UGC Approved Indexed Peer Reviewed Journal

ISSN: 2320-6586 (Online)

IILM UNIVERSITY

Technologies for Sustainable Development Goals 2025 (TECH4SDG-2025)

School of Computer Science & Engineering

IILM University Greater Noida

Presents

1st National Conference

on

Technologies for Sustainable Development Goals 2025 (TECH4SDG-2025)

3rd March 2025

Technically Co-Sponsored by IEEE UP SECTION (INDIA)

Venue:

IILM University, Greater Noida

Plot No.18,16, Knowledge Park II, Greater Noida, Uttar Pradesh 201306

Procedings Published at

International Journal of Research in Modern Engineering and Emerging Technology

Vol. 13, Sp. Issue 1, April 2025

Doi: https://doi.org/10.63345/ijrmeet.org.v13.si1.1301

Editor-in-Chief

Dr. Mylavarapu Seetharama Prasad

www.ijrmeet.org

ISSN: (Online) 2320-6586

INTERNATIONAL JOURNAL OF RESEARCH IN MODERN ENGINEERING & EMERGING TECHNOLOGY

(IJRMEET)

I.F. (wef. 2023: 6.004)

Vol. 13, Sp. Issue 1, April: 2025

No part of this Journal may be reproduced in any form, by Photostat, Microfilm, Xerography, or any other means, or incorporated into any information retrieval System, electronic or mechanical, without the written permission of the Author, Editor-in-Chief and the Publisher of this Journal.

Copyright © 2025
Inc. All Rights Reserved

Published By
Resagate Global
KDP Grand Savanna, R. N. Ext.,
Ghaziabad- 201017, Uttar Pradesh, India

Powered By
Editor-in-Chief
IJRMEET
www.ijrmeet.org

INTERNATIONAL JOURNAL OF RESEARCH IN MODERN ENGINEERING & EMERGING TECHNOLOGY (IJRMEET)

Dear Author / Researcher,

On behalf of the *International Journal of Research in Modern Engineering & Emerging Technology (IJRMEET)*, I extend my heartfelt gratitude to all the authors and research scholars for choosing our platform to publish their valuable research contributions.

IJRMEET, a Refereed, Peer Reviewed, Indexed, and Monthly Journal in Electronic format, has been consistently dedicated since April 2013 to advancing scholarly work in the domains of Modern Engineering and Emerging Technologies. Your innovative and quality research is at the core of our mission to promote academic excellence and practical solutions in the ever-evolving field of engineering and technology.

We believe that publication should be based purely on the merit, originality, and relevance of the research, not on financial considerations. We ensure that every manuscript undergoes a thorough review process to maintain the integrity, reliability, and scholarly value of each published work.

Our journal aims not only to disseminate high-quality research globally but also to highlight critical engineering problems and their practical resolutions. I encourage researchers, academicians, faculty members, and industry professionals to continue contributing to IJRMEET and to inspire their peers and students to join us in this academic pursuit.

We sincerely thank our respected Editors, Reviewers, Technical Advisors, Authors, Web Developers, Subscribers, Supporters, and the extended academic community whose efforts and encouragement make each issue of IJRMEET a successful endeavor.

With warm regards,

Dr. Mylavarapu Seetharama Prasad

Editor-in-Chief, IJRMEET
Email: editor@ijrmeet.org
Website: www.ijrmeet.org

IILM UNIVERSITY

Technologies for Sustainable Development Goals 2025 (TECH4SDG-2025)

School of Computer Science & Engineering

IILM University Greater Noida

Presents

1st National Conference

on

Technologies for Sustainable Development Goals 2025 (TECH4SDG-2025)

3rd March 2025

Technically Co-Sponsored by IEEE UP SECTION (INDIA)

Venue:

IILM University, Greater Noida

Plot No.18,16, Knowledge Park II, Greater Noida, Uttar Pradesh 201306

IILM UNIVERSITY

ORGANIZING COMMITTEE

CHIEF PATRON

Prof. (Dr.) Taruna Gautam, Vice Chancellor, IILM University, Greater Noida

PATRON

Prof.(Dr.) Rajeev Tiwari, Dean - School of Computer Science & Engineering, IILM University, Greater Noida

GENERAL CHAIRS

Prof. (Dr.) Harshal Patil, Professor & Head-Computing & Security,
School of Computer Science & Engineering, IILM University, Greater Noida

Dr. Jasminder Kaur Sandhu, Associate Professor & Head-Machine Learning & Data Science,
School of Computer Science & Engineering, IILM University, Greater Noida

PROGRAM AND ORGANIZING CHAIRS

Dr. Lalit Kumar, Associate Professor & Head-Computing Applications,
School of Computer Science & Engineering, IILM University, Greater Noida

CONVENERS

Dr. Lalit Kumar, Associate Professor& Head- Head-Computing Applications,
School of Computer Science & Engineering, IILM University, Greater Noida

Dr. Deependra Rastogi, Assistant Professor & Head-Labs,
School of Computer Science & Engineering, IILM University, Greater Noida

ORGANIZING SECRETARY

Dr. Sumit Singh Dhanda, Associate Professor, School of Computer Science & Engineering, IILM University, Greater Noida

Ms. Suman Avdhesh Yadav, Assistant Professor, School of Computer Science & Engineering, IILM University, Greater Noida

Mr. Shantanu Bindewari, Assistant Professor, School of Computer Science & Engineering, IILM University, Greater Noida

TECHNICAL PROGRAM COMMITTEE CHAIRS

Prof. Pardeep Singh, Galgotias University, Uttar Pradesh

Dr. Sunil Nain, UIET, Kurukshetra University, Kurukshetra

Dr. Sandeep Punia, CHRIST (Deemed to be University), Bengaluru

Prof. (Dr.) Rajiv Agarwal, LIET Greater Noida, India

Dr. Sandeep Verma, NIT Jalandhar, India

Dr. Sourabh Jain, IIIT Sonepat, India

Dr. Vandana Sharma, Christ University Delhi NCR, India

Prof. (Dr.) Brijmohan Singh, Quantum University, India

Prof. Balamurugan Balusamy, Shiv Nadar University, India
Dr. Shashikant Patil, Atlas SkillTech University Mumbai, India
Dr. Abhimanyu Nain, Guru Jambheshwar University, Hisar, Haryana
Dr. Ajay Punia, Guru Jambheshwar University, Hisar, Haryana
Prof. Sanjay Jain, Amity University Rajasthan, Jaipur
Prof. Ashwani Yadav, Amity University Rajasthan
Dr. Amit Kumar, Galgotias University, Greater Noida
Dr. Jitendra Rajpurohit, Symbiosis University, Pune
Dr. Pankaj Agarwal, Jindal Steels Ltd.
Prof. Sanjay Yadav, Alliance University, Bengaluru

INDUSTRIAL AND ENTREPRENEUR CHAIRS

Mr. Vaibhav Sharma, IILM University, Greater Noida, India

FINANCE COMMITTEE

Mr. Abhinav Raghav, IILM University, Greater Noida, India
Mr. Vikas Tiwari, IILM University, Greater Noida, India

REGISTRATION COMMITTEE

Dr. Anand Singh, IILM University, Greater Noida, India
Ms. Apoorva Jain, IILM University, Greater Noida, India

WEB ADMINISTRATORS

Mr. Shantanu Bindewari, IILM University, Greater Noida
Mr. Shiva Nath, IILM University, Greater Noida

WOMEN@TECH4SDG

Dr. Gunjan Mittal Roy, IILM University, Greater Noida, India
Dr. Kirti Shukla, IILM University, Greater Noida, India
Dr. Apoorva Jain, IILM University, Greater Noida, India
Ms. Heena Khera, IILM University, Greater Noida, India
Ms. Reeta Mishra, IILM University, Greater Noida, India
Dr. Divya Prakash, Shobhit University Gangoh
Dr. Pushpa Singh, IILM University, Greater Noida, India
Dr. Preeti Narooka, Manipal University Jaipur, Rajasthan
Dr. Daksha Baroda, IILM University, Greater Noida, India




JILM UNIVERSITY
1st IEEE National Conference

राष्ट्रीय सौर ऊर्जा संस्थान
(नवीन एवं नवीकरणीय ऊर्जा मंत्रालय, भारत सरकार का स्वायत्त संस्थान)
National Institute of Solar Energy
(An Autonomous Institute of Ministry of New and Renewable Energy, Govt. of India)
गुरुग्राम - फरीदाबाद रोड, ग्वाल पहाड़ी, गुरुग्राम - 122 003, हरियाणा, भारत
Gurugram - Faridabad Road, Gwal Pahari, Gurugram -122 003, Haryana, India

डॉ. मोहम्मद रिहान / Dr. Mohammad Rihan
महानिदेशक / Director General



MESSAGE

I am happy to know about Tech4SDG-2025, a distinguished national conference that aims to explore and highlight the transformative power of technology in achieving the United Nations Sustainable Development Goals (SDGs). This event serves as a critical platform for fostering collaboration among experts, innovators, and leaders who are dedicated to creating solutions that drive sustainable change.

As we face global challenges ranging from environmental sustainability to social equity, it is clear that technological advancements will play a pivotal role in shaping our collective future. Tech4SDG-2025 presents a unique opportunity to examine how cutting-edge technologies can contribute to solving the most pressing issues of our time, from climate change to poverty alleviation.

I look forward to the engaging discussions and innovative ideas that will emerge from this conference. I believe that by working together, we can harness the potential of technology to drive meaningful progress towards a sustainable and equitable world.

I extend my best wishes to all the participants and organizers of Tech4SDG-2025.

27.02.25

(Dr. Mohammad Rihan)

Dated: 27th February, 2025
Place: Gurugram

दूरभाष / Tel. No. : 0124-285 3000, 3056
ईमेल / Email : dgnise.mnre@nise.res.in, mohdrihan@nise.res.in, वेबसाइट/ Website : www.nise.res.in

INTERNATIONAL JOURNAL OF RESEARCH IN MODERN ENGINEERING & EMERGING TECHNOLOGY (IJRMEET)

Authors' Guidelines

Resagate Global welcomes submissions in all areas related to Management, Pharmacy, Engineering, Education, Humanities, Social Science, etc. Manuscript for all discipline must be in English prepared on a standard A4 size paper setting. It must be prepared in 12-point Times New Roman and must follow the following criteria for all discipline.

1. Each manuscript requires an abstract with a length of 15 – 20 lines in 12 point font Times New Roman and Italic font followed by 5 – 7 keywords.
2. Type-written manuscripts in MS Word (.doc) format should be submitted by E-mail to editor@ijrmeet.org
3. Research Papers/Review Articles will be published in the Journal after peer-reviewed process.
4. Leave 1 inch margin for each – top, bottom, left and right.
5. List of references must be present.
6. Papers without references will not be reviewed.
7. Section headers will be bold faced sentence case whereas sub-section header will be in normal style, both indented at 0.5 inch. Line space is 1.5 for entire article.
8. Once the paper is accepted, the authors will be required to send the signed copy of Copyright Form through E-mail to editor@ijrmeet.org
9. It is mandatory for all the authors to sign the Copyright Transfer Form.
10. It will be take more then 2-3 weeks to 1 month to publish after submitting.
11. Research paper should contain with abstract (including 200-300 words) & including minimum 1500 words and you must follow all the steps (Design) of research.
12. The decision of Reviewers will be final and canvassing in any form will be disqualification of authors in future issues.
13. In article minimum 1500 words must required.
14. Page layout must be created only A4 size only.
15. PDF file is not accepted.

INDEX

S. No.	Particulars	Page No.
1	A Comparative Study On Load Balancing Algorithms And Its Types **Methily Johri & Aditri Ashish**	1–10
2	Optimizing Supply Chain Management with Ethereum 2.0: Innovations in Blockchain Technology **Ayush Gupta & Dr. Ambuj Kumar Agarwal**	11–17
3	Smart Surveillance: "A Real-Time Crowd Analysis System for Density and Anomaly Detection" **Komal Sharma, Dr. Pankaj Kumar Varshney, Aditi Aggarwal & Gaurav Kumar**	17–22
4	AI-Driven Network Optimization: Matching Policyholders to Cost-Effective Providers Using Business Intelligence **Ruchi Mangharamani & Prof. (Dr) Sangeet Vashishtha**	23–29
5	The Future of UX: Designing for Emerging Technologies (AI, AR, VR, Voice UI) **Ojas Gupta & Prof.(Dr.) Arpit Jain**	30–37
6	Enhancing Liquidity Stress Testing: Best Practices for Modern Banking Risks **Padmini Bulani & Dr Abhishek Jain**	38–45
7	AI-Powered Investment Strategies: Optimizing Risk and Returns in Modern Banking **Aditya Mehra & Dr. Shakeb Khan**	46–53
8	Scaling Customer Journey Optimization in a Multi-Tenant Distributed System	54–61

S. No.	Particulars	Page No.
	Sumit Kumar Agrawal & Prof. (Dr) MSR Prasad	
9	Object Detection Using Convolutional Neural Networks: Advances, Techniques, and Applications **Bharath Thandalam Rajasekaran, Saravanan Thirumazhisai Prabhagaran & Prof. (Dr) Punit Goel**	62–69
10	AI-Augmented Intrusion Detection Systems for High-Speed Optical Networks **Sattvik Sharma & Prof.(Dr) Avneesh Kumar**	70–77
11	Generative AI in Data Security: Opportunities and Challenges **Vybhavreddy Kammireddy Changalreddy, Piyush Bipinkumar Desai & Prof (Dr) Ajay Shriram Kushwaha**	78–86
12	Integrating Salesforce with Cloud-Based Data Warehousing for Unified Analytics **Nidhi Shashikumar & Dr S P Singh**	87–94
13	AI-Powered Cybersecurity: A Unified Approach to Protecting Enterprise, Cloud, and SaaS Applications **Varun Grover, Khushmeet Singh & Er. Siddharth**	95–103
14	Sales and Order Analysis Using Excel-Based Dashboard: A Case Study on Vrinda Store **Mohd Ammar Khan & Harun Faridi**	104–106
15	ChatMania: A Realtime Chat Application **Dr. Kirti Shukla & Anshika**	107–110

S. No.	Particulars	Page No.
16	Digital Surveillance and Domestic Abuse: A Legal Vacuum in Indian Marital Relationships **Vishal Nehra & Dr. Rakesh Kumar**	110–116
17	The Role of Emotional Appeal in Online Advertisements Targeting Working Women in Delhi-NCR **Mona Mishra & Dr. Praveen Mittal**	116–120
18	AI-Driven Data Governance Strategies for Enhanced Cloud Security in Enterprises **Chandana Pandey & Dr Gauri Shanker Kushwaha**	121–123
19	Evolution of Social Media Advertising and Consumer Behavior **Mr. Pramod Rana & Prof (Dr) Punit Goel**	124–129
20	Sustainability Accounting Practices in Indian Manufacturing Firms **Mrs. Sonal Jain & Dr. Ajit Singh**	129–134
21	Fundamental Rights vs. Reasonable Restrictions: A Study of Evolving Judicial Balances **Mrs. Anshika Agarwal & Dr. Vijay Kumar Singh**	134–139
22	सतत शिक्षा के लिए हिंदी साहित्य की भूमिका: सतत विकास लक्ष्य-4 (गुणवत्तापूर्ण शिक्षा) का सांस्कृतिक विश्लेषण **श्रीमती रेणु गुप्ता, डॉ. बृजलता शर्मा**	140–144
23	Mind–Gut Synergy in Chronic Lifestyle Conditions: Evaluating Psychotherapy-Driven Behavioral Change and Microbiota-Mediated Metabolic Repair **Krithika. V, Dr. Sarbesh Kumar Singh**	145–151

S. No.	Particulars	Page No.
24	प्राचीन शिक्षा प्रणाली से आधुनिक AI आधारित शिक्षा की ओर संक्रमण **गौरव जोशी, डॉ सारिका गोयल**	152–159
25	पर्वतीय क्षेत्रों में शिक्षा के डिजिटलीकरण की चुनौतियाँ एवं संभावनाएँ **राकेश उनियाल, डॉ. मीनाक्षी हर्राव वर्मा**	160–168
26	Women Leadership and Democratic Participation in India: Challenges and Opportunities in Parliamentary Politics **Renu Yadav, Dr. P.P.S. Rana**	169–176
27	Evaluating GST Effects on Competitiveness and Industrial Development **Aman Goel, Dr. Pooja Yadav**	177–183
28	एस०आर० हरनोट के कथा साहित्य में लोक संस्कृति, पर्यावरण चेतना और सामाजिक परिवर्तन का अध्ययन **सीमा देवी, डॉ० अरविन्द्र कौर चुंबर**	184–189
29	Balancing National Security and Human Rights in Modern India **Shalu Jain, Dr. Vijay Kumar**	190–197
30	Economic Performance Drivers and Fiscal Resilience in Indian Airports **Lalit Kumar Sharma, Dr. Pooja Yadav**	198–203
31	Educational Governance and AI Learning Outcomes in Government Elementary Schools **Dr. Shubhra Chaturvedi**	203–210
32	Artificial Intelligence and the Future of Teacher Roles in India Classroom **Neeru Verma**	211–220
33	Research Culture Among Undergraduate Students in Indian Universities **Dr. Dhanashri Rajshri Ravindra Jadhav**	221–229

S. No.	Particulars	Page No.
34	Awareness of Human Papillomavirus Vaccination Among Adolescent Girls and Their Parents **Dr. Chintamani Venu Madhav Naresh Kumar**	230–234
35	Graduate Employability and Skill Gaps in State Universities **Narender Panghal**	235–242
36	Political Funding Transparency in Indian Election **Dr. Anand Kumar Dwivedi**	243–252
37	AI-Powered Platforms for Data Analytics and Audience Development **Sachin Sangal**	253–258
38	Engineering Leadership Models in AI Startups: Balancing Innovation and Operational Efficiency **Dr. Kalpesh Rasiklal Rakholia**	259–269
39	Challenges in Integrating CWSN in Regular Classrooms **Anil Kumar**	270–280
40	An Artificial Intelligence-Based Legal Compliance Framework for Real-Time Environmental Governance to Advance SDGs 9, 12, 13, and 16 **Dr. Jyoti Janardhan Reddy**	281–288
41	Impact of Source Segregation and Waste Characterization on the Efficiency of Material Recovery Facilities **Varinder Vikram Singh, Dr. Pankaj Kumar Bharti**	289–296
42	Significance of Emotional Intelligence of schedule caste students in relation to Self-concept at secondary level **Mrs. Varsha Asher Wasker, Dr. Kuldeep Singh Tomar**	297–305
43	औपनिवेशिक भारत में स्थानीय बाजारों के सामाजिक परिवर्तन का ऐतिहासिक अध्ययन **Pankaj Tamta**	306–310

S. No.	Particulars	Page No.
44	Teachers' Readiness to Integrate Generative AI into Lesson Planning and Classroom Instruction **Prema Bharti**	311–316
45	Battery Usage Optimization Techniques for AI-Heavy Mobile Apps **Dr. Akankasha Kathuria**	317–321
46	Gender, Technology, and Changing Family Structures in Urban India: A Socio-cultural Analysis **Prof. Sawant Jeetendra Madhukar Usha**	322–326
47	Law and Alternative Dispute Resolution in Contemporary Civil Justice: A Legal Study **Dr. Pooja Khurana**	327–331
48	English Literature and the Representation of Women in Contemporary Fiction: A Corpus-Based Study of Narrative Agency, 2000–2024 **Dr. Abu Farah Hoque**	332–336
49	Agricultural Impact of Biochar and Reduced Fertilizer on Mustard Soil Health and Yield **Dr. Bibhu Santosh Behera**	337–346
50	Ethical and Privacy Frameworks for AI-Driven Customer Data Analytics in Medical Profession **Dr. Gaurav Singh Tomar**	347–351
51	Influence of Abhyas and Meditation on Attention, Emotional Regulation, and Lifestyle Behaviour among Students **Dr. Rakhee Rajendra Gugale**	352–357
52	Platform Culture and Fragmented Selfhood in Contemporary English Literature **Dr. Akanksha Singh**	358–362
53	Digital Health Literacy and Health Information Inequality in Rural India: A Multidimensional Assessment	363–368

S. No.	Particulars	Page No.
	Ranjana Jadaun	
54	स्मार्ट विनिर्माण और उद्योग 5.0 में कृत्रिम बुद्धिमत्ता, मानव-केंद्रित तकनीक और सतत विकास का अंतःविषयक अध्ययन **Dr. Ghamendra Kumar Sahu**	369–375
55	Contribution of Yoga-Based Breathing Techniques to Daily Stress Management **Dr. Sweta Kumari**	376–387
56	Algorithmic Silence and Unspoken Meaning in Contemporary English Fiction **Dr. Jyoti Devi**	388–396
57	Cost-Benefit Analysis of Custom Image Analysis Tools in Oncology Research **Sumit Malhotra**	397–405
58	उच्च शिक्षा में सूक्ष्म अधिगम तकनीकों का शैक्षिक प्रभाव **Ram Singh**	406–412
59	Optimising Laboratory Workflows with Low-Code/No-Code Software Solutions **Dr. Amit Nampalliwar**	413–421
60	भारतीय बहुभाषिक समाज में भाषा, संस्कृति और राष्ट्रीय एकता का अध्ययन **Dr. Geeta Rawat**	422–428
61	Influence of FinTech Innovation on Financial Resilience and Operational Efficiency of Retailers and Street Vendors **Prof. Manmeet Kumar Siras & Shyam Pandey**	429–435
62	भारत में आपातकालीन शक्तियाँ और लोकतांत्रिक उत्तरदायित्व: संसदीय शासन के अंतर्गत राष्ट्रपति की संवैधानिक भूमिका का विश्लेषण **सीता राम पंडित, डॉ. पी. पी. राणा**	436–441
63	Mechanical Design Improvements for Faster Thermal Dissipation in High-Capacity Batteries	442–450

S. No.	Particulars	Page No.
	Dharmendra Tiwari	
64	English Literature and the Changing Patterns of Communication among Young Adults **Ravindra Hanmantrao Sagar**	451–459
65	An Explainable AI Framework for Transparent and Reliable Medical Diagnosis **Dr. Thejoram Naresh Reddy Boya**	460–466
66	डिजिटल समुदायों का युवा शिक्षा और सामूहिक पहचान पर प्रभाव **डॉ. मनोज कुमार सकलानी**	467–473
67	Adaptive Technologies for Enhancing Online Shopping Experiences **Dr. Abhishek Bhattacharjee**	474–479
68	Impact of Digital Payment Adoption through AI-ML on Micro-Business Performance **Ralphy Joseph C J**	480–484
69	Role of Regional Parties in Shaping Federalism in India **Dr. Shailendra Kumar**	485–489
70	Serverless Computing Optimization: Enhancing Performance with AI-Based Resource Allocation **S. Venkatasubramanian**	490–495
71	Student Satisfaction in Autonomous vs. Affiliated Colleges **Dr. Mohit Dixit**	496–500
72	Psychological and Social Isolation and Its Effect on Urban Elderly **Mredula P., Dr Sarita Gupta**	501–507
73	The Role of Folk Literature in Promoting Community Health Awareness in Rural India: A Study from the Perspective of English Literature	508–512

S. No.	Particulars	Page No.
	Dr. Revant Gautam	
74	Exam Stress Clinical Psychology Mechanisms Among Rural Students **Dr. Avinash D. Karambhe**	513–517
75	उभरती हिंद-प्रशांत सुरक्षा संरचना में भू-राजनीतिक प्रतिस्पर्धा और रणनीतिक प्रतिरोध **Dr. Girish Chandra Pachauli**	518–522
76	Sustainable Edible Coatings for Reducing Oxidative Deterioration in Fresh Fruits **Amar Jensi Solanki**	523–528
77	Impact of GST Implementation on Legal Disputes in Small Businesses **Dr. Nikhat Khan**	529–534
78	Innovations in Healthcare Product Management Through AI and Machine Learning **Dr. Navdeep Singh**	535–538
79	Psychological Effects of Music and Memory Recall in Elderly Patients **Lindamulage Mithun Dilantha Deva Adithiya**	539–544
80	Comparative Study of Formative Assessment in Government vs. Private Schools **Dr. Roopali Chandra**	545–549
81	Educational Learning Needs of Orphaned Children in Institutional Homes **Ajitha. P. M**	550–554
82	Behavioral Differences in Joint vs. Nuclear Family Children **Rajeevan Edadan Puthiya Veetil**	555–559
83	Leveraging Data Architecture to Enhance Business Intelligence in Retail and Finance **Dr. Priyanka Gosain**	560–563

S. No.	Particulars	Page No.
84	Effect of Pelvic Floor Exercises on Women's Health and Functional Recovery **Dr. Kapila Jain**	564–569
85	Acceptance of AI-Assisted Drug Information Systems by Pharmacists **Dr. Tarun Sahani**	570–574
86	Jane Austen's Portrayal of Marriage and Society in English Literature **Serjana Thapa**	575–581
87	Employability Skill Gaps in Engineering Graduates (2013–2016) **Dr. A. H. Khan**	582–586
88	Aggressive Behavior, Family Conflict and Social Adjustment Among Students in Rural Kerala: A Comparative Study **Vinod Babu, Prof . Dr. S. Chandrachud**	587-592
89	Impact of Digital Documentation on Logistics Management Efficiency **S. Lakshmi Narasimma**	593–599
90	Generative AI Models for Product Design Innovation: Applications in Automotive and Last-Mile Delivery **Dr. Bimal Kumar Kalita**	600–603
91	Prevalence of Low Back Pain Among Women Attending General Outpatient Departments **Dr. Trushna Tembhekar**	604–609
92	Women's Reservation and Performance in Local Bodies **Rashmi Shukla**	610–613

S. No.	Particulars	Page No.
93	Ayurvedic Approaches to Menopausal Health and Rajonivritti **Dr. Ashwini R. Metangale**	614–619
94	Effect of Core Strengthening Exercises on Physical Function in Women **Prof. (Dr.) Vrushalee Dodke**	620–625
95	Relationship Between Physical Activity and Joint Health Among Young Adults **Dr. Priti S. Arikar**	626–632
96	Assessment of Screen Time and Sleep Quality Among School-Age Children **Dr. Sayali Jichkar**	633–638
97	Cellular Responses of Yeast to Different Sugar Concentrations in Biology **Aarthi B Pradhan**	639–644
98	Political Funding Transparency in Indian Elections **Dr. Kanta Verma**	645–648
99	Gender Identity and Expression in College Students **Dr. Babhuti Kashyap**	649–653
100	A Study of the Corrosion Inhibition Properties of Glycine and Alanine on Metal Surfaces **Pinky**	654–659
101	The Impact of British Rule on the Indian Education System **Dr. Nageshwar Joolu**	660–664

S. No.	Particulars	Page No.
102	Merchandising Optimization Techniques for Users in Online Marketplaces **Dr. Munish Kumar Sharma**	665–668
103	Incorporating Voice Navigation and Control in Web Accessibility **Venkata Sumanth Appari**	669–673
104	Relationship Between Posture and Common Musculoskeletal Problems Among Adults **Dr. Rupali Vaibhav Selukar**	674–677
105	Influence of Household Water Sources on Basic Microbial Diversity **Dr. Kunjlata Lal**	678–681

International Journal of Research in Modern Engineering and Emerging Technology (IJRMEET)

Vol. 13, Sp. Issue: 01, April: 2025
(IJRMEET) ISSN (o): 2320-6586

Relationship Between Posture and Common Musculoskeletal Problems Among Adults

Dr. Rupali Vaibhav Selukar

Professor, Rognidan evam Vikriti Vigyan

MUHS Nashik

ORCID ID https://orcid.org/0009-0004-7034-2548

Abstract : Musculoskeletal pain is among the most common reasons for disability and lost work among adults, and posture is a modifiable factor that is often cited but rarely measured in community studies. This cross-sectional study of 420 adults aged 25–55 years examined the relation between posture and musculoskeletal pain. Posture was rated by a trained observer using a standardised ten-point composite score and classified as good (n = 130), fair (n = 160) or poor (n = 130). Pain in the previous 12 months was recorded with the Nordic Musculoskeletal Questionnaire. Pain was reported by 238 adults (56.7%), and the prevalence rose from 36.9% with good posture to 57.5% with fair posture and 75.4% with poor posture ($\chi^2 = 39.2$, $p < 0.001$). Mean pain intensity was 2.1, 3.4 and 4.9 on a 0–10 scale ($p < 0.001$). After adjustment for sitting time, sex, age, body mass index and exercise, poor posture was associated with higher odds of pain (adjusted OR 3.60, 95% CI 2.04–6.35). The association was found for the low back, neck, shoulder and upper back. Posture assessment and correction should be included in the prevention of musculoskeletal problems in adults.

Keywords: posture; musculoskeletal pain; low back pain; neck pain; adults; Nordic questionnaire; prevention

Introduction

Pain in the muscles, bones and joints is a leading cause of disability worldwide. Low back pain is the single largest cause of years lived with disability, and neck pain ranks high among all conditions (Hoy et al., 2014a, 2014b). The burden extends beyond health care to lost productivity and reduced quality of life, and in India it is increased by the large numbers of workers who do sedentary or physically awkward work.

Posture, the position in which the body is held against gravity, has long been considered a contributor to these problems. Good posture distributes load evenly across joints and keeps muscles in a position of mechanical advantage. Poor posture, such as a forward head, rounded shoulders, a slumped spine or an exaggerated lumbar curve, places sustained strain on muscles, ligaments and discs. Clinical models of movement impairment propose that such faulty alignment leads to repeated micro-stress and eventually to pain (Sahrmann, 2002; Kendall et al., 2005).

Despite this plausible link, the evidence is mixed. Some studies find a clear association between particular postures and pain, whereas others find weak or no association, and many rely on a single posture measure or a single body region. Few studies compare overall posture quality with pain in several regions in the general adult population, and fewer still adjust for the other factors, such as sitting time, age and exercise, that influence both.

This study examines the relation between overall posture and common musculoskeletal problems among adults. It aims to compare the prevalence and intensity of pain across categories of posture, to examine which body regions are most affected, and to test whether posture is independently associated with pain after adjustment for other factors.

Literature Review

The epidemiology of musculoskeletal pain provides the context. Hoy et al. (2014a) estimated the global burden of low back pain in the Global Burden of Disease 2010 study and found that it was the leading cause of disability, with prevalence increasing with age. A parallel analysis showed that neck pain was the fourth leading cause of disability (Hoy et al., 2014b). Reviews of work-related disorders conclude that physical factors such as awkward posture and repetition contribute, together with individual and psychosocial factors (Punnett & Wegman, 2004).

Evidence for specific postures is substantial. Silva et al. (2009) found that adults with chronic neck pain showed more forward head posture than pain-free adults, and a meta-analysis reported an association between forward head posture and neck pain, although the strength depended on how posture was measured (Mahmoud et al., 2019). In a prospective cohort study, Ariëns et al. (2001) found that sustained neck flexion and long periods of sitting at work were associated with the later onset of neck pain. For the low back, a systematic review of awkward occupational postures found limited to moderate evidence of an association with pain, which was stronger for prolonged forward bending (Roffey et al., 2010), and a review of sitting at work found that sitting alone was not strongly linked to low back pain unless combined with other factors (Lis et al., 2007).

Postural assessment methods range from clinical observation to photographic and instrument-based measurement. The Rapid Upper Limb Assessment and the Rapid Entire Body Assessment score posture and load in work tasks and are widely used in ergonomics (McAtamney & Corlett, 1993; Hignett & McAtamney, 2000). Symptoms in many studies are recorded with the Standardised Nordic Questionnaire, which allows comparison between regions and studies (Kuorinka et al., 1987).

Two gaps follow from this review. Most studies look at a single region or a single posture, so little is known about overall posture quality and multi-region pain in general populations. And the independent contribution of posture, after adjustment for sitting, age, body weight and exercise, is seldom reported. This study addresses both.

Research Methodology

Design and participants

A cross-sectional survey with postural examination was carried out among adults aged 25–55 years living in an urban community. Eligible adults had lived in the area for at least one year. Those with a history of spinal surgery, fracture, inflammatory arthritis, neurological disease or pregnancy were excluded. The sample size was calculated for a comparison of proportions between the extreme posture groups, assuming a medium effect (Cohen, 1988), 80% power and a two-sided alpha of 0.05, and was increased for non-response, giving 420 adults, who were selected by stratified random sampling from household lists. Informed consent was obtained and the ethics committee approved the protocol.

Posture assessment

Posture was assessed by a trained observer using a standardised ten-point composite score, with participants standing and sitting in their usual positions. The score awards one point for each of ten features: head position, shoulder level, shoulder protraction, thoracic curve, lumbar curve, pelvic tilt, knee alignment, foot alignment, sitting back support and sitting trunk angle. Higher scores indicate better posture. Scores of 8–10 were classified as good, 5–7 as fair and 0–4 as poor. Lateral and posterior photographs were taken for review. Inter-rater agreement on 40 participants rated by a second observer was good (kappa 0.81).

Outcomes and covariates

Musculoskeletal pain in the previous 12 months in six body regions (neck, shoulder, upper back, low back, wrist or hand, knee) was recorded with the Standardised Nordic Questionnaire (Kuorinka et al., 1987). A participant was classified as having pain if any region was affected. Current pain intensity was rated on a numerical scale from 0 to 10. Information was gathered on age, sex, height and weight, daily sitting hours and regular exercise (at least 150 minutes per week).

Statistical analysis

Categorical data are shown as counts and percentages with Wilson 95% confidence intervals. Pain prevalence across posture categories was compared by chi-square and expressed as Cramér's V and odds ratios with Woolf confidence intervals. Pain intensity was compared by one-way analysis of variance. Multivariable logistic regression estimated adjusted odds ratios of pain, including posture category, sitting time, sex, age, body mass index and exercise. A p value below 0.05 was regarded as significant.

Table 1. Study hypotheses and tests

Hypothesis	Statement	Test
H1	Pain prevalence differs across posture categories	Chi-square test; odds ratio
H2	Pain intensity differs across posture categories	One-way ANOVA
H3	Posture is associated with pain in specific body regions	Chi-square test by region
H4	Posture is independently associated with pain after adjustment	Multivariable logistic regression

Results

Participant profile

All 420 adults completed the assessment. Their characteristics are in Table 2. Women formed 54.8% of the sample and 61.9% reported sitting for more than six hours a day.

Table 2. Characteristics of participants (N = 420)

Characteristic	Category	n	%
Sex	Female	230	54.8
	Male	190	45.2
Age group	25–34 years	134	31.9
	35–44 years	152	36.2
	45–55 years	134	31.9
Body mass index	<25 kg/m²	236	56.2
	≥25 kg/m²	184	43.8
Daily sitting	≤6 hours	160	38.1
	More than 6 hours	260	61.9
Regular exercise	Yes	146	34.8
	No	274	65.2

Pain prevalence by posture

Musculoskeletal pain in the previous 12 months was reported by 238 of 420 adults (56.7%, 95% CI 51.9–61.3). Prevalence increased as posture worsened (Table 3, Figure 1; $\chi^2 = 39.2$, df = 2, p <0.001; Cramér's V = 0.31). Compared with good posture, fair posture carried 2.31 times the odds of pain (95% CI 1.44–3.71) and poor posture 5.23 times the odds (95% CI 3.06–8.93). H1 is supported.

Table 3. Prevalence of musculoskeletal pain by posture category

Posture	n	With pain	% (95% CI)	Crude OR (95% CI)
Good posture	130	48	36.9 (29.1–45.5)	1.00 (reference)
Fair posture	160	92	57.5 (49.8–64.9)	2.31 (1.44–3.71)
Poor posture	130	98	75.4 (67.3–82.0)	5.23 (3.06–8.93)
Total	420	238	56.7 (51.9–61.3)	

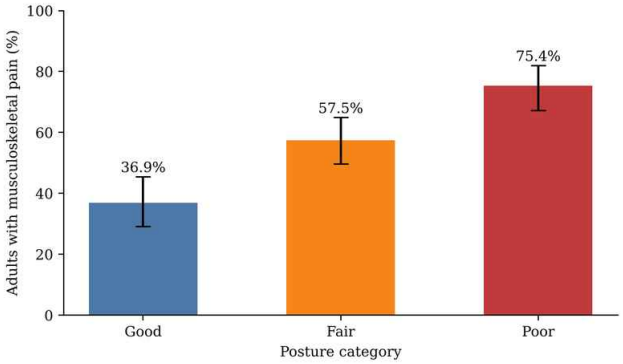

Figure 1. Prevalence of musculoskeletal pain (with 95% confidence intervals) by posture category.

Pain intensity

Mean pain intensity differed across posture categories ($F(2, 417) = 72.3$, $p < 0.001$, $\eta^2 = 0.26$), from 2.1 ± 1.6 with good posture to 3.4 ± 1.9 with fair posture and 4.9 ± 2.1 with poor posture. All pairwise differences were significant (Tukey–Kramer $p < 0.001$ or lower). H2 is supported.

Body regions

The low back was the most frequent site of pain (142 adults), followed by the neck (118) and the shoulder (96) (Table 4, Figure 2). Prevalence in every region rose with poorer posture. Region-specific differences were significant for the low back ($p < 0.001$), neck ($p < 0.001$), shoulder ($p = 0.001$) and upper back ($p < 0.001$), and were weaker for the knee ($p = 0.370$) and wrist or hand ($p = 0.189$). H3 is partly supported.

Table 4. Regional pain by posture category, n (% of group)

Region	Good (n = 130)	Fair (n = 160)	Poor (n = 130)	χ^2	p
Low back	28 (21.5)	52 (32.5)	62 (47.7)	20.1	<0.001
Neck	20 (15.4)	44 (27.5)	54 (41.5)	22.1	<0.001
Shoulder	18 (13.8)	35 (21.9)	43 (33.1)	13.8	0.001
Upper back	12 (9.2)	26 (16.2)	36 (27.7)	15.6	<0.001
Knee	15 (11.5)	23 (14.4)	23 (17.7)	2.0	0.370
Wrist/hand	9 (6.9)	17 (10.6)	18 (13.8)	3.3	0.189

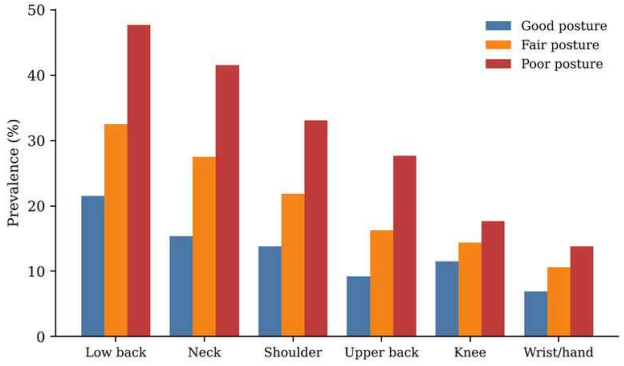

Figure 2. Regional prevalence of pain by posture category.

Adjusted association

In the multivariable model (Table 5, Figure 3), poor posture was strongly associated with pain (adjusted OR 3.60, 95% CI 2.04–6.35), as was fair posture (adjusted OR 1.86, 95% CI 1.10–3.16). Sitting for more than six hours (adjusted OR 1.73) and age of 40 years or more (1.58) were also associated with pain, and regular exercise was protective (0.59). Female sex and higher body mass index showed positive but non-significant associations. H4 is supported.

Table 5. Multivariable logistic regression of musculoskeletal pain (N = 420)

Variable	Adjusted OR	95% CI	p value
Fair vs good posture	1.86	1.10–3.16	0.022
Poor vs good posture	3.60	2.04–6.35	<0.001
Sitting >6 h/day vs less	1.73	1.08–2.77	0.022
Female vs male	1.35	0.86–2.12	0.192
Age ≥40 vs <40 years	1.58	1.01–2.49	0.046
BMI ≥25 vs <25 kg/m²	1.39	0.87–2.23	0.169
Regular exercise vs none	0.59	0.38–0.93	0.024

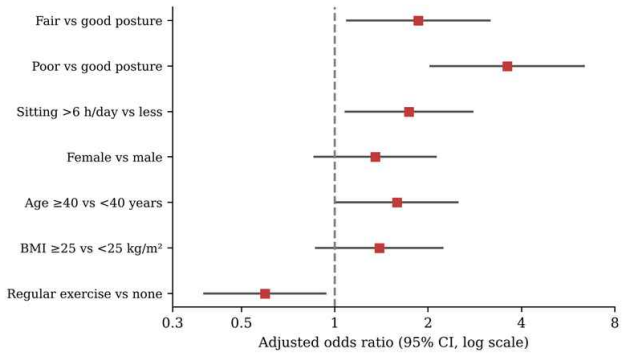

Figure 3. Adjusted odds ratios for musculoskeletal pain.

Discussion

Poor posture was strongly associated with musculoskeletal pain in this adult sample. Prevalence was 36.9% with good posture and 75.4% with poor posture, and pain intensity rose in the same direction. The association remained after

adjustment for sitting time, age, sex, body weight and exercise, so it is unlikely to be explained by these factors alone. This is consistent with the clinical view that faulty alignment contributes to cumulative strain (Sahrmann, 2002; Kendall et al., 2005) and with studies of forward head posture and neck pain (Silva et al., 2009; Mahmoud et al., 2019).

The regional pattern is informative. The association was clear for the low back, neck, shoulder and upper back, which are the regions most directly loaded by the trunk and head position, and it was weaker for the knee and wrist or hand, which are more dependent on local activity and joint disease. This agrees with reports that awkward trunk and neck postures are associated with spinal pain (Ariëns et al., 2001; Roffey et al., 2010). The finding for prolonged sitting fits the observation that sitting is more harmful when combined with poor posture and little movement (Lis et al., 2007), and the protective association of regular exercise supports the importance of muscle conditioning.

Several interpretations should be considered. Pain may itself alter posture, as people adopt protective positions, so the direction of the relation cannot be established from a cross-sectional study. Posture is also related to other factors such as muscle strength, work demands and psychosocial stress, which were not measured. Nevertheless, the consistency of the dose–response pattern and its persistence after adjustment suggest that posture is a relevant target for prevention.

For practice, the results favour including posture assessment in routine health checks and workplace programmes. Simple measures, such as ergonomic adjustment of work stations, regular breaks from sitting, exercises to strengthen the postural muscles and education on correct positions, can be directed to adults whose posture is rated fair or poor (Punnett & Wegman, 2004; Hignett & McAtamney, 2000).

Limitations

The cross-sectional design limits causal inference. Pain was self-reported with a 12-month recall, and posture was rated by observation, which, although standardised, may not capture posture during daily activities. The composite score was developed for the study and has not been widely validated. Psychosocial factors, occupation-specific loads and history of injury were not assessed. The sample was drawn from one urban community.

Conclusion

Worse posture was associated with a higher prevalence and greater intensity of musculoskeletal pain among adults, from 36.9% with good posture to 75.4% with poor posture, and the association persisted after adjustment (adjusted OR 3.60). It was most evident for the spine and shoulder. Programmes for the prevention of musculoskeletal problems should include assessment of posture, education on ergonomics and regular exercise. Prospective studies and trials of posture correction are needed to confirm causation.

References

- Ariëns, G. A. M., Bongers, P. M., Douwes, M., Miedema, M. C., Hoogendoorn, W. E., van der Wal, G., et al. (2001). Are neck flexion, neck rotation, and sitting at work risk factors for neck pain? Results of a prospective cohort study. Occupational and Environmental Medicine, 58(3), 200–207.
- Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Lawrence Erlbaum Associates.
- Hignett, S., & McAtamney, L. (2000). Rapid Entire Body Assessment (REBA). Applied Ergonomics, 31(2), 201–205.
- Hoy, D., March, L., Brooks, P., Blyth, F., Woolf, A., Bain, C., et al. (2014a). The global burden of low back pain: Estimates from the Global Burden of Disease 2010 study. Annals of the Rheumatic Diseases, 73(6), 968–974.
- Hoy, D., March, L., Woolf, A., Blyth, F., Brooks, P., Smith, E., et al. (2014b). The global burden of neck pain: Estimates from the Global Burden of Disease 2010 study. Annals of the Rheumatic Diseases, 73(7), 1309–1315.
- Kendall, F. P., McCreary, E. K., Provance, P. G., Rodgers, M. M., & Romani, W. A. (2005). Muscles: Testing and function with posture and pain (5th ed.). Lippincott Williams & Wilkins.
- Kuorinka, I., Jonsson, B., Kilbom, A., Vinterberg, H., Biering-Sørensen, F., Andersson, G., & Jørgensen, K. (1987). Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. Applied Ergonomics, 18(3), 233–237.
- Lis, A. M., Black, K. M., Korn, H., & Nordin, M. (2007). Association between sitting and occupational LBP. European Spine Journal, 16(2), 283–298.
- Mahmoud, N. F., Hassan, K. A., Abdelmajeed, S. F., Moustafa, I. M., & Silva, A. G. (2019). The relationship between forward head posture and neck pain: A systematic review and meta-analysis. Current Reviews in Musculoskeletal Medicine, 12(4), 562–577.
- McAtamney, L., & Corlett, E. N. (1993). RULA: A survey method for the investigation of work-related upper limb disorders. Applied Ergonomics, 24(2), 91–99.
- Punnett, L., & Wegman, D. H. (2004). Work-related musculoskeletal disorders: The epidemiologic evidence and the debate. Journal of Electromyography and Kinesiology, 14(1), 13–23.
- Roffey, D. M., Wai, E. K., Bishop, P., Kwon, B. K., & Dagenais, S. (2010). Causal assessment of awkward occupational postures and low back pain: Results of a systematic review. The Spine Journal, 10(1), 89–99.
- Sahrmann, S. A. (2002). Diagnosis and treatment of movement impairment syndromes. Mosby.
- Silva, A. G., Punt, T. D., Sharples, P., Vilas-Boas, J. P., & Johnson, M. I. (2009). Head posture and neck pain of chronic nontraumatic origin: A comparison between patients and pain-free persons. Archives of Physical Medicine and Rehabilitation, 90(4), 669–674.

Published By
Resagate Global, KDP Grand Savanna, R. N. Ext.,
Ghaziabad- 201017, Uttar Pradesh, India

Copyright © 2025 Inc. All Rights Reserved Contact Us: editor@ijrmeet.org