

ISEBBSAPI 2026

International Seminar on Ecology, Biological and Biochemical Sciences, Agriculture and Population Issues

Book of Abstracts



University of Rajshahi
16 – 17 July, 2026

Organized by

Department of Population Science and Human Resource Development
Ecology and Biodiversity Research Lab IES
UGC HEAT-ATF Project PIN: 13192 Department of Fisheries
Career Counselling and Development Centre (CCDC)
University of Rajshahi



NABIL GROUP

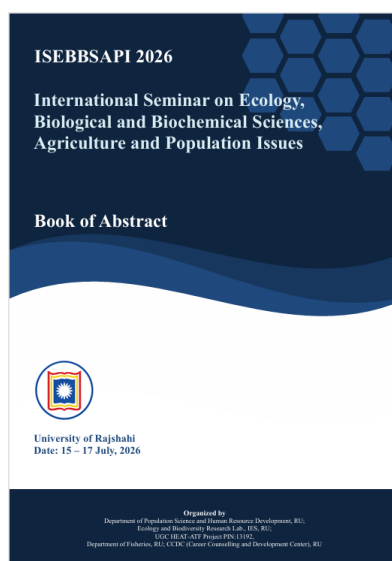
OUR BRANDS



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[Online Version]

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University of Rajshahi

Editing & Design

Professor Dr. A. J. M. Shoquillur Rahman

Professor Dr. Md. Redwanur Rahman

Professor Dr. Tapan Kumar Roy

Professor Dr. Md. Nurul Momen

Professor Dr. Md. Adil Hasan Chowdhury

Professor Dr. Md. Golbar Hossain

Professor Dr. Md. Mahfuzur Rahman

Masud Karim

Graphics

Konok Mehorab Shibli

Undergraduate student

Department of Population Science and Human Resource Development

University of Rajshahi



Message



It is with immense pride and great pleasure that I extend my warmest greetings to all participants, researchers, invited speakers and distinguished guests at the International Seminar on Ecology, Biological & Biochemical Sciences, Agriculture and Population Issues (ISEBBSAPI-2026).

The University of Rajshahi has long been a beacon of academic excellence and scientific inquiry in Bangladesh. This seminar embodies that tradition — a spirit of curiosity, collaboration, and commitment to knowledge that transcends borders. ISEBBSAPI-2026 brings together eminent scholars, researchers, and young scientists from across the globe, representing a remarkable convergence of minds united by a shared purpose: to advance science in service of humanity.

The themes of this seminar — spanning sustainable agriculture, biodiversity conservation, climate resilience, population issues, and biotechnology — are not merely academic concerns. They are among the most urgent challenges of our time. Bangladesh, with its rich ecological diversity and its people's deep dependence on agriculture and natural resources, stands at the heart of these challenges. It is therefore fitting and necessary that the University of Rajshahi host a dialogue of this magnitude.

I am deeply encouraged by the dedication of the organizing departments — the Department of Population Science and Human Resource Development, RU; the Ecology and Biodiversity Research Lab, IES, RU; UGC HEAT-ATF Project PIN: 13192, Department of Fisheries, RU; CCDC (Career Counselling and Development Center), RU — whose collective efforts made this seminar possible. Their vision in creating this interdisciplinary platform reflects the future direction of science: collaborative, inclusive, and solution-driven.

To our international guests and speakers, I say — welcome to Rajshahi, a city steeped in culture and academic heritage, and to a community that deeply values your presence and scholarship.

To our students and early-career researchers — I urge you to seize this opportunity with both hands. Engage with the ideas presented, ask bold questions, forge new connections, and carry the seminar's conversations into your research and careers.

I have every confidence that ISEBBSAPI-2026 will foster meaningful scientific exchange, inspire new collaborations, and contribute lasting knowledge to the fields it touches. I wish all participants a productive, enriching, and memorable seminar experience.

With warm regards and best wishes

Professor Dr. Md. Faridul Islam

Vice-Chancellor

University of Rajshahi

Rajshahi-6205, Bangladesh



Message



On behalf of the Administration of the University of Rajshahi, I am delighted to welcome all participants to the International Seminar on Ecology, Biological & Biochemical Sciences, Agriculture, and Population Issues — ISEBBSAPI-2026.

The smooth organization of an international academic event of this scale requires not only intellectual vision but also meticulous administrative coordination. I am proud to say that our university's administrative machinery has risen admirably to support this endeavor, and I commend the organizing committee for its outstanding planning and dedication.

Science does not advance in isolation. It flourishes when institutions create the right environment — one where ideas flow freely, researchers feel supported, and collaboration is actively encouraged. The University of Rajshahi remains firmly committed to providing precisely that environment. Our continued investment in research infrastructure, faculty development, and international academic partnerships is a testament to that commitment.

I encourage all attendees — whether seasoned professors or presenters — to fully engage in the intellectual exchange this seminar offers. The networks forged here today may well become the foundation for tomorrow's scientific breakthroughs.

I wish ISEBBSAPI-2026 every success and express my sincere gratitude to all who have traveled — near and far — to be part of this occasion.

Warm regards

Professor Dr. Md. Abdul Alim
Pro Vice-Chancellor (Administrative)
University of Rajshahi
Rajshahi-6205, Bangladesh



Message



It gives me great academic satisfaction to welcome researchers, faculty members, students, and distinguished guests to ISEBBSAPI-2026 — an International Seminar on Ecology, Biological & Biochemical Sciences, Agriculture, and Population Issues.

Academic progress is driven by the courage to ask new questions and the wisdom to collaborate across disciplines. ISEBBSAPI-2026 embodies both. The four thematic tracks of this seminar reflect a carefully considered academic vision — one that acknowledges the interconnectedness of our natural environment, our food systems, our biological sciences, and our population issues. These are not separate domains; they are deeply intertwined, and the University of Rajshahi is proud to host a platform that treats them as such.

I am particularly gratified to see the participation of young scholars and postgraduate researchers in this seminar. The future of Bangladeshi science rests in their hands, and exposure to international academic dialogue at this stage of their careers is invaluable. I urge them to present their work with confidence, absorb their peers' feedback with humility, and return to their laboratories and fieldwork with renewed inspiration.

To our international collaborators and members of the organizing committee, presenters, participants—your presence elevates this seminar immeasurably. We are grateful for your willingness to share your expertise and to build bridges of knowledge across borders.

I am confident that the academic outcomes of ISEBBSAPI-2026 — the papers presented, the connections made, the ideas challenged and refined — will resonate far beyond the walls of this campus.

With academic greetings

Professor Dr. Mamunur Rashid
Pro Vice-Chancellor (Academia)
University of Rajshahi
Rajshahi-6205, Bangladesh



Message



Dear Distinguished Guests, Colleagues, and Fellow Researchers,
It is deeply fulfilling to welcome you all to ISEBBSAPI-2026. As Convener of the Organizing Committee, I have had the privilege of watching this seminar take shape — from its earliest conception to the vibrant event it has become — and I can say with full sincerity that every step of this journey has been driven by one purpose: to create a genuinely meaningful scientific experience for every participant.

The idea behind ISEBBSAPI-2026 arose from the recognition that some of the most pressing challenges facing Bangladesh and the wider world — food insecurity, biodiversity loss, climate vulnerability, emerging diseases, and population health inequities — transcend the boundaries of any single academic discipline. Addressing them requires precisely the kind of cross-disciplinary conversation this seminar is designed to facilitate.

We have been fortunate to receive an overwhelming response from researchers across Bangladesh and beyond. The quality and diversity of the submitted abstracts and papers have exceeded our expectations, and I am confident that the presentations and discussions over the coming days will be stimulating, rigorous, and genuinely productive.

I express my deepest gratitude to the co-conveners, the organizing secretary, all committee members, and the supporting departments for their tireless efforts in bringing ISEBBSAPI-2026 to life. I also thank our members of the organizing committee, invited speakers, session chairs, co-chairs and discussants for their expertise and prestige at this event.

To every participant — your presence here is what makes this seminar meaningful. Thank you for being part of it.

With warm regards

Dr. J. A. M. Shoquillur Rahman

Convener, ISEBBSAPI-2026 Organizing Committee

and

Professor

Department of Population Science and Human Resource Development,

University of Rajshahi,

Rajshahi-6205, Bangladesh.



Welcome Message



It is a great pleasure to welcome all the participants, researchers, academicians, professionals, and students to the International Seminar on Ecology, Biological & Biochemical Sciences, Agriculture and Population Issues (ISEBBSAPI-2026)

On behalf of the Organizing Committee, I wish to extend my sincere thanks to all the participants for their contribution to this international seminar. Your involvement, whether within Bangladesh or overseas, mirrors our collective dedication to scientific knowledge through partnership, innovation, and interdisciplinarity.

ISEBBSAPI-2026 is expected to create an opportunity for scholars from various disciplines to share ideas and discuss some of the world's most pressing issues, such as climate change, biodiversity conservation, food security, sustainable agriculture, and population dynamics. These challenges are complex, interdisciplinary, and global, and the need for collaboration and the sharing of knowledge has never been greater.

We are very excited about the enthusiastic response from researchers in Bangladesh and many other countries. The seminar aims to promote relevant discussions and facilitate new research collaborations and the exchange of innovative ideas through a wide and diverse scientific program with four thematic tracks. All the authors and presenters are gratefully acknowledged for sharing their valuable research and for making this seminar academically vibrant.

We are also most warmly welcoming our distinguished international participants and hope that your stay at the University of Rajshahi and the historic city of Rajshahi will be professionally rewarding and personally memorable. We invite our young researchers and students to take this opportunity to learn from leading experts, engage in stimulating discussions, and establish long-lasting professional and academic connections.

I thank our Hon'ble Patron and Vice-Chancellor for his unwavering support, Conference Chair, Co-Chairs, Conveners, members of the International and National Advisory Boards, Scientific Committee and Organizing Committee, Volunteers and all the persons whose dedication and combined efforts have made ISEBBSAPI-2026 a reality.

I wish every participant a fruitful, inspiring, and successful seminar, and I hope that the knowledge and collaborations that will be established through ISEBBSAPI-2026 will contribute meaningfully to scientific advancement and sustainable development.

With best wishes for the success of ISEBBSAPI-2026.

Dr. Md. Nurul Momen

Secretary, Organizing Committee, ISEBBSAPI-2026
Director, CCDC & Professor, Department of Public Administration
University of Rajshahi, Rajshahi-6205, Bangladesh
Cell: +8801712141061 | Email: ccdc.director@ru.ac.bd

International Seminar on Ecology, Biological and Biochemical Sciences, Agriculture and Population Issues

16 – 17 July, 2026

Organizing Committee

1	Dr. J. A. M. Shoquilor Rahman	Professor Department of Population Science and Human Resource Development	Convener
2	Dr. Md. Redwanur Rahman	Professor Institute of Environmental Science	Co-convenor
3	Dr. Md. Nurul Momen	Professor Department of Public Administration & Director Career Counselling & Development Centre (CCDC)	Organizing Secretary
4	Dr. Tapan Kumar Roy	Professor Department of Population Science and Human Resource Development	Member
5	Dr. Md. Yeamin Hossain	Professor Department of Fisheries,	Member
6	Dr. Md. Adil Hasan Chowdhury	Professor Department of Anthropology & Assistant Director, Career Counseling and Development Centre (CCDC).	Member
7	Dr. Md. Golbar Hossain	Professor Department of Veterinary and Animal Sciences & Assistant Director, Career Counseling and Development Centre (CCDC).	Member
8	Dr. Md. Mahfuzur Rahman	Professor Department of Population Science and Human Resource Development	Member
9	Masud Karim	Lecturer Department of Population Science and Human Resource Development	Member
10	Md Atiqur Rahman	Research Fellow Institute of Environmental Science (IES)	Member

1. Scientific Sub-committee

1	Dr. Md. Redwanur Rahman	Professor Institute of Environmental Science, RU	Convenor
2	Dr. Tapan Kumar Roy	Professor Department of Population Science and Human Resource Development, RU	Member- Secretary
3	Dr. Md. Yeamin Hossain	Professor Department of Fisheries, RU	Member
4	Dr. Md. Mahfuzur Rahman	Professor Department of Population Science and Human Resource Development, RU	Member
5	Masud Karim	Lecturer Department of Population Science and Human Resource Development, RU	Member

2. Finance Sub-committee

1	Dr. Md. Adil Hasan Chowdhury	Professor Department of Anthropology, RU & Assistant Director, Career Counseling and Development Centre (CCDC).	Convenor
2	Dr. Md. Redwanur Rahman	Professor Institute of Environmental Science, RU	Member
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3. Press-publicity, Media & Message Collection sub-committee

Organizing Committee

4. Registration sub-committee

1	Dr. Md. Mahfuzur Rahman	Professor Department of Population Science and Human Resource Development, RU	Convenor
2	Dr. Md. Redwanur Rahman	Professor Institute of Environmental Science, RU	Member
3	Dr. Md. Yeamin Hossain	Professor Department of Fisheries, RU	Member
4	Masud Karim	Lecturer Department of Population Science and Human Resource Development, RU	Member

5. Certificate and Crest Processing Sub-committee

1	Dr. Md. Nurul Momen	Professor Department of Public Administration & Director Career Counselling & Development Centre (CCDC), RU	Convenor
2	Dr. Md. Adil Hasan Chowdhury	Professor Department of Anthropology & Assistant Director, Career Counseling and Development Centre (CCDC), RU	Member
3	Dr. Md. Golbar Hossain	Professor Department of Veterinary and Animal Sciences & Assistant Director, Career Counseling and Development Centre (CCDC), RU	Member
4	Jannatoul Ferdous	Research Fellow, Department of Veterinary and Animal Sciences, RU	Member
5	Refayet Karim	Research Fellow, Department of Veterinary and Animal Sciences, RU	Member
6	Konok Mehorab Shibli	Undergraduate Student, Department of Population Science and Human Resource Development	Member



ISEBBSAPI 2026

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PROGRAM SCHEDULE

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Department of Population Science and Human Resource Development
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UGC HEAT-ATF Project PIN: 13192 Department of Fisheries
Career Counselling and Development Centre (CCDC)
University of Rajshahi

Program Summary

Day 1: Thursday, July 16, 2026

Time	Event	Venue
08:00 AM - 09:15 AM	Kits Collections (Only for Registered Participation)	CCDC [Room # 125]
09:30 AM - 11:00 AM	Inaugural Ceremony	Senate Building
11:00 AM - 11:15 AM	Tea Break	Senate Building
11:15 AM - 01:15 PM	Invited Speech	Senate Building
02:00 PM – 05:00 PM	Technical Session - I & Technical Session - II	CCDC [Room # 125 & 126]

Day 2: Friday, July 17, 2026

Time	Event	Venue
09:30 AM – 11:30 AM	Training Program [Improving Science Through Multidisciplinary Collaboration: A Discussion Session with Young Researchers]	CCDC [Room # 125]

Program Details

Day 1: Thursday, July 16, 2026

[Inaugural Session]
Inaugural Session: Program Schedule
Date: 16 July 2026, Thursday
Venue: Senate Building, RU

08:45 AM	Registration and Distribution of Seminar Kits
09:30 AM	Guests take their seats on the podium
09:35 AM	National Anthem
09:40 AM	Recitation from the Holy Books
09:50 AM	Welcome Speech: Professor Dr. Md. Nurul Momen Director, CCDC, RU
10:00 AM	Speech of Special Guest: Professor Md. Mamunur Rashid Pro-Vice Chancellor (Academic), RU
10:10 AM	Speech of Special Guest: Professor Dr. Md. Abdul Alim Pro-Vice Chancellor (Administration), RU
10:20 AM	Speech of the Chief Guest: Professor Dr. Md. Faridul Islam Vice-Chancellor, RU
10:30 AM	Vote of Thanks: Professor Dr. J A M Shoquillur Rahman Population Science & Human Resource Development, RU
10:40 AM	Tea Break

Invited Speech

Time	Event	Chair	Venue
11:00 AM - 11:30 AM	Invited Speech – I Sphingolipid Overexpressing Transgenic Mouse Model in Cancer and Cardiovascular Disease Research Dr. Monowarul Mobin Siddique Department of Nutrition and Integrative Physiology University of Utah Salt Lake City, USA.	Session Chair: Dr. Md. Redwanur Rahman Session Co-chair: Dr. Tapan Kumar Roy Discussant: Dr. Md. Yeamin Hossain	Senate Building
11:30 AM – 12:00 PM	Invited Speech – II Pollinator Diversity: Distribution, Ecological, and Conservation to Support of Agricultural and Plantation in Northern Sumatera, Indonesia Ameilia Zuliyanti Siregar Department of Agrotechnology Faculty of Agriculture Universitas Sumatera Utara Sumatera Utara, Indonesia.	Session Chair: Dr. Md. Redwanur Rahman Session Co-chair: Dr. Tapan Kumar Roy Discussant: Dr. Md. Yeamin Hossain	Senate Building
12:00 PM – 12:30 PM	Invited Speech – III Longitudinal Links Between Loneliness and Depressive Symptoms Among Older Adults in the United States Dr. Md. Ismail Tareque Department of Geography College of Arts & Social Sciences Sultan Qaboos University Muscat 123, Sultanate of Oman.	Session Chair: Dr. Md. Redwanur Rahman Session Co-chair: Dr. Tapan Kumar Roy Discussant: Dr. Md. Yeamin Hossain	Senate Building

Contributed Session – I

Theme: Population Issues & Biological and Bio-chemical Sciences

Session Chair:

Dr. Monowarul Mobin Siddique

University of Utah, USA

Session Co-Chair:

Dr. Shahajada Selim

Bangladesh Medical University, Dhaka, Bangladesh

Discussants:

Dr. Md. Ismail Tareq

College of Arts & Social Sciences, Sultan Qaboos University
Sultanate of Oman

Dr. Nazib Wadud

Medical Center, University of Rajshahi

Dr. Mahfuzur Rahman

Department of Population Science and Human Resource Development, University of Rajshahi

Time: 02:00PM – 05:00PM

Venue: CCDC [Room # 125]

Section: Health Issues

SL No.	Paper Title	Author
1	Impact of Maternal Educational Status on Stunting, Wasting, and Underweight Among Under-Five Children in Bangladesh Using National Survey Data	Konok Mehorab Shibli Mst. Afiya Jahin Shithi Rafia Sultana Rinte Md. Nuruzzaman Haque J A M Shoquilor Rahman Md. Nure Alam Siddiqi Masud Karim
2	Risk factors for suicide attempts in Bangladesh: A cross-sectional study	Sheikh Md. Abu Hena Mostafa Alim Md. Abdul Wadood Md. Jasim Uddin Md. Golam Hossain Mustafizur Rahman Romana Akhtar Md. Masud Rana Sarker Md. Masud Rana
3	Socio-economic Patterns of Food Consumption and Dietary Diversity among Bangladeshi Children Aged 6-23 Months: is the Achievement of Minimum Dietary Diversity Protective Against Morbidity?	Md. Mosfequr Rahman
4	Suicidal Ideation and Its Associated Factors among University Students in Bangladesh	Salman Shahriar Masum
5	Patterns Of Patient Behavior and Clinical Presentation in Hospitalized Dengue Cases: Insights from a Tertiary Level Center	Parveen S Mahejabin F Farah S Chaklader TA

SL No.	Paper Title	Author
6	Knowledge, Awareness, Dietary Practices, and Menstrual Factors Associated with Hemoglobin Levels among Female University Students	Rayhane Gaus Peary Shela Pervin Md. Mostafizur Rahman
7	Socioeconomic and Empowerment Correlates of Caesarean Delivery in Bangladesh: A Nationwide Study Using BDHS 2022 Data	Mist. Laila Akter Shela Pervin Md. Nazrul Islam Mondal

Section: Biological & Biochemical Sciences

SL No.	Paper Title	Author
1	Elucidating the Anticancer Mechanism of Nonactin through Gene Expression, In-Vitro and In-Silico studies in A549 Lung Cancer Cells	Taufique Abdullah Syed Rashel Kabir Md. Tofazzal Islam Mohammad Taufiq Alam
2	Anticancer Potential of the Repurposed Drug Eltrombopag Olamine Against Human Lung Adenocarcinoma Cells	Md. Gausul Azam Syed Rashel Kabir Mohammad Taufiq Alam
3	Purification and Characterization of a Novel Lectin from the Freshwater Mussel <i>Lamellidens marginalis</i> with Antimicrobial, Antibiofilm, and Antioxidant Activities	Sumaia Marjan Mim Imtiaj Hasan
4	Antibacterial and Antifungal Activities of the Extracts of <i>Aerides multiflora</i> Roxb. A Native Medicinal Orchids in Bangladesh	Mst. Naznin Ayesha S. M. Shahinul Islam
5	Isolation, Molecular Characterization of Plasmid Mediated Extended Spectrum β -Lactamase (ESBL) from the River Water of Bangladesh	Md. Mahedi Hasan Surov Paheli Datta Asma Akter Mehedi Hasan Sakib Samia Alam Lina Amit Kumar Dutta
6	Investigation of pH-Controlled Photocatalytic Removal of Methylene Blue and Methyl Orange Using TiO ₂ Synthesized via Hydrothermal and Sol-Gel Methods	A. Ray M. H. Kabir M. M. Hasan D. Biswas M. K. B. Palash N. M. A. Rayhan M. S. Hossan A. A. S. M. Zahid M. H. Rahman

Contributed Session – II

Theme: Ecology and Agriculture

Session Chair:

Professor Ameilia Zuliyanti Siregar
Universitas Sumatera Utara, Indonesia.

Session Co-chair:

Professor Saleha Jasmine
Department of Fisheries, University of Rajshahi

Discussants:

Professor Dr. Md. Redwanur Rahman
Institute of Environmental Science, University of Rajshahi

Professor Dr. Mostafizur Rahman
Department of Population Science and Human Resource Development, University of Rajshahi

Dr. Masud Rana
Research Assistant, Bangladesh Medical University

Time: 02:00PM – 05:00PM

Venue: CCDC [Room No:126]

Section: Ecology

SL No.	Paper Title	Author
1	Resurgence of Measles in Bangladesh: The Growing Impact of Climate Change on Child Health	Md. Masud Rana Md. Redwanur Rahman J A M Shoquilor Rahman
2	The Exposome and Endocrine Diseases: Integrating Environmental and Biological Risk Factors	Shahjada Selim Md. Masud Rana
3	Intensifying Cooling Service of Vegetation Under Urban Warming: A Multi-Temporal Google Earth Engine Analysis of the NDVI–Land Surface Temperature Relationship in Rajshahi City, Bangladesh (2001–2025)	Md. Imran Hossain Md. Atiqur Rahman Nafia Muntakim Tomalika Biswas Nurul Hamid Md. Zihad Ahmed Md. Redwanur Rahman
4	Monitoring Biodiversity and Climate Change Impacts in Rohingya Settlement Areas of South-Eastern Coastal Bangladesh Using Multi Indexing Remote Sensing Approach	Nurul Hamid Md. Redwanur Rahman
5	Comparison of Effect of Organic and Inorganic Fertilizer on Soil Chemical Properties in Spinach Production	Sabia Sultana Md. Redwanur Rahman
6	Association between Disaster Exposure and Mental Health Outcomes among Women in Bangladesh: Evidence from Nationally Representative Data	Md. Minhajul Md. Mahfuzur Rahman
7	Determinants of Cesarean Delivery at First Birth and its Geographical Distribution in Bangladesh	Shela Parvin Md. Mostafizur Rahman Md. Nazrul Islam Mondal J A M Shoquilor Rahman

Section: Agriculture

SL No.	Paper Title	Author
1	Phytogetic Nutrition with Garlic and Moringa Leaf Enhances Gut Integrity and Skeletal Development in Broilers: A Natural Strategy for Safer and Sustainable Poultry Production	Md. Royhan Gofur Mst. Suriya Tanjum Toma Md. Tanvir Hossain Most. Rukhsana Akter
2	First Evaluation of Aquatic Biodiversity in the <i>Gajner Beel</i> Wetland Ecosystem in Northwestern Bangladesh: Proposals for Sustainable Management	Md. Motiour Rahman Khan Md. Golam Sarwar Md. Ashekur Rahman Saleha Jasmine Md. Yeamin Hossain
3	Fisheries-Based Entrepreneurship in Bangladesh: Current Status, Constraints, and Future Directions	Md. Ashekur Rahman Md. Mahabubur Rahman Saleha Jasmine Md. Nazrul Islam Mondal Md. Abidul Hasan Md. Yeamin Hossain
4	Towards Safe Fish and Fisheries Products Production in Bangladesh: Innovations, Regulations, and Stakeholder Responsibilities	Md. Yeamin Hossain Md. Mahabubur Rahman Saleha Jasmine Md. Nazrul Islam Mondal Md. Akhtar Hossain Md. Golam Sarwar Md. Ashekur Rahman

Day 2: Thursday, July 17, 2026

Training Program for Researchers/Students

Session Chair:

Professor Dr. Md. Nurul Momen

Director, Career Counselling & Development Centre (CCDC) &
Professor, Department of Public Administration
University of Rajshahi

Session Co-chair:

Dr. Md. Adil Hasan Chowdhury

Assistant Director, Career Counselling & Development Centre (CCDC) &
Professor, Department of Anthropology
University of Rajshahi

Discussant:

Dr. Md. Golbar Hossain

Assistant Director, Career Counselling & Development Centre (CCDC) &
Professor, Department of Veterinary and Animal Sciences
University of Rajshahi

Time: 09:30AM – 12:00PM

Venue: CCDC [Room No:125]

Speaker / Trainer	Title	Participants
Dr. Monowarul Mobin Siddique Department of Nutrition and Integrative Physiology University of Utah Salt Lake City, USA.	Improving Science Through Multidisciplinary Collaboration: A Discussion Session with Young Researchers	All undergraduate & graduate students, and researchers of the University of Rajshahi.



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ABSTRACTS

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University of Rajshahi

Abstract on Invited Speech

Title: SPHINGOLIPID OVEREXPRESSING TRANSGENIC MOUSE MODEL IN CANCER AND CARDIOVASCULAR DISEASE RESEARCH

Dr. Monowarul Mobin Siddique, Assistant Professor, Department of Nutrition and Integrative Physiology,
University of Utah, Salt Lake City, USA

ABSTRACT

Lipids are now widely recognized as key contributors to the development of complex metabolic diseases. While the pathogenic roles of many common lipid metabolites have been extensively studied, ceramides—a class of bioactive sphingolipids—have emerged as "silent killers" implicated in a broad spectrum of human diseases, including metabolic disorders and cancer. Ceramide accumulation is elevated in obesity, where it impairs mitochondrial function and shifts cellular fuel utilization from glucose toward fatty acids. These metabolic alterations contribute to insulin resistance, hepatic steatosis, and other cardiometabolic complications. Our previous preclinical studies demonstrated that genetic or pharmacological inhibition of hepatic ceramide synthesis improves insulin sensitivity and protects against liver, heart, and kidney dysfunction. Building on these findings, we are investigating whether ceramide accumulation also contributes to obesity-associated intestinal tumorigenesis. Our in vitro studies suggest that ceramide accumulation reprograms the metabolism of intestinal stem cells (ISCs), promoting stemness and proliferation. Mechanistically, ceramides shift ISC energy metabolism toward fatty acid utilization at the expense of carbohydrate metabolism, thereby creating a metabolic state that favors cellular proliferation. To investigate these mechanisms in vivo, we developed a novel gain-of-function mouse model with intestine-specific ceramide accumulation. Using this transgenic mouse model, we are examining how gut-specific sphingolipid accumulation alters ISC metabolism and promotes proliferative changes that may initiate precancerous lesions. Because ceramides are only induced in the intestinal epithelium, this genetically engineered model enables us to investigate the direct effects of intestinal ceramides without confounding influences from ceramide transport or metabolism in other organs. The experimental design and key findings will be presented with graphical illustrations to the audience to highlight the underlying molecular mechanisms and experimental approaches.

Title: Pollinator Diversity, Distribution, Ecology, and Conservation in Support of Agricultural and Plantation Ecosystems in North Sumatra, Indonesia

Ameilia Zuliyanti Siregar¹, Md. Redwanur Rahman², Ravindra C. Joshi³

¹ Department of Agrotechnology, Faculty of Agriculture, Universitas Sumatera Utara, Jl. Dr. A. Sofyan No. 3 Medan, 20155, Email: ameilia@usu.ac.id

² Institute of Environmental Science, University of Rajshahi Rajshahi-6205, Bangladesh, Email: redwan_rahman@ru.ac.bd

³ Philippine Rice Research Institute, Maligaya, Science City of Muñoz, Nueva Ecija 3119, Philippines, Email: rcjoshi4@gmail.com

Abstract

This study evaluated the diversity, abundance, and plant-pollinator interactions of pollinators in agricultural and plantation ecosystems in North Sumatra, Indonesia, from January to May 2026. Pollinator observations were conducted in horticultural crops, including chili pepper (*Capsicum annuum*), tomato (*Solanum lycopersicum*), cucumber, and eggplant, as well as plantation crops such as oil palm, coconut, cocoa, and coffee. Pollinators were sampled using sweep nets, direct observations, and scan sampling. A total of 2,970 pollinator individuals representing the orders Hymenoptera, Diptera, Lepidoptera, Coleoptera, and Chiroptera were recorded. Hymenoptera was the dominant order, with the family Apidae comprising the most abundant species, including *Apis cerana*, *A. mellifera*, *A. dorsata*, *Trigona speciosa*, *Heterotrigona itama*, and *Xylocopa latipes*. In plantation ecosystems, *Elaeidobius kamerunicus* was the dominant pollinator in oil palm plantations, whereas *Eurema hecabe* was the most abundant pollinator in horticultural crops. Lepidoptera exhibited the highest species diversity, while Chiroptera was the least represented taxonomic group. Pollinator visits were recorded on 51 flowering plant species, encompassing both cultivated and non-cultivated plants. Non-cultivated flowering species played a critical role in sustaining pollinator communities by providing supplementary floral resources and habitat. Biodiversity analyses revealed relatively high species diversity and evenness across the study sites, indicating that these ecosystems provide favorable conditions for maintaining diverse pollinator assemblages. Overall, the findings demonstrate the ecological importance of pollinator diversity in supporting ecosystem stability and enhancing agricultural productivity. Conserving both pollinator populations and non-cultivated flowering vegetation should therefore be considered an integral component of sustainable agricultural and plantation management in North Sumatra, Indonesia.

Title: Longitudinal Links Between Loneliness and Depressive Symptoms Among Older Adults in the United States

Md Ismail Tareque^{1*}, Md. Nahedul Islam², Waad Ali¹, Mohammad Hamiduzzaman³, Chi-Tsun Chiu⁴, Md. Shariful Islam⁵, Md. Zahidul Islam⁶

¹ Department of Geography, College of Arts & Social Sciences, Sultan Qaboos University, Muscat 123, Sultanate of Oman

² Department of Population Science and HRD, University of Rajshahi, Bangladesh

³ University Centre for Rural Health, The University of Sydney, Australia

⁴ Institute of European and American Studies, Academia Sinica, Taipei City, Taiwan

⁵ Department of Public Health, First Capital University of Bangladesh, Bangladesh

⁶ Institute of Biological Sciences, University of Rajshahi, Rajshahi-6205, Bangladesh

[†]These authors contributed equally to this work.

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Abstract

Background: This study examines the longitudinal links between loneliness and depressive symptoms among older adults in the United States over a 16-year period.

Study Setup: Data were drawn from the Health and Retirement Study, specifically Waves 8 (2006) and 16 (2022). Two analytical samples were created: (1) participants aged 60 years and older without depressive symptoms in 2006 ($n = 790$) to assess the influence of baseline loneliness on subsequent depressive symptoms, and (2) participants who were not lonely in 2006 ($n = 788$) to evaluate the effect of baseline depressive symptoms on later loneliness. Loneliness was measured using the 3-item Revised UCLA Loneliness Scale, and depressive symptoms were assessed with a modified 7-item CES-D scale. Descriptive statistics and binary logistic regression models were used.

Results: Older adults who reported feeling lonely in 2006 had nearly twice the odds of developing depressive symptoms by 2022 compared with their non-lonely counterparts (AOR = 1.98, 95% CI: 1.06–3.69). Conversely, baseline depressive symptoms increased the likelihood of experiencing loneliness later on (AOR = 1.70, 95% CI: 1.04–2.79). Additionally, cognitive impairment was linked to later loneliness, and women and individuals with poorer self-rated health were at higher risk of developing depressive symptoms.

Discussion: The findings suggest a bidirectional relationship between loneliness and depressive symptoms in later life, underscoring the need for coordinated interventions that address both conditions. The study's extensive follow-up and bidirectional design offer new insights for gerontological research, highlighting the public health importance of addressing these interconnected psychosocial challenges faced by the aging population.

Keywords: Loneliness; Depressive symptoms; Older adults; Longitudinal study; Mental health.

Abstract on Health Issues

Title: Impact of Maternal Educational Status on Stunting, Wasting, and Underweight Among Under-Five Children in Bangladesh Using National Survey Data

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Abstract

Background: Child undernutrition remains a major public health issue in Bangladesh. Maternal education is a key determinant of child nutrition; this study examined its association with stunting, wasting, and underweight among under-five children in Bangladesh using nationally representative data.

Methods: This cross-sectional study used the Bangladesh Demographic and Health Survey (BDHS) 2022 data from 4,084 mother-child pairs, assessed child undernutrition using World Health Organization (WHO) growth standards, applied descriptive and chi-square analyses, and employed multivariable logistic regression to estimate adjusted associations between maternal education and child nutritional outcomes.

Results: The prevalence of stunting, underweight, and wasting was 23.46%, 22.53%, and 11.80%, respectively. Maternal education and literacy were significantly associated with all three nutritional outcomes ($p < 0.01$). Compared with children of mothers with no formal education, children of mothers with higher education had significantly lower odds (stunting: AOR=0.425, 95% CI: 0.279-0.647; underweight: AOR=0.383, 95% CI: 0.248-0.590; wasting: AOR=0.568, 95% CI: 0.340-0.947). Household wealth, child age, and birth order were also significant predictors of child nutritional status.

Conclusions: Higher maternal educational attainment is independently associated with lower risks of stunting, wasting, and underweight among Bangladeshi children under five years of age. Policies promoting female education, maternal health literacy, and equitable socioeconomic development should be strengthened to reduce childhood undernutrition in Bangladesh.

Keywords: Maternal education; stunting; wasting; underweight; Bangladesh; BDHS.

Title: Risk factors for suicide attempts in Bangladesh: A cross-sectional study

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ABSTRACT

Background: Suicide in is an escalating public health crisis in Bangladesh. Its prevention needs understanding of suicide attempt and its contributing factors. Research on this issue is rare in this country. So, we designed to study the factors contributing to suicide attempt in Bangladesh.

Methods: It was a cross-sectional study. The study population included suicide attempters attending hospitals in the Rajshahi Division of Bangladesh and their non-patient neighbors. A multi-stage random sampling technique was used for data collection with a semi-structured questionnaire. Frequency distribution, Chi-square test and binary logistic regression model were applied for data analysis using Microsoft Excel and SPSS (Version 22).

Results: A total of 620 respondents, 53.7% female and 46.3% male, aged between 10 and 70 years took part in the study. Of them, 68.9% belonged to the 18–39 age group. Most participants (82%) came from rural areas. Suicide attempts were more common among individuals aged ≤ 39 years, married, highly educated, living in joint families, with a history of substance abuse, medical comorbidities, and lifetime suicidal ideation. More than 82% of the respondents had mental comorbidities.

Conclusions: The study identified several modifiable factors that contribute to suicide attempts. The findings will hopefully help the concerned authorities to develop a suicide prevention and surveillance framework in the country.

Keywords: Risk factors; Suicide attempt; Suicide; Mental health; Rajshahi; Bangladesh.

Title: Socio-economic patterns of food consumption and dietary diversity among Bangladeshi children aged 6-23 months: Is the achievement of minimum dietary diversity protective against morbidity?

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Abstract

Most interventions to foster child growth and development in Bangladesh focus on improving food quality and quantity. This study aimed to assess the pattern of food consumption and dietary diversity by socioeconomic status (SES) among Bangladeshi children. It also assessed how the attainment of adequate dietary diversity is associated with childhood morbid conditions. The most recent nationally representative, cross-sectional data from the Bangladesh Demographic and Health Survey 2022, was used for analysis of 2,539 children aged 6 to 23 months. Consumption of seven food groups and minimum dietary diversity (MDD) were collected through the mother's 24-h dietary recall. Logistic regression models were conducted to assess the association between household wealth and maternal education with food consumption and MDD, after controlling for covariates. We assessed the relationship between attainment of MDD and childhood experience of diarrhea, fever, and symptoms of ARI in the preceding two weeks. Both household wealth and maternal education were significantly associated with MDD but the SES gradient was not particularly strong. Furthermore, the associations between SES and consumption of food groups were not consistent. Maternal education was more strongly associated with consumption of essential food items and all food groups, but household wealth was found to have a significant influence on intake of the dairy group only. The findings also indicated a notable protective effect of dietary diversity against various morbid conditions, including diarrhea, fever, and any morbid condition. Interventions designed to improve food consumption and diversified dietary intake among Indian children need to be universal in their targeting given the overall high prevalence of inadequate dietary diversity and the relatively small differentials by SES. Additionally, the attainment of a varied diet was identified as protective against certain morbid conditions. Nutritional interventions promoting the daily consumption of diverse meals are advised to tackle the persistent issue of childhood morbidity in Bangladesh.

Title: Suicidal Ideation and Its Associated Factors among University Students in Bangladesh

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Abstract

Background: Suicidal ideation (SI) is a critical public health concern and a well-established precursor to suicide attempts and completed suicide. University students are particularly vulnerable due to academic pressure, financial hardship, family-related stress, and the growing burden of internet addiction and psychological distress. In Bangladesh, studies examining SI using comprehensive validated instruments, particularly those disaggregating active suicidal desire, passive suicidal desire, suicidal planning, and previous attempt history as distinct outcomes, remain limited, and the combined influence of internet addiction and psychological distress on SI in a regional university population has not been previously investigated. **Objectives:** This study aimed to assess the prevalence of suicidal ideation (SI) and its behavioral components among undergraduate students, and to determine the independent sociodemographic, behavioral, lifestyle-related, and psychological factors associated with these outcomes, with particular emphasis on the contributory roles of internet addiction (IA) and psychological distress. **Methods:** A cross-sectional study was conducted among 763 third and fourth-year undergraduate students at the University of Rajshahi, selected through multistage random sampling across 15 departments from five faculties. Data were collected using three validated Bangla-adapted instruments: the Beck Scale for Suicidal Ideation (BSSI; Cronbach's $\alpha = 0.84$), Young's Internet Addiction Test (IAT; $\alpha = 0.85$), and the Kessler Psychological Distress Scale (K-6; $\alpha = 0.83$). Chi square tests examined bivariate associations, and binary logistic regression identified independent predictors as adjusted odds ratios (aOR), with significance set at $p < 0.05$. **Results:** The overall prevalence of high SI was 7.9%. Component-level analysis revealed passive suicidal desire as the most prevalent form (8.0%), followed by previous suicide attempt history (6.8%), active suicidal desire (6.2%), and suicidal planning (5.4%). Internet addiction was present in 50.5% of respondents, with 74.0% at moderate severity, and psychological distress was identified in 23.1%, with 30.5% reporting severe distress. In the adjusted model, poor parental relationship quality was the strongest independent risk factor for SI (aOR: 16.57), followed by psychological distress (aOR: 3.14), smoking (aOR: 3.01), and internet addiction (aOR: 2.23). Arts and Commerce enrollment was protective relative to science (aOR: 0.30 and 0.22), as was moderate monthly family income of 15,001-30,000 BDT (aOR: 0.41). Internet addiction was the sole independent predictor of active suicidal desire (aOR: 4.99), while poor parental relationship (aOR: 16.24), psychological distress (aOR: 3.02), and smoking (aOR: 2.45) independently predicted passive suicidal desire, with moderate income remaining protective (aOR: 0.37). Suicidal planning was strongly associated with previous attempt history (aOR: 6.75), reflecting a clear escalation from ideation to attempt. **Conclusion:** Suicidal ideation and its behavioral components are prevalent among undergraduate students shaped primarily by family relationship quality, psychological distress, internet addiction, and smoking, while Arts/Commerce enrollment and moderate income are protective, with science faculty students representing a particularly high-risk subgroup. These findings highlight the need for university-based prevention strategies, including routine screening, targeted counseling, digital well-being programs, and faculty-differentiated mental health interventions. **Keywords:** Suicidal Ideation (SI), Internet Addiction (IA), Psychological Distress, Suicide Attempt, Active Suicidal Desire, Passive Suicidal Desire, Suicide Plan.

Title: PATTERNS OF PATIENT BEHAVIOR AND CLINICAL PRESENTATION IN HOSPITALIZED DENGUE CASES: INSIGHTS FROM A TERTIARY LEVEL CENTER

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ABSTRACT

Background: Dengue is emerging as a challenging public health problem in Bangladesh. Clinical Presentation of Disease and behaviour pf patient regarding illness is important which determine patient outcome.

Objective: This study aims to explore healthcare seeking behavior and clinical presentation among patients with dengue attending tertiary care hospital.

Methods: A cross-sectional observational study was conducted among patients attending tertiary level hospital in Dhaka city. Socio-demographics, clinical presentations and treatment-seeking pattern were assessed through interviewer administered questionnaire among total of 268 patients.

Results: Each participant in this study experienced fever, with headache (82%) and myalgia (75%). Acute phase markers were high among admitted dengue patients where 86.2% reported NS1 positive. Mean hemoglobin was low (40.3% having HB <11gm/dl) and most patients were having leucopenia (63.8%) (WBC < 4000/cmm). Although 90.7% reported Platelet count >50000/cmm but yet very significant amounts of patients (2.6%) had platelet < 20000/cmm at presentation. Patients preferred pharmacy-based self-medication first before going to hospital (42%). Significant associations were found between socio-demographic factors such as education and income with healthcare-seeking behavior and clinical outcomes ($p < 0.05$, Table 4).

Conclusion: Patients take too much time for getting admitted into hospital because of self-medication by drugs from pharmacy. All these clinical presentations supported laboratory findings that reported high grade clinical severity among admitted patients (NS1 positivity high and leucopenia most common). Program awareness should start from primary level of care.

Keywords: Dengue Fever, Healthcare-Seeking Behavior, Clinical Manifestation, Laboratory Markers, Dhaka, Bangladesh.

Title: Knowledge, Awareness, Dietary Practices, and Menstrual Factors Associated with Hemoglobin Levels among Female University Students

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Abstract

Introduction: Iron deficiency is a major cause of anemia worldwide, particularly among young women. Female university students are at increased risk because of higher iron requirements, menstrual blood loss, and poor dietary habits. In Bangladesh, anemia remains a significant public health concern, but evidence on its determinants among university students is limited. This study examined the factors associated with anemia among female students at the University of Rajshahi.

Methods: A cross-sectional study was conducted among 220 female students selected by simple random sampling from Taposhi Rabeya Hall. Data on socio-demographic characteristics, dietary habits, menstrual history, and knowledge, awareness, and preventive practices related to iron deficiency were collected using a structured questionnaire. Hemoglobin levels were measured for 100 participants. Descriptive statistics, bivariate analysis, and multiple regression were performed.

Results: Over 70% of participants were anemic, with 44% having moderate anemia. Hemoglobin levels were significantly associated with family size, irregular menstruation, heavy menstrual bleeding, and awareness of personal preventive actions. Knowledge was not significantly associated with hemoglobin levels. Better preventive practices were related to mother's education, a balanced diet, and greater awareness of anemia prevention.

Conclusion: Anemia among female university students is influenced mainly by menstrual health, dietary habits, family characteristics, and preventive behaviors. Nutrition education, improved access to iron-rich foods, menstrual health support, and regular hemoglobin screening are recommended to reduce anemia and improve students' health and academic performance.

Title: Socioeconomic and Empowerment Correlates of Caesarean Delivery in Bangladesh: A Nationwide Study Using BDHS 2022 Data

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Abstract

Background: Women's empowerment and maternal health are important targets of the Sustainable Development Goals (SDGs). The caesarean section (CS) rate in Bangladesh reached nearly 51.8% in 2025, far exceeding the 10-15% level recommended by the World Health Organization (WHO). Our objective is to examine the relationship between women's empowerment and CS delivery in Bangladesh.

Methods: This cross-sectional study used data from 4,872 ever-married women aged 15-49 years in the Bangladesh Demographic and Health Survey (BDHS) 2022. The Survey-based Women's Empowerment (SWPER) index was used to quantify women's empowerment. Multivariable logistic regression was used to estimate adjusted odds ratios (aORs) for CS delivery based on these characteristics, while accounting for potential covariates.

Results: The overall prevalence of CS was 45.31% (43.03-47.6). CS was higher among the richest women (68.67%), deliveries in private facilities (84.43%), and those receiving >4 antenatal care (ANC) visits (62.62%). The multivariable analysis showed that women who were more socially independent were much more likely to have a caesarean delivery (aOR: 1.60, 95% CI: 1.11-2.29), while delivery in private facilities had a nine-time increased the likelihood of caesarean delivery (aOR: 9.49, 95% CI: 7.44-12.11). Moreover, women from affluent households were more likely to have CS, with the wealthiest quintile having over twice the odds of the poorest (aOR: 2.06, 95% CI: 1.40-3.03). Conversely, no substantial correlation was identified between CS and women's decision-making autonomy. These results show that socio-economic factors, such as wealth and access to private care, have a big effect on CS rates. They also show how important social independence and the ability to make their own decisions are in this regard.

Keywords: Women's empowerment; Caesarean section; BDHS 2022; SWPER index; Logistic regression; Bangladesh

Abstract on Biological & Biochemical Sciences

Title: Elucidating the Anticancer Mechanism of Nonactin through Gene Expression, In-Vitro and In-Silico studies in A549 Lung Cancer Cells

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Abstract:

Background: Cancer remains one of the leading causes of mortality worldwide, underscoring the need for effective multi-targeted therapeutic agents. Natural compounds such as Nonactin, a well-known antibiotic, have gained attention for their potential to interfere with multiple cellular pathways.

Objectives: This study evaluated the anticancer potential of Nonactin across human cancer cell lines through a combination of experimental and computational approaches.

Materials & methods: Cytotoxicity was assessed using MTT assays in MCF-7 (breast), A549 (lung), and HCT-116 (colon) cancer cells. Gene expression profiling was performed in A549 cells via quantitative PCR (qPCR) to examine key apoptotic and survival-related markers. In addition, molecular docking was carried out to predict the binding interactions of Nonactin with apoptosis-regulating proteins. Nonactin demonstrated dose-dependent cytotoxicity in all tested cell lines, significantly reducing cell viability. qPCR analysis revealed upregulation of p53, Caspase-9, and Cytochrome-C, alongside suppression of NF- κ B and anti-apoptotic genes, indicating activation of the intrinsic mitochondrial apoptotic pathway. Docking results further predicted a strong binding affinity of Nonactin with p53, suggesting a potential mechanistic role in apoptosis induction.

Significant findings: These findings suggest that Nonactin can effectively induce apoptosis through modulation of p53-related pathways and mitochondrial signaling.

Conclusion: Integrating in vitro cytotoxicity, gene expression, and in silico docking analysis supports its potential as a promising candidate for development as a multi-purpose anticancer drug.

Keywords: Nonactin, Lung cancer, Gene expression, MTT assay, Molecular docking.

Title: Anticancer Potential of the Repurposed Drug Eltrombopag Olamine Against Human Lung Adenocarcinoma Cells

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Abstract

Eltrombopag olamine (EO), an FDA approved thrombopoietin receptor agonist, has recently shown anticancer activity in MCF-7 (breast adenocarcinoma) and SMMC-7721 (hepatocellular carcinoma) cells, with IC₅₀ values of 31 and 154 µg/mL, respectively, against 127 µg/mL in non-cancerous HEK293T cells, inducing caspase-dependent apoptosis via *FAS*, *TP53*, *BAX*, and *TNF-α* upregulation, S phase arrest, and modulation of EGFR, MAPK, ERK and WNT1 signaling. Lung cancer remains one of the deadliest malignancies worldwide, and conventional chemotherapy imposes severe systemic toxicity that compromises patients' quality of life. Drug repurposing offers a clinically viable alternative using approved compounds with established safety profiles. While EO's anticancer activity is known in breast and liver cancer cells, its effect on lung adenocarcinoma remains unexplored. This study investigated, for the first time, the antiproliferative and apoptotic potential of EO against A549 human lung adenocarcinoma cells. A549 cells were treated with EO for 24 hours, and antiproliferative activity was assessed by MTT assay. Apoptotic morphology was evaluated by Hoechst 33342 staining, and the mode of cell death was characterized by Annexin V/PI flow cytometry. Caspase involvement was examined using caspase inhibitors, and intracellular ROS generation was assessed by the DCFH-DA assay. EO exhibited significant, dose-dependent antiproliferative activity against A549 cells, with selectivity over HEK293T cells. Hoechst and Annexin V/PI staining confirmed apoptosis induction, with a shift toward late apoptotic and necrotic populations following treatment. Notably, caspase inhibitors failed to rescue cell viability, indicating a caspase independent mechanism, in contrast to the caspase dependent pathway reported in breast and liver cancer cells. No significant ROS generation was observed, suggesting an oxidative stress independent route to cell death. This study provides the first evidence that Eltrombopag olamine exerts anticancer activity against human lung adenocarcinoma cells through a distinct caspase independent apoptotic mechanism, contrasting with its caspase dependent action in breast and liver cancer cells, while the consistent involvement of *TNF-α* across cancer types points to a shared upstream trigger within an otherwise divergent apoptotic response, broadening the scope of EO as a mechanistically versatile, repurposed anticancer candidate.

Keywords: Repurposed Drug, A549 Lung Adenocarcinoma, Apoptosis, Caspase Inhibitors.

Title: Purification and Characterization of a Novel Lectin from the Freshwater Mussel *Lamellidens marginalis* with Antimicrobial, Antibiofilm, and Antioxidant Activities

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Abstract: Lectins are carbohydrate binding proteins that play a key role in invertebrate innate immunity by recognizing pathogen associated molecular patterns. In the present study, a lectin was purified from the freshwater mussel *Lamellidens marginalis* (LMLs) by affinity chromatography and characterized for its physicochemical and biological properties. SDS-PAGE analysis revealed a subunit molecular mass of 12.5 ± 1.0 kDa. Hemagglutination inhibition assays showed the activity of LMLs to be strongly inhibited by melibiose, moderately by N-acetyl-D-glucosamine, and weakly by D-xylose, indicating galactose sugar specificity. The lectin remained active across a temperature range of 20-45°C and a pH range of 2.0-4.0. EDTA treatment significantly enhanced hemagglutination activity, indicating the presence of inhibitory metal ions in the native protein, whereas restoration with divalent cations produced differential effects, with Ca^{2+} reducing activity and Mg^{2+} only partially restoring it, pointing to a metal-dependent regulatory mechanism. LMLs exhibited significant toxicity in the brine shrimp lethality assay ($\text{LC}_{50} = 800 \mu\text{g/ml}$) and dose-dependent antibacterial activity against *Bacillus cereus*, *Staphylococcus aureus*, *Shigella dysenteriae*, and *Shigella sonnei* at the concentration of 1 mg/ml, along with antifungal activity against *Aspergillus niger*. LMLs markedly inhibited biofilm formation in all five tested strains, *Bacillus cereus*, *Shigella dysenteriae*, *Shigella boydii*, *Staphylococcus aureus*, and *Escherichia coli*, indicating broad-spectrum antibiofilm potential. Moderate antioxidant activity was also recorded (DPPH assay, $\text{IC}_{50} = 750 \mu\text{g/ml}$). Together, these findings establish LMLs as a multifunctional bioactive protein, positioning *L. marginalis* as a promising, previously underexplored freshwater source of lectins with biomedical and agricultural relevance.

Keywords: Mussel lectin; *Lamellidens marginalis*; antibiofilm, antifungal.

Title: Antibacterial and Antifungal Activities of the Extracts of *Aerides multiflora* Roxb. A Native Medicinal Orchids in Bangladesh

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Abstract

The present study was conducted to evaluate the antimicrobial activity of *Aerides multiflora*, an important epiphytic medicinal orchid in Bangladesh. Extracts from whole plants and seed pods were collected using methanol, chloroform, petroleum ether and aqueous extract and screened for their antibacterial activity against five bacterial strains, namely *Bacillus cereus*, *E. coli*, *Staphylococcus aureus*, *Pseudomonas* sp. and *Shigella boydii*. Four pathogenic fungi, namely *Rhizopus oryzae*, *Aspergillus flavus*, *Aspergillus niger* and *Fusarium oxysporum* were also tested. The antibacterial activities were evaluated using the disc diffusion method and the antifungal activities were tested using the poison feeding technique. The whole plant methanol extract was found to be superior to the other solvent extracts against both the bacteria and fungi tested. The highest zone of inhibition by the whole plant methanol extract was observed (14.33 ± 0.19) against *Staphylococcus aureus* and the highest percentage inhibition (62.19 ± 0.57) of mycelial growth was observed against *A. flavus*. The value of minimum inhibitory concentration of the extracts was also analyzed. The whole plant methanol extract gave the lowest MIC value against both the tested bacteria and fungi. The results could be used for the isolation and characterization of the novel phytochemical effects on various infectious diseases, especially in view of the emergence of drug-resistant microorganisms such as antimicrobial and antifungal agents.

Keywords: Medicinal, Antibacterial, Antifungal, MIC.

Title: Isolation, Molecular Characterization of Plasmid Mediated Extended Spectrum β -Lactamase (ESBL) from the River Water of Bangladesh

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Abstract:

Wastewater effluents discharged into rivers create nutrient-rich environments that promote the growth of antibiotic-resistant bacteria (ARB) and the spread of antibiotic resistance genes (ARGs). ESBL-producing bacteria, carrying genes such as blaCTX-M, blaTEM, and blaSHV, are widespread and can rapidly transfer resistance. The growth and spread of multidrug-resistant bacteria are further accelerated by discharges from homes, hospitals, businesses, and farms. The current study examined the frequency of organisms that produce extended spectrum β -lactamases (ESBL) and are resistant to multiple drugs (MDR) in 12 surface water samples that were taken close to residential effluent discharge locations in the rivers Buriganga, Turag, Shitalakhya, and Rupsa. A total of 123 distinct phenotypes of bacteria were identified.

From 123 isolates, 25 (20.32%) exhibited ESBL enzyme producing trait, 4(3.23%) classified as XDR bacteria, 19(15.44%) classified as MDR bacteria. Among 25 ESBL positive isolate displaying resistance against β -lactams (40.0%), Cephalosporins (72.7%), Carbapenems (56.0%), Monobactam (64.0%), Aminoglycosides (10.0%), Sulfonamide/Folate inhibitors (20.0%), Tetracyclines / Glycylcyclines (18.0%). AMR index of ESBL producing bacteria indicated that 8(32.0%) are highly resistance, 12(48.0%) are moderately resistance and only 5(20.0%) showed low resistance. Identified 2(8.0%) DTR (Difficult-to-Treat Resistance) bacteria within 25 ESBL positive Bacteria. The presence of these pathogenic strains in the environment highlights the urgent need to control water contamination and implement strict measures to minimize antibiotic use and its subsequent release.

Keywords: AMR, MDR, XDR, ESBL, Plasmid-mediated resistance, River pollution.

Title: Investigation of pH-Controlled Photocatalytic Removal of Methylene Blue and Methyl Orange Using TiO₂ Synthesized via Hydrothermal and Sol-Gel Methods

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Abstract

Textile dye effluents represent a critical environmental hazard due to their persistence, toxicity, and resistance to conventional treatment, requiring advanced oxidation strategies such as semiconductor photocatalysis. This study presents a systematic comparative investigation of TiO₂ photocatalysts synthesized via hydrothermal and sol-gel routes for the degradation of Methylene Blue (MB, cationic) and Methyl Orange (MO, anionic) across a broad pH range (2–12) under light irradiation, with emphasis on elucidating the mechanistic role of pH and synthesis method on degradation efficiency. Hydrothermal TiO₂ demonstrated superior and pH-resilient performance toward MB, achieving degradation efficiencies of 87.67%, 91.41%, 94.89%, and 92.79% at pH 4, 6, 8, and 10, respectively, with a peak of 94.89% at pH 8. In contrast, sol-gel TiO₂ exhibited markedly distinct selectivity, attaining complete degradation (100%) of MO at pH 2, with efficiency declining progressively under alkaline conditions (26.91% at pH 10). These divergent trends are interpreted through the lens of TiO₂ surface charge dynamics relative to its point of zero charge (PZC $\approx$ 6.2). Below the PZC, protonation of surface hydroxyl groups generates positively charged Ti-OH₂⁺ species, promoting strong electrostatic attraction toward anionic MO an effect particularly pronounced in sol-gel TiO₂ at acidic pH. Conversely, above the PZC, surface deprotonation yields negatively charged Ti-O⁻ sites that preferentially adsorb cationic MB. Furthermore, alkaline conditions enrich the catalyst surface with OH⁻ ions, augmenting hydroxyl radical ($\cdot$ OH) generation upon photoexcitation and thereby enhancing MB degradation, consistent with the elevated MB removal observed between pH 8–10 for hydrothermal TiO₂. These findings establish distinct optimum operating windows: sol-gel TiO₂ at pH 2 for anionic dye remediation, and hydrothermal TiO₂ at pH 8 for cationic dye removal. This work underscores the critical importance of synthesis route selection and pH engineering in developing targeted photocatalytic systems for the treatment of specific textile wastewater streams.

Keywords: TiO₂ nanoparticles; photocatalysis; Hydrothermal, Sol-gel; Dyes; pH; Point of zero charge; Radicals.

Abstract on Ecology and Environment

Title: Resurgence of Measles in Bangladesh: The Growing Impact of Climate Change on Child Health

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Abstract

Background: Bangladesh is considered one of the most vulnerable countries to climate change and suffers increasing dangers from cyclones, floods, and climate-induced migration. The number of measles vaccinations declined from about 90% in 2020 to approximately 57% in 2025 with no national supplemental immunization program held since 2020, forming a large group of children at risk of being infected. The influence of climate change on the increased vulnerability to measles was not investigated enough.

Objectives: The purpose of this research was to analyze the epidemic situation in 2026 due to the measles outbreak in Bangladesh and evaluate how climate-induced factors such as floods, displacement, and malnutrition contributed to the problem.

Methods: Mixed methodological review was performed using WHO Disease Outbreak Notices, UNICEF Situational Reports, national immunization statistics, displacement statistics from IOM, and peer-reviewed studies. Linkage between flood-prone location and incomplete vaccinations was investigated through a cross-sectional study (n=13,649).

Results: Up to June 2026, 95,760 suspected cases and 93 confirmed deaths were registered in 61 out of 64 districts, of which 81% of the cases were children under the age of five. Children in flood-prone areas were found to be more prone to having an incomplete vaccination (PR = 1.24; 95% CI: 1.05–1.46). High incidences of child malnutrition such as stunting (28%) and wasting (10%) and vitamin A deficiency and failure to implement biannual vitamin A distribution campaign since 2026 have worsened the situation, and urban migration into under-served areas has emerged as a key transmission amplifier.

Conclusion: The resurgence of measles in Bangladesh is due to the interplay between inadequate immunization infrastructure and increasing climatic stresses. There is an urgent need for climate-resilient immunization interventions such as flood-resistant cold chain logistics, climate-driven catch-up campaigns, and nutritional support to prevent future outbreaks.

Keywords: Measles resurgence, Bangladesh, Climate change, Childhood immunization, Vaccine coverage.

Title: The Exposome and Endocrine Diseases: Integrating Environmental and Biological Risk Factors

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Abstract

Background: The prevalence of various endocrine diseases in Bangladesh is increasing in terms of type 2 diabetes, thyroid conditions, metabolic syndrome, etc., in conjunction with the presence of various environmental risks, for example, high levels of arsenic in groundwater used by about 40 million people. There are more than 50 million cases of thyroid disorders in Bangladesh, with women being more affected compared to men, but almost half of all these cases are still undetected. The exposome approach includes all exposures in terms of environmental, chemical, biological, and lifestyle aspects during a person's lifetime.

Objective: The current literature review is based on the latest findings of environmental exposure and biological risk factors associated with the development of endocrine disorders among the Bangladeshi population, especially arsenic which acts as an endocrine disruptor in this region.

Methods: Based on epidemiological and mechanistic research, this study considers arsenic-induced thyroid dysfunction in both children and adults, arsenic exposure during pregnancy and its consequences on reproductive endocrine endpoints such as the onset of menarche, and connections between arsenicosis and diabetes mellitus. According to a recent cohort study (BiRCH), increased levels of arsenic in childhood urine and toenail samples were strongly linked to high levels of free thyroxine (fT4) in a dose-response relationship, which is consistent with the disruptive effects of arsenic on the thyroid gland even in the case of early life exposure.

Results: The presence of chronic arsenic exposure through contaminated drinking water, which is estimated to cover about 80% of the total landmass of Bangladesh, and affects about 40 million individuals, when combined with genetics, nutrition, and socio-economic conditions, results in increased incidence of endocrine diseases among the population. The chronic exposures in question increase the overall disease burden of Bangladesh by contributing to the high levels of thyroid problems suffered by about 50 million Bangladeshis, where half the affected population is still undiagnosed, and the rising incidence of type 2 diabetes mellitus. Though Bangladesh is contributing increasingly to global research on endocrinology, there is very limited research on exposomes in Bangladesh.

Conclusion: An integrated approach towards the exposome—using environmental biomarkers of exposure, life course epidemiology, and biomarkers of endocrine function is necessary to elucidate causative pathways and implement effective interventions such as those involving water and endocrine disease screening for affected populations in Bangladesh and elsewhere.

Keywords: Exposome; endocrine disruptors; arsenic; thyroid dysfunction; diabetes mellitus

Title: Intensifying Cooling Service of Vegetation Under Urban Warming: A Multi-Temporal Google Earth Engine Analysis of the NDVI–Land Surface Temperature Relationship in Rajshahi City, Bangladesh (2001–2025)

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Abstract:

Rapid urbanisation in mid-sized South Asian cities has intensified the surface urban heat island (SUHI), yet long-term, satellite-based assessments of the vegetation–temperature relationship for Rajshahi — one of the hottest cities in Bangladesh — remain scarce. This study quantifies the spatial and temporal relationship between vegetation health and land surface temperature (LST) across a 546 km² study area centred on Rajshahi City for four pre-monsoon periods (2001, 2009, 2017 and 2025) using cloud-based Google Earth Engine (GEE) processing of Landsat 5, 8 and 9 Collection-2 surface-reflectance imagery. The Normalised Difference Vegetation Index (NDVI) and LST were derived per pixel at 30 m resolution; permanent water was masked using the Normalised Difference Water Index (NDWI), and a physically-based quality-control (QC) filter ($LST \geq 20^\circ\text{C}$) was applied uniformly to remove residual cloud and cloud-shadow contamination. Pearson and Spearman correlation, ordinary-least-squares (OLS) regression, non-parametric bootstrap confidence intervals and Fisher r-to-z tests were applied to stratified random pixel samples ($n \approx 9,500\text{--}9,700$ per year). A consistent, highly significant negative NDVI–LST correlation was found in 2001 ($r = -0.583$), 2009 ($r = -0.774$) and 2025 ($r = -0.609$), all at $p < 0.001$, confirming the cooling effect of vegetation. The strongest gradient occurred in the drought year 2009. Critically, the apparent positive correlation reported for the cloud-affected 2017 pre monsoon (raw $r = +0.359$) was shown to be an artefact of ~ 250 contaminated low-temperature pixels: after QC, the relationship collapsed to statistical insignificance ($r = -0.008$, $p = 0.42$), demonstrating a climate-driven breakdown rather than a true inversion. The OLS cooling slope steepened from -10.82°C per NDVI unit in 2001 to -12.77°C per NDVI unit in 2025 — an 18.1 % intensification that a Fisher r-to-z test confirms is statistically significant ($z = 2.80$, $p = 0.005$). Concurrently, the share of land experiencing extreme surface heat ($\geq 40^\circ\text{C}$) rose from 1.1 % in 2001 to 8.0 % in 2025. These results provide quantitative evidence that the marginal climate regulating value of vegetation is increasing as Rajshahi warms, and underscore the urgency of protecting the city’s remaining mango-orchard belt and peri-urban cropland as a measurable, low-cost climate-adaptation strategy. **Keywords:** NDVI; land surface temperature; surface urban heat island; Google Earth Engine; Landsat; cloud contamination; Rajshahi; South Asia.

Title: MONITORING BIODIVERSITY AND CLIMATE CHANGE IMPACTS IN ROHINGYA SETTLEMENT AREAS OF SOUTH-EASTERN COASTAL BANGLADESH USING MULTI INDEXING REMOTE SENSING APPROACH

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Abstract

Monitoring biodiversity and climate-induced environmental changes in refugee-affected regions is essential for comprehending ecological degradation and formulating sustainable management measures. The Rohingya settlement regions in southern coastal Bangladesh constitute one of the most ecologically vulnerable landscapes where accelerated land alteration, vegetation removal, and thermal irregularities have exacerbated since the onset of mass displacement in 2017. This study seeks to measure biodiversity loss and evaluate the impacts of climate change on geomorphosites through a multi-index remote sensing methodology. Satellite imagery from Landsat-8, Landsat-9, and Sentinel-2, spanning 2015 to 2025, was processed in ArcGIS to calculate NDVI, EVI, EHI, TDVI and LST values. Spatial and temporal analyses were conducted to delineate vegetation dynamics, ecosystem health, habitat degradation and fluctuations in surface temperature. Statistical analysis revealed a strong and significant negative correlation between NDVI and land surface temperature (LST) ($r < -0.70$, $p < 0.01$), indicating that vegetation loss has directly intensified surface warming across settlement zones. Similarly, the Ecological Health Index (EHI) exhibited a significant inverse relationship with LST ($p < 0.05$), confirming progressive ecosystem stress associated with land cover alteration. Linear regression analysis further demonstrated a consistent declining trend in NDVI and EHI with increasing LST, quantitatively establishing vegetation degradation as a primary driver of localized climate change impacts in the study area. This analysis indicates a significant deterioration in vegetative health and coverage, as evidenced by declining NDVI, EVI, EHI, and TDVI trend values, alongside an increase in LST within major settlement clusters. This suggests considerable vegetation depletion and biodiversity stress, while TDVI trends corroborate extensive soil and vegetation moisture loss. Land surface temperature (LST) rose markedly to between 2.5 and 3.5 degrees, indicating substantial warming attributable to deforestation and land cover alteration. These findings highlight the significant and enduring environmental effects of the settlement, offering essential data to inform sustainable rehabilitation programs, biodiversity conservation, and climate-resilient actions in this ecologically sensitive area.

Keywords: Geomorphosites, Biodiversity loss, Rohingya settlement, EHI, Climate change and Remote sensing

Title: COMPARISON OF EFFECT OF ORGANIC AND INORGANIC FERTILIZER ON SOIL CHEMICAL PROPERTIES IN SPINACH PRODUCTION

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Abstract

The research work was conducted in November 2024 at Field laboratory of Institute of Environmental Science, Rajshahi University Rajshahi to study the comparison of effect of organic and inorganic fertilizer on soil chemical properties in Spinach production. There were six treatments in this experiment. The experiment was laid out in randomized complete block design (RCBD) with three replications. Each block was compacted with a 6unit plot. Thus, the total numbers of unit plots were 18. The unit plot was $4\text{m} \times 1.25\text{m} = 5.0 \text{ m}^2$ having plot to plot 0.5m and 1m from surrounding the boundary. The unit plots were separated with earthen bunds to avoid nutrient transfer to besides plot by lateral seepage.

This study evaluated the impact of six different soil treatments (T_0 – T_5) on the dynamics of soil organic matter (SOM), macronutrients (N, P, K), and micronutrients (S, Zn, B) from pre-cultivation to post-harvest. Results indicate that while cultivation generally leads to nutrient depletion, specific management protocols can mitigate these losses and enhance soil fertility.

Statistical analysis revealed that Total Nitrogen (TN) and Available Phosphorus (P) were significantly influenced by the treatments (and, respectively). Treatment T_5 emerged as the superior protocol, achieving the highest net gains in TN (+0.04%) and Available P (+2.20 mg/kg). In contrast, the control (T_0) and T_2 experienced substantial phosphorus depletion (up to -10.02 mg/kg). A notable inverse relationship was observed between SOM and TN; while SOM decreased in most plots due to microbial mineralization, TN levels rose, suggesting a high rate of organic nitrogen conversion.

Regarding micronutrients, Sulfur (S) and Boron (B) levels showed highly significant variations (). T_5 demonstrated the best performance in minimizing Sulfur loss (-1.46mg/kg) and maximizing Zinc (Zn) accumulation (+0.08mg/kg). Although changes in Exchangeable Potassium (K) and SOM were recorded as non-significant (NS), the numerical trends consistently favored T_5 and T_4 for maintaining nutrient stability.

Overall, Treatment T_5 provided the most balanced nutrient profile, effectively preventing the "nutrient mining" seen in other treatments. This study recommends T_5 as an optimal strategy for sustaining soil health and ensuring long-term productivity in intensive cropping systems.

Keywords: Nutrient Dynamics, Soil Fertility Management, Mineralization, Macronutrients and Micronutrients, Sustainable Agriculture, Phosphorus Depletion

Title: Determinants of Cesarean Delivery at First Birth and Its Geographical Distribution in Bangladesh

Authors

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Abstract

Background: First-birth cesarean creates a pattern where subsequent births are more likely to be delivered through Cesarean Section (CS). Despite this growing concern, research on the determinants of CS at first birth in the context of Bangladesh remains limited. This study aims to identify the determinants associated with CS at first birth and to find out the districts with a high and low prevalence.

Methods: Data were extracted from the Bangladesh Multiple Indicator Cluster Survey, 2019. Bivariate analysis was performed to examine the association between CS and a wide range of explanatory variables. A multilevel logistic regression model was used to assess the effects of these factors on CS.

Results: This study revealed that the prevalence of CS was 44.66% for first births. We found that the odds of CS were higher for mothers aged 30 years and above (aOR=3.25, 95%CI:1.43-7.37), attending antenatal care at least 4 times (aOR=2.20, 95%CI:1.26-3.85), and having larger-than-average babies (aOR =2.36, 95%CI: 1.48–3.76). Private hospitals had a higher likelihood of 14.77 times (aOR=14.77, 95%CI:9.75- 22.38), which was the most significant predictor for CS at first birth. Geographic distribution showed a higher prevalence of CS in several southwestern districts of Bangladesh.

Conclusion: In Bangladesh, approximately 4 out of 9 first births were delivered by CS, with higher rates in Khulna. Private facility, maternal age, frequent antenatal visits, and larger size baby were key influencing factors of CS at first birth. These highlight the need for clinical guidelines and region-specific policies to raise awareness about the risks of CS at first birth, including complications in future pregnancies and long-term health outcomes.

Keywords: Cesarean section, risk factors, multilevel logistic regression analysis, Geographic Distribution, Bangladesh.

Title: Association between Disaster Exposure and Mental Health Outcomes among Women in Bangladesh: Evidence from Nationally Representative Data

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Abstract

Natural disasters are increasingly recognized as important determinants of mental health, particularly in low- and middle-income countries. Bangladesh is highly vulnerable to climate-related disasters. However, nationally representative evidence on the relationship between disaster exposure and women's mental health remains limited. The objective of this study is to examine the association between living in disaster-affected districts and symptoms of anxiety and depression among the reproductive-aged (15–49 years) ever-married women in Bangladesh. Data were drawn from the 2022 Bangladesh Demographic and Health Survey (BDHS) and the Emergency Events Database. A total of 20,029 ever-married women aged 15–49 years were included in the analysis. Districts experiencing at least one climate-related disaster (extreme temperature, storm, flood, and landslide) between 2018 and 2022 were classified as disaster-affected. Anxiety and depression symptoms were measured using the Generalized Anxiety Disorder 7-item (GAD-7) and Patient Health Questionnaire 9-item (PHQ-9) scales, respectively. Descriptive statistics, chi-square test, and a multivariable logistic regression model accounting for complex survey design were used to analyze the data. Overall, 19.5% of women reported symptoms of anxiety and 5.1% reported symptoms of depression. Bivariate analysis shows a higher anxiety prevalence among women in disaster-affected districts compared with non-affected districts (20.5% vs. 18.0%), while the difference in depression prevalence across the disaster-affected and non-affected areas was very small (5.1% vs. 4.9%). After adjustment for key socioeconomic and demographic factors, living in disaster-affected districts was observed to be significantly linked to an 18% increased risk of having anxiety (Adjusted Odds Ratio (AOR) = 1.18, 95% Confidence Interval (CI): 1.03–1.36; $p = 0.025$). Nevertheless, the association between having depression and living in non-affected districts was statistically nonsignificant. Women aged 30–39 years (AOR=1.47, 95% CI: 1.33–1.64, $p<0.001$) and 40–49 years (AOR=1.49, 95% CI: 1.31–1.70, $p<0.001$) had higher odds of having anxiety and depression (30–39 years: AOR=1.35, 95% CI: 1.12–1.63, $p=0.001$; 40–49 years: AOR=1.44, 95% CI: 1.15–1.80, $p=0.001$) than those aged 15–29 years. Being widowed, divorced, or separated was linked to a higher risk of having anxiety (AOR=1.49, 95% CI: 1.21–1.84, $p<0.001$) when compared with currently married women. Having sex in the last 4 weeks was associated with lower odds of having anxiety and depression. Women whose husbands were residing abroad were significantly less likely to have anxiety (AOR=0.74, 95% CI: 0.59–0.93, $p=0.011$) and depression (AOR=0.66, 95% CI: 0.45–0.97, $p=0.036$) than those whose husbands were living with them in the country. Our findings indicate that disaster exposure for the reproductive-aged women in Bangladesh was associated with an increased risk of having anxiety but not depression. These findings highlight the importance of integrating mental health and psychosocial support into disaster preparedness and response strategies, with a focus on socially and economically marginalized and disadvantaged women.

Keywords: Natural disaster; climate vulnerability; anxiety; depression; women's mental health; Bangladesh.

Abstract on Agriculture

Title: Phytogenic Nutrition with Garlic and Moringa Leaf Enhances Gut Integrity and Skeletal Development in Broilers: A Natural Strategy for Safer and Sustainable Poultry Production

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Abstract

Poultry researchers are searching for potential natural feed additives that will be both environmentally friendly and safe for human health. Phytogenic feed additives are gaining attention as potential alternatives of antibiotic to enhance broiler growth. The experiment was conducted to evaluate the effect of garlic and moringa leaf on bone and gut growth of broilers chickens. The broilers (n=90) were reared for 35 days with the treatments: T1 = Normal water, T2 = 7.5gm garlic powder/L, and T3 = 5gm moringa leaf powder/L. The broiler leg bones were taken out by maceration method, and gut morphology was studied by routine histologic technique. To assess the effect of garlic and moringa leaf powder, the length and weight of leg bones, and length of intestine, and villus height and crypt depth of ileum, and length and width of mucosal plicae of cecum were measured. The length and weight of leg bones of garlic- and moringa leaf-treated broilers were significantly ($p<0.05$) higher than the control broilers, and the length of leg bones of moringa leaf-treated broilers were significantly ($p<0.05$) higher than the garlic-treated broilers. The gross length of small intestine and colorectum of garlic- and moringa leaf-treated broilers, and length of cecum of moringa leaf-treated broilers was significantly ($p<0.05$) higher than the control broilers. The villus height of ileum of moringa leaf-treated broilers was significantly ($p<0.05$) higher and garlic-treated broilers was non-significantly higher than the control broilers. The length and width of cecal plicae and crypt depth of cecum of garlic- and moringa leaf-treated broilers were significantly ($p<0.05$) higher than the control broilers. In conclusion, dietary addition of garlic and moringa-leaf powder could improve the bone and gut growth of broiler chickens, though moringa leaf powder showed comparatively better improvement than the garlic powder. The results indicated that garlic and moringa-leaf powder could be used in the diet of broiler chickens for health hazards free safe broiler production.

Keywords: Garlic, moringa leaf, bone, gut, broiler chicken

Title: First Evaluation of Aquatic Biodiversity in the *Gajner Beel* Wetland Ecosystem in Northwestern Bangladesh: Proposals for Sustainable Management

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Abstract

The *Gajner Beel* wetland ecosystem supports a rich diversity of aquatic organisms, including fishes, aquatic plants, arthropods, mollusks, amphibians, reptiles, and aquatic birds, which collectively contribute to the stability and resilience of aquatic ecosystems through the maintenance of balanced food webs and ecological processes. Therefore, the present study aimed to assess the aquatic biodiversity of *Gajner Beel*, located in the northwestern region of Bangladesh, and to identify the major factors responsible for the decline of native fish species. The study documented a total of 52 fish species in the *Gajner Beel* ecosystem, comprising 48 indigenous species, 3 Indian major carps, and 1 exotic species. In addition, 29 aquatic plant species, 4 arthropod species, 3 mollusk species, 5 amphibian species, 5 reptile species, and 11 species of aquatic birds were recorded from the study area. Among the identified fish species, 8 were categorized as threatened, with 11.80% classified as vulnerable, 11.80% as endangered, and 2.00% as critically endangered, whereas the majority (56.90%) belonged to the least concern category. The maximum length (L_{max}) of 23 fish species was measured and compared with records available in FishBase. Among these species, *Amblypharyngodon mola* exhibited a maximum length of 8.5 cm, while *Pethia phutunio* reached 4.7 cm. The findings further revealed that declining water levels, overfishing, and habitat destruction are the principal factors contributing to the degradation of *beel* fisheries and the reduction of native fish diversity. Therefore, this study highlights the considerable biodiversity of the *Gajner Beel* wetland ecosystem and emphasizes the ecological significance of this habitat. The presence of numerous threatened fish species, together with increasing anthropogenic pressures, underscores the urgent need for effective conservation and sustainable management strategies to protect and restore the biodiversity and fisheries resources of this important wetland ecosystem.

Keywords: Gajner Beel, Aquatic biodiversity, Wetland ecosystem, Native fish species, Fisheries conservation

Title: Fisheries-Based Entrepreneurship in Bangladesh: Current Status, Constraints, and Future Directions

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Abstract

The fisheries sector is a cornerstone of Bangladesh's economy, contributing significantly to food and nutritional security, employment generation, rural livelihoods, and export earnings. Beyond primary production, fisheries-based entrepreneurship has emerged as a promising avenue for economic diversification, value addition, and sustainable enterprise development. Opportunities in aquaculture, hatcheries, feed manufacturing, fish processing, value-added products, ornamental fisheries, cold-chain logistics, digital marketing, and fisheries services have expanded the entrepreneurial landscape, particularly for youth and women. However, the sector's full entrepreneurial potential remains constrained by limited access to finance, inadequate technical and business skills, weak market linkages, insufficient value-chain integration, climate-related risks, and inconsistent adoption of modern technologies and quality standards. This research presents a comprehensive assessment of the current status of fisheries-based entrepreneurship in Bangladesh, examining its contribution to economic growth, employment, and the evolving blue economy. It critically analyzes the key constraints affecting entrepreneurial development, including institutional, financial, technological, environmental, and policy-related challenges that hinder enterprise competitiveness and scalability. The research further explores future directions for fostering a resilient and innovation-driven fisheries entrepreneurial ecosystem. Emphasis is placed on digital transformation, sustainable aquaculture practices, climate-smart production systems, value chain modernization, product diversification, quality assurance and certification, access to finance, entrepreneurship education, and public-private partnerships. It also highlights the importance of enabling policy frameworks, research and extension support, market intelligence, and inclusive stakeholder collaboration to strengthen entrepreneurial capacity and improve market competitiveness. Promoting fisheries-based entrepreneurship through innovation, investment, and evidence-based policies will not only enhance the resilience and profitability of fisheries enterprises but also contribute to sustainable economic development, food security, and the achievement of the Sustainable Development Goals (SDGs) in Bangladesh.

Keywords: Fisheries; Entrepreneurship; Sustainable Aquaculture; Blue Economy; Value Chain Development; Innovation; Bangladesh

Title: Towards Safe Fish and Fisheries Products Production in Bangladesh: Innovations, Regulations, and Stakeholder Responsibilities

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Abstract

The fisheries sector is a vital contributor to Bangladesh's economy, food and nutritional security, employment, and export earnings. As one of the world's leading producers of inland fisheries and aquaculture, Bangladesh faces increasing pressure to ensure the safety and quality of fish and fisheries products in response to growing consumer awareness, expanding global seafood trade, and stringent food safety standards. Despite significant progress in fisheries development, the sector continues to encounter challenges, including microbial contamination, misuse of veterinary drugs and chemicals, environmental pollution, inadequate biosecurity and hygiene, post-harvest losses, weak cold-chain management, limited traceability, and inconsistent compliance with national and international regulations. This research provides an overview of the current status of safe fish and fisheries products production in Bangladesh, highlighting advancements in aquaculture management, quality assurance, food safety governance, and export-oriented processing. It examines the major biological, chemical, and physical hazards affecting product safety, as well as the institutional and technical constraints across the fisheries value chain. The research also discusses sustainable strategies to enhance food safety through the implementation of Good Aquaculture Practices (GAqP), Good Hygienic Practices (GHP), Good Manufacturing Practices (GMP), Hazard Analysis and Critical Control Point (HACCP), biosecurity, antimicrobial stewardship, environmental monitoring, digital traceability, and climate-resilient aquaculture technologies. Furthermore, it highlights the role of innovations such as smart aquaculture, rapid residue detection, IoT-based monitoring, and blockchain-enabled traceability in strengthening supply chain transparency. Finally, the research emphasizes the importance of effective regulations and the shared responsibilities of government agencies, research institutions, producers, processors, traders, exporters, and consumers in ensuring food safety. Integrating scientific innovation, robust regulatory frameworks, and stakeholder collaboration is essential for producing safe, high-quality fish and fisheries products while promoting public health, environmental sustainability, and the long-term competitiveness of Bangladesh's fisheries sector.

Keywords: Safe Fish Production; Fisheries Products; Food Safety Management; Good Aquaculture Practices; Traceability and Quality Assurance; Sustainable Fisheries Development



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