(6), 1084-1093.
- 94. Brindha, S. (2021). A robust and adaptive fuzzy logic based differential evolution algorithm using population diversity tuning for multi-objective optimization. Engineering Applications of Artificial Intelligence, 102, 104240.
- 95. Gowsalya, R., & Amali, S. M. J. (2014). Naive Bayes based network traffic classification using correlation information. International Journal of Advanced Research in Computer Science and Software Engineering, 4(3).
- 96. Sivaramkumar, V., Thansekhar, M. R., Saravanan, R., & Miruna Joe Amali, S. (2018). Demonstrating the importance of using total time balance instead of route balance on a multi-objective vehicle routing problem with time windows. The International Journal of Advanced Manufacturing Technology, 98, 1287-1306.