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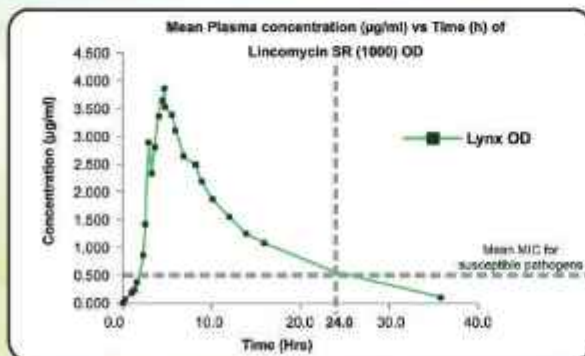
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Once again, we are successful to index JIMA in yet another indexing in **EMBASE in 2024 with retrospective effect (Serial No. 5532 in the Embase Jan 2024 Journal List).**

Work is going on for PUBMED CENTRAL indexing in full swing.

We are really grateful to **Dr. R. V. Asokan**, our beloved National President and **Dr. Anilkumar J. Nayek**, our Hony. Secretary General for round the year support to JIMA Committee.

I express my heartfelt gratitude to all the JIMA Committee members, the Reviewers and Staffs of JIMA for this historical achievement of JIMA.

**Dr. Sanjoy Banerjee**  
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### Listed in Embase at serial No.5532

A	B	C	D
1	Embase journal titles (Jan 2024)	Abbreviated title	ISSN EISSN
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5527	Journal of the History of Medicine and Allied Sciences	J. Hist. Med. Allied Sci.	00225045 14684373
5528	Journal of the History of the Behavioral Sciences	J. Hist. Behav. Sci.	00225061 18206698
5529	Journal of the History of the Neurosciences	J. Hist. Neurosci.	0964704X 17445213
5530	Journal of the Hong Kong College of Cardiology	J. Hong Kong Coll. Cardiol.	10277811
5531	Journal of the Indian Chemical Society	J. Indian Chem. Soc.	00194522
5532	Journal of the Indian Medical Association	J. Indian Med. Assoc.	00195847
5533	Journal of the Intensive Care Society	J. Intensive Care Soc.	17511437
5534	Journal of the International AIDS Society	J. Int. AIDS Soc.	
5535	Journal of the International Association of Providers of AIDS	J. Int. Assoc. Providers AIDS Care	23259574 23259582

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## 2024 : A Year of Transformative Strides in Medicine, Surgery and Public Health

As 2024 draws to a close, the Journal of the Indian Medical Association (JIMA) reflects with pride on the remarkable advancements and challenges that have defined the year in medicine and public health. These 12 months were a testament to the resilience, innovation, and dedication of the global medical community in addressing some of the most pressing healthcare issues of our time.

This year was not just about scientific discoveries but also about fostering a deeper understanding of the human condition and its interplay with health systems, policies, and technology. From groundbreaking therapies that redefined chronic disease management to policy interventions aimed at ensuring equitable access to healthcare, 2024 encapsulated the diversity and depth of the global healthcare landscape.

Through its editorials, JIMA captured the pulse of these developments, offering a platform for thought leadership and dialogue on the multifaceted challenges in healthcare. Themes ranging from the ethical integration of artificial intelligence and advancements in surgical technologies to the evolving landscape of mental health and the persistent fight against inequities in healthcare access have illuminated the path forward.

This retrospective highlights the pivotal moments and overarching themes of 2024, offering insights into how these advancements are shaping our collective pursuit of health and well-being. It also serves as a reminder of the enduring challenges that require our unwavering commitment as we move into 2025. By reflecting on the strides made and the lessons learned, JIMA reaffirms its dedication to fostering knowledge, innovation, and collaboration in the ongoing journey toward better health for all.

### ADVANCING THERAPEUTICS AND TECHNOLOGIES

#### Breakthroughs in Diabetes Care :

The year 2024 marked pivotal advancements in the treatment of Type 2 Diabetes Mellitus (T2DM), with oral semaglutide emerging as a landmark therapeutic option for more than last 2 years. This novel oral GLP-1 receptor agonist, marketed under the brand name Rybelsus, revolutionized diabetes care by addressing the long-standing challenges associated with injectable GLP-1 agonists. Leveraging innovative SNAC (Sodium N-[8-(2-hydroxybenzoyl) Amino] Caprylate) technology, oral semaglutide ensures stable absorption of the peptide in the gastrointestinal tract, overcoming degradation barriers and offering efficacy comparable to its injectable counterparts. This innovation not only simplifies the management of

T2DM but also significantly enhances patient adherence and satisfaction by eliminating needle-related barriers such as fear and discomfort.

Additionally, the development of once-weekly insulins like Insulin Icodec and Efsitora Alfa heralded a transformative step in basal insulin therapy. These ultra-long-acting insulins, with pharmacokinetic profiles offering stable glycemic control over a week, reduce the need for daily injections, mitigating the logistical and psychological burdens on patients. Phase III trials revealed their efficacy in achieving glycemic targets comparable to daily basal insulins, with no additional risks of hypoglycemia. By minimizing the frequency of injections, these insulins are poised to redefine diabetes management, making therapy more accessible and sustainable for a larger population.

#### Progress in Robotic-Assisted Surgery :

The field of surgical technology witnessed groundbreaking enhancements in Robot-assisted Surgery (RAS). The da Vinci Xi system, a master-slave robotic platform, continued to set the standard for precision, offering unparalleled three-dimensional magnified views and ergonomic control for surgeons. These advancements translated into reduced intraoperative complications, such as blood loss, and improved surgical outcomes across specialties, including urology, gynecology, and oncology.

To address one of the key limitations of robotic platforms – the lack of tactile sensation – innovations like VerroTouch, a haptic feedback system under development, have garnered significant attention. This system integrates vibrotactile feedback and stereo sound to replicate the sensation of touch, enabling surgeons to navigate complex anatomical structures with greater confidence. Complementing these advancements, augmented vision systems and real-time tracking technologies allowed precise overlay of imaging data, such as MRI or CT scans, onto the surgical field. This integration of imaging and robotics transformed procedures like radical prostatectomies, enhancing both oncological precision and functional outcomes.

#### Artificial Intelligence : Revolutionizing Medicine

Artificial Intelligence (AI) maintained its trajectory as a transformative force across healthcare in 2024. AI technologies expanded their footprint, from predictive analytics in cardiology to diagnostic imaging in oncology. For instance, AI algorithms trained on large datasets demonstrated superior accuracy in predicting cardiovascular risks compared to traditional

methods. In oncology, AI-powered tools optimized histopathological image analysis, facilitating earlier cancer diagnoses and personalized treatment strategies.

Despite these breakthroughs, challenges persist. Ensuring the clinical validation of AI tools remains critical to gaining widespread trust and adoption. Many models show promise in controlled environments but lack robustness in real-world scenarios, raising concerns about generalizability. Furthermore, ethical issues, such as data privacy, algorithmic biases, and the potential over-reliance on AI systems, highlighted the need for a balanced approach that integrates technological innovation with human oversight.

The path forward lies in embracing AI as a collaborative partner, augmenting rather than replacing human expertise. This partnership must prioritize ethical frameworks, transparency, and rigorous validation to harness AI's full potential while preserving the human touch central to patient care.

#### CHRONIC DISEASES AND PREVENTIVE CARE

##### Tackling End-Stage Kidney Disease : The Promise of Bioartificial Kidneys

Chronic diseases like End Stage Kidney Disease (ESKD) remain a growing global health challenge, with increasing prevalence fueled by lifestyle diseases such as diabetes and hypertension. In India, the burden of ESKD is particularly daunting, with over 90% of patients unable to access renal replacement therapies due to financial constraints. Against this backdrop, 2024 saw significant editorial focus on bioartificial kidneys, a revolutionary development in nephrology.

Bioartificial kidneys represent a quantum leap in renal replacement therapy. These devices are designed to mimic the filtration, absorptive, and secretory functions of human kidneys, offering an alternative to conventional dialysis or transplantation. Leveraging breakthroughs in nanotechnology, they integrate silicon nanopore membranes and cultured proximal tubular epithelial cells to deliver continuous renal support without the need for immunosuppressive therapy. Their portability, efficiency, and independence from donor organs position them as a transformative solution for ESKD patients, especially in resource-limited settings.

Moreover, wearable and implantable versions of these devices have advanced to preclinical trials, demonstrating promising outcomes. These technologies could alleviate the dependency on dialysis centers, reduce treatment costs, and improve

patients' quality of life, representing a beacon of hope for millions struggling with kidney failure globally.

### Headache Disorders : Evolving Strategies for a Changing Landscape

Primary headache disorders, including migraine and tension-type headaches, constitute a significant but often underdiagnosed public health concern in India. These disorders affect a broad demographic, with recent studies highlighting their disproportionate impact on women and younger populations. The prevalence of migraine, for example, reaches as high as 23% in certain regions, emphasizing the need for targeted interventions tailored to local epidemiological trends.

Editorials in 2024 highlighted the shifting clinical landscape of headache disorders, focusing on improvements in diagnosis, management, and public health strategies. Advances in neuroimaging and diagnostic tools have facilitated better differentiation of primary headache types, enabling more precise treatment plans. The integration of pharmacological therapies, including triptans for acute attacks and beta-blockers or CGRP (Calcitonin Gene-Related Peptide) inhibitors for prophylaxis, has transformed patient outcomes. Additionally, non-pharmacological approaches, such as cognitive behavioral therapy and mindfulness-based interventions, have gained traction as complementary options.

Public health initiatives, including awareness campaigns and training programs for primary care physicians, have also been pivotal in bridging gaps in care. These efforts are particularly crucial in rural and underserved areas, where access to neurologists and specialized headache clinics remains limited. The emphasis on preventive care, lifestyle modification, and early intervention has positioned India to better address the substantial personal and societal burden imposed by headache disorders .

## WOMEN'S HEALTH AND ENDOMETRIOSIS

### Understanding the Complexity of Endometriosis :

Endometriosis, a chronic and often debilitating gynecological condition, was a focal point in 2024 editorials due to its multifaceted nature and significant impact on women's health. Affecting an estimated 10-15% of women of reproductive age globally, this enigmatic disease is characterized by the presence of endometrial-like tissue outside the uterus, leading to symptoms such as chronic pelvic pain, dysmenorrhea, dyspareunia, and subfertility. The varied clinical manifestations and the elusive pathophysiology of endometriosis continue to pose

challenges for timely diagnosis and effective management .

### Diagnostic Challenges :

A recurring theme in the discussions was the complexity of diagnosing endometriosis. While advances in imaging techniques like pelvic ultrasonography and MRI have enhanced diagnostic accuracy, limitations persist. Notably, the reliance on clinical presentation and the use of biomarkers such as CA-125, which have limited diagnostic value, underline the need for improved non-invasive diagnostic tools. Additionally, the editorial highlighted a paradigm shift from laparoscopic confirmation as the gold standard to more patient-friendly diagnostic strategies that prioritize symptom assessment and imaging .

### Tailored Medical Interventions :

Hormonal therapies remain the cornerstone of endometriosis management. Editors emphasized the efficacy of Dienogest, a selective progestogen known for its ability to reduce pain and suppress disease progression. Long-term therapies such as Levonorgestrel-releasing intrauterine systems (LNG-IUS) and GnRH agonists were also noted for their role in mitigating recurrent symptoms and enhancing patient satisfaction. Continuous Combined Oral Contraceptives (COCs) were highlighted as an effective, non-invasive option for managing dysmenorrhea and other cyclical symptoms, providing sustained relief and improving quality of life .

Despite these advances, hormonal therapies are not without limitations, including side effects like irregular bleeding, weight gain, and potential impacts on bone mineral density. The editorials underscored the importance of tailoring treatments to individual patient profiles, considering factors such as symptom severity, fertility goals, and tolerance to medications.

### Innovations in Surgical and Assisted Reproductive Technologies :

Surgical intervention remains indispensable for certain patients, particularly those with severe pain, Deep Infiltrating Endometriosis (DIE), or ovarian endometriomas. The editorials advocated for evidence-based surgical approaches, emphasizing the benefits of excision over ablation for reducing pain and recurrence. However, the potential impact of surgery on ovarian reserve necessitates a balanced discussion with patients, particularly those seeking fertility preservation .

In cases of endometriosis-associated infertility, the role of Assisted Reproductive Technologies (ART)

was underscored as a pivotal option. Techniques such as In Vitro Fertilization (IVF) provide a pathway for achieving pregnancy in patients where other interventions have failed. Recent innovations in ART, including improved protocols for ovarian stimulation and embryo transfer, were highlighted as critical tools for addressing the unique challenges posed by endometriosis.

### **Bridging Gaps in Care :**

The editorials drew attention to persistent gaps in care, including delays in diagnosis and limited access to specialized treatment in resource-constrained settings. The psychosocial impact of endometriosis, encompassing its effects on mental health, relationships, and professional life, was a recurring theme, advocating for holistic management approaches. Strengthening public awareness, training healthcare providers, and investing in research to unravel the pathophysiology of the disease were identified as critical priorities for reducing the burden of endometriosis.

### **The Road Ahead :**

While significant progress has been made in the diagnosis and management of endometriosis, the editorials stressed the need for continued innovation and a patient-centered approach. By integrating advancements in medical and surgical therapies with broader systemic changes in healthcare delivery, there is potential to transform outcomes for millions of women affected by this condition.

## **GLOBAL HEALTH AND POLICY: HEALTH AS A HUMAN RIGHT**

### **Advocating for Universal Health Coverage :**

The editorial *"My Health, My Right"*, published in alignment with World Health Day 2024, served as a powerful call to action, emphasizing the inextricable link between health and human rights. Framed around the theme of equitable access to healthcare, the editorial highlighted the urgency of achieving Universal Health Coverage (UHC) – a vision where all individuals, irrespective of socioeconomic status, geography, or gender, can access quality health services without financial hardship. With over 4.5 billion people globally lacking full access to basic healthcare services, the editorial underscored the critical need for systemic reforms to bridge this gap .

### **Progress and Challenges in South-East Asia :**

The editorial presented a mixed picture of progress within the South-East Asia Region (SEAR). Notable achievements included an increase in the Universal Health Coverage service coverage index from 47 in

2010 to 62 in 2021, alongside a 68.5% reduction in maternal mortality and dramatic declines in neonatal and under-five mortality rates. Despite these advances, disparities remain stark: nearly 40% of the region's population still lacks access to basic healthcare, with preventable deaths from non-communicable diseases (NCDs) such as cancer, diabetes, and cardiovascular conditions persisting at alarmingly high rates .

### **Equity in Access to Care :**

The editorial addressed the pervasive inequities in healthcare access, particularly for marginalized populations. Women, rural communities, and economically disadvantaged groups were identified as bearing the brunt of healthcare disparities. Gender-based inequities in diagnosing and treating conditions like diabetes and hypertension were highlighted, with women often receiving delayed or insufficient care compared to men. The editorial also pointed to the persistent public health crisis of violence against women, noting that over one-third of women in SEAR have experienced intimate partner violence, further undermining their health and well-being .

### **Policy Directions and Systemic Reforms :**

To realize the vision of health as a fundamental right, the editorial advocated for multifaceted systemic reforms:

- 1) Investing in Healthcare Infrastructure: Prioritizing underserved regions and building robust systems to ensure the availability of quality health services in both rural and urban areas.
- 2) Human Resource Development: Expanding the healthcare workforce, with a focus on training primary care providers, midwives, and nurses to address shortages, particularly in rural areas.
- 3) Health Financing: Implementing financial models that protect households from catastrophic health expenditures, such as public insurance schemes and government subsidies for essential services.
- 4) Gender Equity in Healthcare: Developing targeted interventions to close gender gaps in diagnosis, treatment, and prevention, with an emphasis on diseases that disproportionately affect women.
- 5) Community Engagement: Empowering communities through health education, awareness campaigns, and the promotion of preventive care practices.
- 6) Integrated Health Systems: Strengthening primary healthcare systems to serve as the foundation for comprehensive, accessible, and equitable health services.

### Health Beyond Healthcare :

The editorial highlighted the importance of addressing broader determinants of health, such as clean water, adequate nutrition, safe housing, and education. It argued that achieving health equity requires tackling social and environmental inequities that perpetuate cycles of poverty and ill-health. By framing health as a cornerstone of human dignity and development, the editorial underscored its role in fostering inclusive and prosperous societies.

### A Moral and Practical Imperative :

At its core, *"My Health, My Right"* reminded readers that equitable healthcare is not merely a moral obligation but also a practical necessity for sustainable development. As nations navigate complex public health crises and demographic shifts, ensuring access to healthcare for all emerges as a crucial strategy for building resilient communities and economies.

### A Call to Action :

The editorial concluded with a resounding call for collective action, emphasizing the urgent need for governments, policymakers, and global stakeholders to come together in the pursuit of health equity. It highlighted the importance of aligning national and international efforts with the principles of Sustainable Development Goal 3 – to ensure healthy lives and promote well-being for all at all ages. By addressing systemic inequities, investing in inclusive healthcare systems, and fostering global cooperation, the vision of health as a universal right can evolve from a distant aspiration to a tangible reality. The editorial underscored that achieving this goal is not only a moral imperative but also a critical step towards creating resilient communities and sustainable futures, where no one is left behind in the journey toward health and well-being.

## MENTAL HEALTH IN TRANSITION

### Progress Shaped by the Mental Healthcare Act of 2017 :

The Mental Healthcare Act of 2017 represented a significant legislative milestone in India, laying the foundation for a rights-based approach to mental health. By defining access to mental healthcare as a fundamental right, the Act mandated the provision of affordable, accessible, and high-quality mental health services for all citizens. It also emphasized decriminalizing suicide, safeguarding patient rights, and ensuring that mental health care is provided with dignity and respect. The editorials in 2024 reflected

on the progress spurred by this Act, particularly in raising awareness and encouraging policy shifts that prioritize mental health as a critical component of public health.

### Integration of Mental Health into Primary Care :

The District Mental Health Program (DMHP) emerged as a cornerstone initiative for integrating mental health services into primary healthcare. This program, operational under the broader National Mental Health Program (NMHP), was designed to decentralize mental health services, making them accessible to underserved populations at the district level. The DMHP focuses on early detection, treatment, rehabilitation, and community outreach, addressing conditions ranging from Common Mental Disorders (CMDs) like depression and anxiety to Severe Mental Disorders (SMDs) such as schizophrenia and bipolar disorder.

### Key Components of the DMHP include :

- 1) Training Primary Care Workers: Empowering general practitioners and healthcare workers with the skills to identify and manage mental health conditions.
- 2) Community Engagement: Conducting mental health awareness campaigns to reduce stigma and promote early intervention.
- 3) Strengthening Infrastructure: Establishing district mental health clinics and integrating psychiatric wings in general hospitals.
- 4) Service Delivery Models: Promoting telepsychiatry and mobile outreach to bridge the gaps in rural and remote areas.

### Persisting Challenges: Stigma and Resource Gaps :

Despite these advancements, significant barriers persist. Stigma surrounding mental illness remains one of the most formidable obstacles to care. Many individuals delay or avoid seeking treatment due to fear of social ostracism, compounded by limited awareness of mental health conditions. The editorials highlighted the need for sustained public education campaigns to challenge misconceptions and normalize discussions about mental health.

Additionally, resource constraints hinder the effective implementation of mental health programs. A glaring shortage of mental health professionals – including psychiatrists, psychologists, and social workers – limits the program's reach. India's mental health workforce density remains far below global recommendations, particularly in rural areas where access to specialized care is minimal. Financial

constraints further exacerbate the situation, with mental health services often receiving insufficient funding relative to other health sectors.

### The Role of Technology in Mental Health :

Amid these challenges, technology is emerging as a transformative tool in mental health care. Telepsychiatry platforms, digital mental health apps, and virtual counseling sessions are increasingly being integrated into service delivery models. These innovations have expanded access to care, particularly for populations in remote and underserved areas and have shown promise in mitigating the stigma associated with in-person consultations.

### Charting a Path Forward :

To build on the momentum created by the Mental Healthcare Act and the DMHP, a multi-pronged approach is essential:

1. **Scaling Mental Health Services:** Expanding the DMHP to cover all districts and ensuring consistent funding for program sustainability.
2. **Workforce Development:** Investing in the training and recruitment of mental health professionals and incentivizing their deployment in rural areas.
3. **Community-Based Care Models:** Strengthening partnerships with local organizations and self-help groups to create a supportive ecosystem for mental health care.
4. **Policy Advocacy:** Prioritizing mental health in national health budgets and fostering cross-sectoral collaborations to address social determinants of mental health.

### Towards a Mentally Healthy India :

The editorials concluded that while the progress in mental health care has been encouraging, the road ahead demands unwavering commitment from stakeholders. Bridging the gaps in service delivery, addressing stigma, and integrating mental health into broader healthcare systems are pivotal to ensuring equitable access to care. By leveraging the potential of technology, fostering community engagement, and advocating for systemic reforms, India can chart a path toward a future where mental health is not only a policy priority but also a societal norm.

## LEGAL AND ETHICAL DIMENSIONS IN MEDICINE

### Navigating Medical Negligence : Professional Accountability

The issue of medical negligence was a prominent theme in the 2024 editorials, highlighting its critical impact on trust within doctor-patient relationships. Medical negligence, as defined by the Medical Council

Act, involves a failure on the part of a registered practitioner to provide the standard of care expected, leading to harm or injury to the patient. The editorials emphasized that professional accountability is central to mitigating negligence. This includes maintaining up-to-date knowledge, practicing within the scope of expertise, and adhering to established protocols and guidelines. The importance of clear communication with patients and meticulous documentation of clinical decisions was also stressed as foundational to demonstrating accountability .

### Patient Consent : A Cornerstone of Ethical Practice

Editorials underscored the pivotal role of informed consent in ethical medical practice. Consent must be obtained through a transparent process where patients are provided with clear, comprehensive information about their diagnosis, treatment options, risks, benefits, and potential alternatives. The editorials delineated between types of consent:

- **Implied Consent**, limited to routine examinations and non-invasive procedures.
- **Written Consent**, mandatory for invasive interventions, high-risk procedures and treatments involving potential complications.

The practice of obtaining "blanket consents," which lack specificity, was criticized as legally invalid. Instead, tailored, procedure-specific consents were advocated, witnessed by neutral parties to ensure ethical compliance. The inclusion of therapeutic privilege – where certain risks might be withheld if disclosure is deemed detrimental to the patient – was discussed as a nuanced aspect requiring cautious application .

### Ethical Standards : A Guide to Medical Integrity

The editorials stressed adherence to ethical principles as the backbone of medical integrity. Key recommendations included:

- 1) **Respect for Patient Autonomy :** Honoring patients' rights to make informed decisions about their care.
- 2) **Non-Maleficence and Beneficence :** Balancing the duty to avoid harm with the imperative to promote well-being.
- 3) **Justice :** Ensuring equitable access to care, regardless of socioeconomic or demographic factors.

Ethical concerns surrounding confidentiality, especially in sensitive cases, were highlighted. Practitioners were advised to uphold privacy while navigating scenarios where third-party disclosures might be necessary for public safety.



### Preventive Strategies to Mitigate Litigation :

To reduce the incidence of medical litigation, the editorials outlined practical measures:

- 1) **Continuing Medical Education (CME) :** Regularly updating knowledge and skills to meet evolving standards of care.
- 2) **Professional Etiquette :** Maintaining respectful communication with patients and colleagues to foster trust.
- 3) **Detailed Medical Records :** Keeping thorough, chronological, and tamper-proof documentation as evidence of due diligence.
- 4) **Seeking Second Opinions :** In complex or ambiguous cases, consulting peers to ensure comprehensive evaluation and shared responsibility.

Special attention was given to the importance of a professional demeanor, advising practitioners to communicate empathy, avoid overpromising outcomes, and ensure transparency during adverse events.

### Fostering Trust in the Doctor-Patient Relationship

The editorials acknowledged that trust is the cornerstone of effective healthcare delivery. Instances of negligence, whether perceived or real, erode this trust and often lead to disputes. To rebuild and sustain this trust, practitioners were encouraged to adopt proactive communication strategies, foster openness in discussing complications and prioritize patient safety above all.

### The Ethical and Legal Horizon :

Looking ahead, the editorials advocated for systemic reforms to support practitioners and patients alike. These include:

- **Legal Safeguards for Practitioners :** Implementing frameworks that protect doctors from frivolous lawsuits while holding them accountable for genuine lapses.
- **Patient Advocacy Systems :** Establishing mechanisms to mediate disputes and provide patients with a fair hearing before litigation.
- **Ethics Committees :** Strengthening institutional review boards to guide practitioners through ethically complex decisions.

The discussions on medical negligence and ethics in 2024 emphasized that a culture of transparency, accountability and respect is essential for advancing healthcare. By adhering to high ethical standards and implementing robust preventive strategies, the medical community can not only reduce litigation risks but also foster a stronger, trust-based doctor-patient

relationship that ultimately enhances the quality of care.

### The Road Ahead :

As we stand at the threshold of a new year, the editorial reflections from 2024 offer a moment of pause – both to celebrate the strides we have made and to acknowledge the work that remains. The year has been marked by transformative progress across healthcare, from the introduction of groundbreaking therapies to advancements in technology and policy frameworks aimed at fostering equitable health systems. These developments serve as a testament to the resilience and ingenuity of the global medical community, yet they also underscore the complexity of the challenges that lie ahead.

#### Expanding Access to Groundbreaking Therapies

The advent of innovative therapies, such as oral semaglutide for diabetes and bioartificial kidneys for chronic kidney disease, has shown the potential of modern medicine to not only enhance patient outcomes but also improve accessibility and adherence. The road ahead demands a concerted effort to ensure these advancements are not limited to affluent populations but reach underserved communities globally. Scaling distribution networks, reducing costs, and fostering partnerships between governments and private sectors will be critical to achieving universal access to these life-saving interventions.

### Building Equitable Health Systems :

The call for universal health coverage and the recognition of health as a fundamental right have gained momentum, but significant inequities persist. The path forward must prioritize closing gaps in healthcare access, particularly for marginalized populations, women, and rural communities. Strengthening primary healthcare, addressing social determinants of health and investing in infrastructure and human resources will be foundational in building resilient and inclusive health systems. This endeavor will also require innovative financing mechanisms and policies that ensure no one is left behind in the pursuit of well-being.

### Navigating the Ethical Integration of AI :

Artificial Intelligence continues to redefine the boundaries of medicine, offering unprecedented opportunities to improve diagnostics, personalize treatments and optimize healthcare delivery. However, its integration is fraught with ethical challenges, including issues of privacy, bias and the potential for over-reliance on machine learning systems. The road

ahead must include robust regulatory frameworks, transparent validation processes, and an unwavering commitment to balancing AI's capabilities with the irreplaceable human touch. Embracing AI as a collaborative tool rather than a replacement for clinical expertise will be key to its responsible and effective implementation.

#### **Advancing Research and Innovation :**

Innovation remains the lifeblood of medical progress, and the need for multidisciplinary research has never been greater. From precision medicine to regenerative therapies and sustainable public health strategies, the scope of research must expand to address the evolving challenges of our times. Collaboration between academia, industry, and policymakers will play a crucial role in translating discoveries into tangible healthcare improvements.

#### **Fostering a Global Dialogue :**

The challenges of global health – from pandemics to chronic disease burdens – demand collective action and shared learning. JIMA reaffirms its commitment to being at the forefront of this evolving narrative, serving as a platform for disseminating knowledge, fostering dialogue among stakeholders, and inspiring innovation. By championing evidence-based practices, ethical integrity and inclusivity, the journal aims to contribute meaningfully to shaping the future of healthcare.

#### **A Call to Action :**

The journey ahead is as demanding as it is promising. As we navigate the complexities of a rapidly evolving healthcare landscape, the vision of a healthier, more equitable world must guide our efforts. This requires not only technical excellence but also a steadfast dedication to compassion, collaboration, and the well-being of all. The reflections from 2024 remind us that progress is possible when we unite in purpose and action, and they inspire us to meet the opportunities and challenges of 2025 with renewed resolve and optimism.

JIMA looks forward to continuing its legacy of thought leadership and advocacy, shaping a future where medical advancements, ethical practices, and equitable health systems converge to uplift humanity. Together, we can transform the aspirations of today into the achievements of tomorrow.

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## Original Article

# Diagnostic Yield of Bronchoscopy in Benign Lung Diseases at Tertiary Health Care Hospital in South Gujarat

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**Methodology** : Sixty patients with benign lung disorders like Suspected Sputum Negative Pulmonary Tuberculosis, Suspected Fungal Pneumonia, Suspected Bacterial Pneumonia and Suspected Interstitial Lung Disease were enrolled from April, 2020 to April, 2021 in this study. Detailed clinical history, physical examinations and necessary investigations were carried out. Eligible patients were subjected for fiberoptic video bronchoscopy. During Bronchoscopy Gross fiberoptic bronchoscopy findings noted and Bronchoalveolar lavage or tissue were sent for necessary investigations. Data entry and analysis were done using MS Excel sheet 2013.

**Result** : Overall diagnostic yield of bronchoscopy in 60 patients was 63.3%. Out of 37 Sputum negative suspected cases of Pulmonary Tuberculosis posted for bronchoscopy, 22(59.4%) cases were confirmed to have tuberculosis, only 1(2.7%) case was having Bacterial pneumonia and 2(3.4%) cases were diagnosed with Tuberculosis had super added bacterial infection. Other 13 patients suspected of having bacterial pneumonia, 7(53.3%) patients were confirmed to have bacterial pneumonia while 2(15.3%) cases were found positive for tuberculosis. Out of 5 suspected cases of fungal pneumonia and 5 suspected cases of Interstitial Lung Disease, each 2(40%) patients had positive findings respectively. Overall complications developed in 7(11.7%) patients.

**Conclusion** : Our study suggests, fiberoptic bronchoscopy can provide good sample material for diagnosis of suspected cases. Bronchoalveolar Lavage and Bronchial Brushing sent for AFB, CBNAAT, TB Culture, Cytology, KOH etc were cumulatively used to increase diagnostic yield of bronchoscopy.

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**Key words** : Bronchoalveolar Lavage, Bronchial Brushing, CBNAAT.

**F**iberoptic Bronchoscopy (FOB) is a very useful and safe procedure for diagnosis of various respiratory diseases. FOB can be performed under local anaesthesia in various clinical/hospital settings providing maximal visualization of tracheobronchial tree<sup>1</sup>, if performed carefully, can be a thoroughly safe procedure<sup>2</sup>. Many patients having clinical and radiological features of pulmonary tuberculosis have negative sputum smear examinations, even if repeated on several occasions and their sputum culture for Acid Fast Bacilli (AFB) may also turn to be negative. Incorrect diagnosis, inadequate antibiotic therapy, impaired host defence, atypical organisms, resistant

### Editor's Comment :

- Fiberoptic bronchoscopy is useful tool in diagnosing of suspected smear negative pulmonary tuberculosis, suspected bacterial, fungal and ILD with respect to their association with clinical and radiological profile at early stage despite not meeting the routine bacteriological criteria for diagnosis and helps in initiating early treatment which in turn improve patient outcome.

pathogens, non-infectious causes, tuberculosis, Endobronchial lesions etc are common causes of non-resolving pneumonia or slowly resolving pneumonia. Fiberoptic bronchoscopy frequently helps to identify the exact cause of difficult to treat pneumonia cases. FOB is immensely useful for making a conclusive diagnosis of lung disease, especially when there is an Endobronchial lesion, providing adequate tissue sample by Endobronchial biopsy, Bronchoalveolar Lavage (BAL) or brush cytology<sup>3</sup>.

### AIMS AND OBJECTIVES

To assess the role of Bronchoscopy in diagnosis of Benign lung disorders like Smear Negative Pulmonary Tuberculosis, Non Resolving Pneumonia, Fungal Pneumonia, Bronchiectasis, Interstitial Lung Disease (ILD) etc.

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### MATERIAL AND METHOD

This is a Prospective study of 60 patients was conducted over a period of one year, from April, 2020 to April, 2021 at Tertiary Health Care Hospital In South Gujarat.

Patient with Age >18 years, Suspected Smear negative pulmonary tuberculosis, Non Resolving pneumonia, Suspected fungal pneumonia, Suspected bacterial pneumonia, Bronchiectasis and Suspected Interstitial Lung Disease (ILD) patients were enrolled in our study.

Patient with Age <18years, Smear positive pulmonary Tuberculosis, critical cardiac or respiratory illness, malignancy, Active bleeding disorder, HIV/AIDS Positive were excluded from our study.

Informed written consent was obtained from all the patients enrolled in study. Detailed clinical history, physical examinations and investigations were carried out. Eligible patients with Chest X-ray and CECT Thorax and clinical findings consisting with Sputum Negative Suspected Pulmonary Tuberculosis, Suspected Bacterial Pneumonia, Suspected Fungal Pneumonia and Non-Resolving Pneumonia were subjected for fiberoptic video bronchoscopy. During bronchoscopy detailed examination of Bronchial tree was done and specimens including BAL, Bronchial brushing, TBLB & TBNA (done in indicated patients), Post Bronchoscopy Sputum (PBS) was collected and sent for necessary investigations. Data entry, preliminary Data analysis and preparation of charts were done in MS Excel sheet 2013.

### OBSERVATIONS

A total of 60 patients were included in our study. Out of which 39(65%) patients were Male and 21(35%) patients were Female. The most common age group involved in the study was 31-40 years (28.3%). The youngest patient was aged 19 years and the oldest was 85 years and mean age was 44.5±16.7 years.

In the present study, cough and fever were the most common symptoms (76.67%) followed by loss of appetite in 36.67% patients and breathlessness in 33.3% patients while loss of weight and night sweat were seen in 26.67% and 16.67% patients respectively. About 12% patients were having chest pain.

Chest X-ray finding of pulmonary infiltrative lesions was the most common finding in majority (55%) of patients followed by consolidation in 33.33% patients. Cavitory lesions and nodular lesion were seen in 13.33% patients each. Bronchiectatic changes and reticulations were noticed in 8.33% cases. Pleural effusion was seen in 6.67% cases whereas lymphadenopathy and collapse of lung was found in 5% of patients.

Most common CT thorax finding was consolidation in two-third of the patients, followed by lymphadenopathy in half of the patients and tree in bud appearance 43.33%. Whereas fibrocavitory lesion, ground glass opacity and nodules were seen in about one third of patients. Septal thickening, reticulations and miliary mottling were seen in 23.33%, 13.33% and 11.67% patients respectively. Only 10% patients showed Pleural effusion and honey-comb appearance.

Out of 60 patients based on clinical and radiological findings, 37 patients were suspected to have Pulmonary Tuberculosis, 13 Patients were suspected to have bacterial pneumonia, 5 Patients were suspected to have fungal pneumonia and 5 Patients were suspected to have ILD. All patients were then subjected to fiberoptic bronchoscopy

Out of 60 patients, 29 patients had no gross FOB findings. 12 (20%) patients had hyperaemia; 9 (15%) patients had congestion and 8 (13.33%) patients had fibrotic and stenotic changes. 5 (8.33%) patients had growth; 5 (8.33%) patients had ulcerative lesions and remaining 4 patients had shown active bleeding (Fig 1).

Table 2 suggest whenever Bronchoalveolar Lavage and Bronchial Brushing sent for AFB staining, CBNAAT, TB Culture, Gram stain and culture sensitivity, Cytology, KOH staining and NTM culture were cumulatively used for increasing diagnostic sensitivity.

Table 3 show, out of 37 suspected sputum negative pulmonary tuberculosis cases posted for bronchoscopy, 22(59.4%) cases were found to be positive for tuberculosis, Only 1(2.7%) case had findings consistent with Bacterial pneumonia and 2(3.4%) cases of tuberculosis had super added bacterial infection. In 13 patients suspected of bacterial pneumonia, more than half found positive for bacterial pneumonia while 2(15.3%) cases were found positive for pulmonary tuberculosis. Out of 5 suspected cases of fungal pneumonia and 5 suspected cases of Interstitial Lung Disease, each 2(40%) patients had positive findings respectively. Thus, overall diagnostic yield of bronchoscopy in 60 patients was 63.3% (Fig 2).

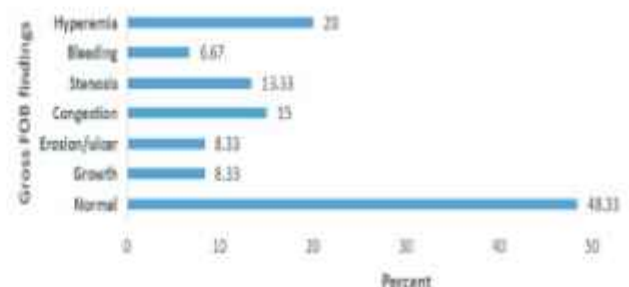


Fig 1 — Distribution of patients according to Gross FOB findings (n=60)

Table 1 — Comprehensive table showing results of various tests (n=60)

Sample type	Performed in no of patients	Positive in no of patients	Percentage
BAL AFB*	60	17	28.3%
BAL CBNAAT*	60	24	40.0%
BAL KOH*	60	2	3.33%
BAL fungal culture	5	2	40.0%
BAL Galactomanan	5	2	40.0%
BAL Cytology	20	2	10.0%
BAL TB culture	60	23	38.3%
BAL NTM Culture*	5	2	40.0%
BB-AFB	60	22	36.7%
BB-CBNAAT	60	23	38.3%
BB-TB culture	43	21	48.8%
TBNA:HP*	6	2	33.3%
Endobronchial Biopsy	6	4	66.7%
PBS AFB*	60	14	23.3%

(\*AFB-Acid Fast bacilli; \*CBNAAT- Cartridge Based Nucleic Acid Amplification Test; \*NTM- Non-tuberculosis Mycobacteria; \*KOH-Potassium Hydroxide; \*TBNA:HP-Trans Bronchial Needle Aspiration; Histopathology Examination; \*PBS-Post Bronchoscopy Sputum)

Table 2 — Cumulative result of Bronchoscopy specimen

Bronchoscopy specimen	Cumulative result
BAL TB CULTURE + BB TB CULTURE	24(40%)
BAL AFB + BB AFB	22(36.7%)
BAL CBNAAT + BB CBNAAT	24(40%)
BAL (AFB+CBNAAT + TB CULTURE)	24(40%)
BB (AFB+CBNAAT + TB CULTURE)	23(38.3%)
BAL (AFB + CBNAAT + TB CULTURE + GMCS + KOH + NTM + CYTOLOGY)	38(63.3%)

Present study found 14/60 (23.3%) positive results for Post Bronchoscopy Sputum (PBS)-AFB staining.

Out of 60 patients, majority 53 (88.3%) patients did not develop any complications. 5 (8.3%) patients developed minor bleeding and 2 (3.3%) patients developed bronchospasm.

### DISCUSSION

The delay in diagnosis and treatment in patients of Non resolving Pneumonia may lead to rise in mortality by 3-5%. For this reason Fiberoptic Bronchoscopy is one of the most widely used diagnostic approach among sputum negative and difficult to treat pneumonia patients<sup>3</sup>.

With the advent of Fiberoptic bronchoscopy, diagnosis of PTB in sputum smear negative patients has become more promising. The main advantage with this instrument is the ability to visualize the bronchial tree and collect samples directly from the bronchial pathology site<sup>4</sup>.

Fungal pneumonia is classically found in neutopenic, immuno-compromised, malignancy and post-transplant patients

there is high mortality if treatment is delayed to confirm a definite diagnosis. Different diagnostic modalities used to detect invasive fungal pneumonia and the decision to treat<sup>5</sup>.

In our study out of 60 patients, 29 patients were normal with no gross FOB findings. 12 (20%) patients had hyperaemia; 9 (15%) patients had congestion and 8 (13.33%) patients had fibrotic and stenosis changes. About 8.33% patients had growth and erosions/ulcer while remaining 4 patients had shown bleeding. In study of Atul Luhadia, *et al*<sup>6</sup>, congestion and hyperaemia (36%) and mucopurulent/mucoid secretions was seen in (32%) cases.

Present study found 17 (28.3%) patients with positive BAL AFB staining.

In BAL CBNAAT findings, 40% patients found positive out of which 33.3% Rifampicin sensitive and 6.7% Rifampicin Resistance. 36.7% patients came positive for BB-AFB. BAL liquid culture was seen positive in 23 (38.3%) patients. TBLB done in 6 patients out of which 4(66.6%) patients biopsy report show Caseating granuloma. Quaiser *et al*<sup>7</sup>, showed a positive yield by BAL fluid smear examination and culture as 17.5% (7/40) and 30% (12/40) respectively. Study by Yong Suk Jo, *et al*<sup>8</sup>, showed BAL positive for AFB smear in 23% and 50% positive for culture. Willcox, *et al*<sup>9</sup>, obtained BB from 83 of the 89 patients and 35 (42%) of them were positive on smear, making early diagnosis possible in 42%.

PBS-AFB staining came positive in 14/60(23.3%) patients. Quaiser, *et al*<sup>7</sup>, reported the yield of PBS smear as 17.5% (7/40) and PBS culture as 27.5% (11/40).

Complications were seen in only 7(11.7%) patients in our study. In study of Vipparthi Surya kumara, *et al*<sup>10</sup>, reported complication in 23.3% cases.

Thus, overall diagnostic yield of bronchoscopy in our study was 63.3% in 60 patients subjected for

Table 3 — Diagnostic yield of Bronchoscopy in suspected different benign Lung Disease

Suspected case of	Total suspected case (n)	Diagnosis done	Diagnosis not confirmed by Bronchoscopy
Tuberculosis	37	22(59.4%) tuberculosis (16-Rifampicin sensitive, 4-Rifampicin resistance, 2-NTM) 1(2.7%) Bacterial pneumonia 2(3.4%) Bacterial Pneumonia with Tuberculosis	12(32.4%)
Bacterial pneumonia	13	7(53.3%) Bacterial pneumonia 2(15.3%) Tuberculosis	4(30%)
Fungal pneumonia	5	2(40%)	3(60%)
ILD	5	2(40%)	3(60%)
Total	60	38(63.3%)	22(36.7%)

bronchoscopy. Diagnostic yield of bronchoscopy in other study was, Shin, *et al*<sup>11</sup>(42.8%), Quaiser, *et al*<sup>7</sup> (60%), Bachh, *et al*<sup>12</sup>(80%), Sarkar, *et al*<sup>13</sup>(80%) and Purohit, *et al*<sup>14</sup>(74%).

Advantage of bronchoscopy in suspected patients with sputum negative pulmonary tuberculosis, isolation of mycobacteria at an early stage when the destruction of lung tissue is minimal and the risk of spreading the disease to contacts can be decreased by early diagnosis and treatment<sup>7</sup>. Bronchoscopy reveals a higher bacteriological confirmation of diagnosis in patients with strong clinical and radiological evidence suggestive of Pulmonary Tuberculosis, Non resolving pneumonia and Interstitial lung disease. Though FOB procedures have some risk of complications, it is considered to be a relatively safe procedure.

#### Ethical Consideration :

The study was conducted after ethical permission from the Institutional Ethical Committee. The institutional ethics committee has gone through the study proposal and had unanimously approved this study. The study participants had been explained the nature and purpose of the study and written consent was obtained.

#### Limitations of study :

Sample size of the study is small because of the covid 19 pandemic and this study may not represent the whole indian populations due to smaller sample size and exclusion of patients with HIV infection, Bleeding disorders and suspected Malignancy

#### CONCLUSION

Role of Fiberoptic Bronchoscopy in malignant lung disorder is well established however, our study suggests that fiberoptic bronchoscopy can provide excellent material for diagnosis of suspected benign lung disorders.

Broncho alveolar Lavage and Bronchial Brushing subjected for AFB stain, CBNAAT, TB Culture, Cytology, KOH stain, NTM Culture etc. shall be cumulatively use for increase diagnostic yield of various etiology.

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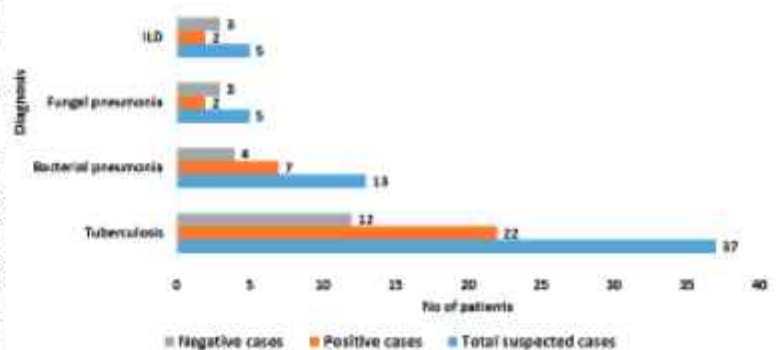


Fig 2 — Diagnostic yield of Bronchoscopy in suspected different Benign Lung Disease

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## Original Article

# A Study of the Clinico-demographic Profile and Clinical Outcomes of COVID-19 Patients in a Tertiary Care Hospital of India

Rupankar Nath<sup>1</sup>, Deepannita Sutradhar<sup>2</sup>, Riturag Thakuria<sup>3</sup>

**Background :** The SARS-CoV-2-induced COVID-19 pandemic has presented substantial challenges to healthcare systems across the globe. This study aimed to investigate the clinico-demographic profile and clinical outcomes of COVID-19 patients in a tertiary care hospital in Barak Valley, Assam, India.

**Methodology :** A retrospective, single-center, hospital-based cross-sectional study was conducted, focusing on patients with laboratory-confirmed COVID-19 admitted between July, 2020 and December, 2020.

**Results :** A total of 353 patients were analyzed with 69% being male and 31% female. Patients were classified into three severity groups: mild, moderate and severe. The mean ages in the mild, moderate and severe groups were 41.58 years, 57.70 years and 59.54 years, respectively. Cachar district accounted for the majority of patients (68.83%), followed by Karimganj district (18%) and Hailakandi district (10%). The common presenting complaints included fever, cough and dyspnoea. Co-morbidities were present in 61.76% of patients, with diabetes and hypertension being the most prevalent. Pulmonary comorbidities showed a strong association with increased mortality rates. Vital signs and laboratory parameters worsened with disease severity with neutrophils increasing and lymphocytes decreasing. Ferritin and LDH levels also increased with severity, reflecting disease progression. Treatment involved remdesivir and convalescent plasma therapy, with the combination showing better outcomes compared to individual therapies.

**Conclusion :** Overall, the study provides valuable insights into the unique challenges and characteristics of COVID-19 patients in the low HDI region of Barak Valley, Assam. The findings can aid in targeted public health interventions, resource allocation and equitable healthcare delivery, ultimately mitigating the impact of the disease and improving patient outcomes in the region. However, the study has certain limitations and further prospective multi-center studies are needed to validate and expand upon these findings.

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**Key words :** COVID-19, Co-morbidity, Clinico-demographic, Mortality, Treatment.

The COVID-19 pandemic, as declared by WHO on March 11, 2020, has presented significant challenges to the health care system Worldwide. COVID-19 is a viral illness caused by SARS CoV-2, a virus of the Coronaviridae family. It was first identified in Wuhan city in Hubei province of China in December, 2019 and was later named as 2019 novel Corona Virus (2019-nCoV)<sup>1</sup>. Similar to the other two Corona Viruses of the family, SARS-CoV and MERS-CoV, which caused outbreaks in China (2003) and Saudi Arabia (2012), SARS-CoV-2 is also believed to have originated from bats that later spread to humans through an intermediate human host, although the exact origin is still being studied<sup>1,2</sup>. While the overall fatality rate of COVID-19 is lower than that of SARS or MERS<sup>3</sup>, its high transmissibility has

### Editor's Comment :

- This study highlights the importance of demographic factors, co-morbidities, and disease severity in determining COVID-19 outcomes in Barak Valley, Assam, emphasizing the need for targeted public health measures and equitable resource allocation. The findings indicate that older age, male gender and co-morbidities, particularly pulmonary conditions, significantly increase mortality risks. Enhanced clinical strategies, including the combination of Remdesivir and convalescent plasma therapy, could improve patient outcomes in severe cases.

resulted in a significantly larger number of infections and deaths Worldwide.

It has become evident that the clinical outcome and manifestation of COVID-19 vary widely among individuals, influenced by a wide range of clinico-demographic factors such as age, co-morbidities, socio-economic status, access to health care, population density and the effectiveness of public health measures implemented by different countries and regions. Performing a clinico-demographic study of COVID-19 in Assam, a low Human Development Index (HDI) region, is essential for understanding the unique challenges and characteristics of the local

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population. This knowledge can inform targeted public health interventions, resource allocation and equitable healthcare delivery, ultimately helping to mitigate the impact of the disease and improve outcomes in the region. To the best of our knowledge, this is the first comprehensive study about the clinico-demographic profile of COVID-19 from Barak Valley, Assam. The primary objective of the study was to analyze the clinico-demographic profile of admitted COVID-19 patients and secondarily to correlate the association of age, sex and co-morbidities with mortality.

### MATERIALS AND METHODS

#### Study Setting and Duration :

This retrospective, single-center, hospital-based cross-sectional study was conducted in a tertiary care hospital situated in Barak Valley, Assam. The study focused on the population of patients who were admitted to the hospital with laboratory-confirmed COVID-19 between July, 2020 and December, 2020.

#### Sampling Method :

The sampling approach employed was non-probability convenience sampling, meaning all consecutive patients admitted during the specified study duration were included.

#### Inclusion and Exclusion Criteria :

All hospitalized patients with laboratory confirmed, COVID-19 (RAT or RTPCR) who consented to participate were included in the study. Duplicate samples, meaning repeat samples taken from patients who were already confirmed positive for COVID-19, were excluded from the study. Additionally, incompletely filled Surveillance Report Form (SRF) forms and/or incomplete inpatient hospital tickets were excluded from the analysis.

#### Data Analysis :

To gather the necessary data for analysis, clinico-demographic information about the patients was collected from the SRF forms and hospital bed tickets. This data was systematically entered into a pre-designed form and further uploaded into a Microsoft Excel® sheet for analysis. Statistical correlation was done using GraphPad Prism® version 8.

### RESULTS

This study involved the analysis of a total of 353 patients, comprising 246 Males (69%) and 107 Females (31%). The patients were categorized into three groups based on the severity of their condition: mild, moderate and severe, according to state protocol. 100 patients (28.3%) were classified as Mild,

169 (47.87%) as Moderate and 84 as severe (23.8%). The mean age of patients in the mild group was 41.58 years, while it was 57.7 years in the moderate group and 59.54 years in the severe group. Upon admission, 239 patients (67.7%) tested positive for Rapid Antigen Testing (RAT), while the remaining 114 patients (32.3%) tested positive for RT-PCR (Table 1).

The majority of patients seeking admission at Silchar Medical College were from Cachar district 68.83% (n=243), followed by 18% (n=65) from Karimganj and 10% (n=35) from Hailakandi district. The mortality of patients increased with increasing distance from the treating hospital (Table 2).

The most common presenting complaint among the patients was fever, reported by 61.76% (n=218) of patients, followed by cough in 53.82% (n=190) of patients. Other symptoms included dyspnoea in 42.78% (n=151) of patients, sore throat in 7.36% (n=26), diarrhoea in 4.25% (n=15), chest pain in 3.4% (n=12), headache in 3.68% (n=13), and loss of taste and smell in 0.28% (n=1) of patients (Fig. 1).

Table 1 — Demographic profile of COVID-19 patients

Parameter	Mild	Moderate	Severe
Total Patients	100	169	84
Male	65	122	59
female	35	47	25
Average Age (in years)	41.58	57.7	59.54
Rat positive	239		
RT-PCR positive	114		

Table 2 — Demographic Distribution of cases and outcome comparison

Place	Total Patients	Mortality	Mortality Percentage
Cachar	243	37	15.22
Hailakandi	35	7	20.00
Karimganj	65	19	29.2
Tripura	6	2	40.00
Others	4	2	50.00



Fig 1 — Presenting complains on admission



Co-morbidities were present in 218 (61.76%) patients, out of which 48 (22%) expired. 19 (15.97%) patients expired who had no co-morbidities. Out of 14 patients with pulmonary co-morbidities, 6 (42.86%) expired. The mortality in patients with diabetes, hypertension (HTN), or both as co-morbidities was 19.09% (n= 21). In patients with diabetes, HTN or both along with additional comorbidities was 19.72% (n=14). In patients without diabetes or HTN but with other co-morbidities, the mortality was 30.43% (n=7). (Fig 2).

Among patients with severe disease, 20.96% (n=74) patients were having age more than 40 and 2.83% (n=10) patients were less than 40. The mortality among patients with an age more than 40 was 17% (n= 60) and mortality at age below 40 was 1.98% (n=7). The percentage of Males in severe group was 70.23% (n=59) and Females 29.77% (n=25) while 21.14% (n=52) were males as compared to 22.39% (n=15) females out of the total mortality (n=67) (Table 3).

The vital signs and laboratory parameters varied across the three severity categories. In the mild category, patients had an average respiratory rate of 19.56 breaths per minute, oxygen saturation (SpO<sub>2</sub>) of 96.8%, heart rate of 92.7 beats per minute, and a mean blood pressure of 75 mm Hg. In the moderate category, the average respiratory rate was 23.75 breaths per minute, SpO<sub>2</sub> was 92%, heart rate was 101.3 beats per minute and mean blood pressure was 70 mm Hg. In the severe category, the average respiratory rate was 25.86 breaths per minute, SpO<sub>2</sub> was 72.8%, heart rate was 125.8 beats per minute, and mean blood pressure was 50 mm Hg (Table 4).

The average Hb levels were 12.46 gm%, 11.8 gm% and 11.39 gm% in mild, moderate and severe group respectively. The total count increased with severity from 6281/ microliters in mild group to 14329/ microliters in severe group with neutrophilia progressively increasing from 62.82% per mm<sup>3</sup> in mild group to 85% per mm<sup>3</sup> in severe group. Lymphocytes progressively decreased with severity from 25.5% per mm<sup>3</sup> in mild group to 8.12% per mm<sup>3</sup> in severe group. Furthermore, the severity of the patients' conditions

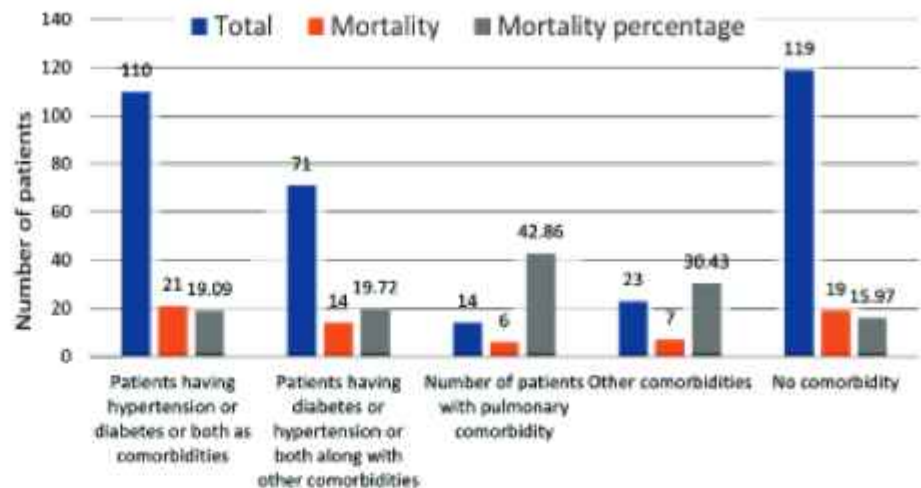


Fig 2 — Association between co-morbidities and mortality

Table 3 — Association of Age and sex with mortality

	Severity	Percentage	Mortality	Percentage
Age >40	74/353	20.96	60/353	17.00
Age <40	10/353	2.83	7/353	1.98
Male	59/84	70.23%	52/67	77.61
Female	25/84	29.77%	15/67	22.39

Table 4 — Vital parameters of admitted patients

	Mild	Moderate	Severe
RR	19.56	23.75	25.86
SPO <sub>2</sub> %	96.8	92	72.8
HR (bpm)	92.7	101.3	125.8
Mean BP (mmHg)	75	70	50

RR - Respiratory Rate (breaths per minute); HR - Heart Rate; BP - Blood Pressure

was reflected in their ferritin and LDH levels, as well as the findings from Chest X-rays. In the mild group, ferritin levels averaged at 129.7 ng/mL, while LDH levels were 391 IU/L. Among the patients in this group, 47 individuals had abnormal Chest X-ray findings. In the moderate group, ferritin levels increased to an average of 330 ng/mL and LDH levels rose to 436 IU/L. The number of patients with abnormal chest X-ray findings also increased to 107. In the severe group, ferritin levels further increased to an average of 416 ng/mL and LDH levels were notably elevated at 594 IU/L. The number of patients with abnormal Chest X-ray findings remained significant, with 33 individuals displaying such findings (Table 5).

Treatment for the patients followed the state protocol, which included symptomatic care. Two major modalities were employed: Pharmacotherapy with Remdesivir and experimental Convalescent Plasma Therapy (CPT). Different treatment combinations were administered based on the severity of the

disease. Specifically, 11 patients received only convalescent plasma therapy and 6 of them (54.54%) did not survive. Remdesivir alone was administered to 126 patients, of whom 31 (24.60%) expired. Among those who received both CPT and Remdesivir (91 patients), the mortality rate was 21.90% with 20 patients expiring. 25 patients did not receive either CPT and Remdesivir of whom 10 patients (40%) expired (Table 6).

In terms of outcome, within the mild group, 90 patients were successfully cured, 7 remained admitted at the time of data collection and 3 were discharged against medical advice. There were no deaths in the group. In the moderate group, 23 individuals expired, while 123 patients recovered. Additionally, 17 patients were still admitted and 4 patients left against medical advice. Within the severe group, 44 patients expired while 32 were successfully cured, additionally, 5 patients remained admitted and 1 patient left against medical advice (Fig 3).

### DISCUSSION

Demographically, the study revealed that the majority of patients seeking admission to Silchar Medical College were Male (69%) compared to Female patients (31%). This observation aligns with previous studies that have also shown a higher susceptibility of males to COVID-19<sup>4-6</sup>. The underlying reasons for this gender disparity are not fully understood and may involve biological such as the higher expression of ACE2 receptor<sup>7</sup>, behavioural such as smoking, excessive alcohol consumption and less adherence to preventive measures like wearing

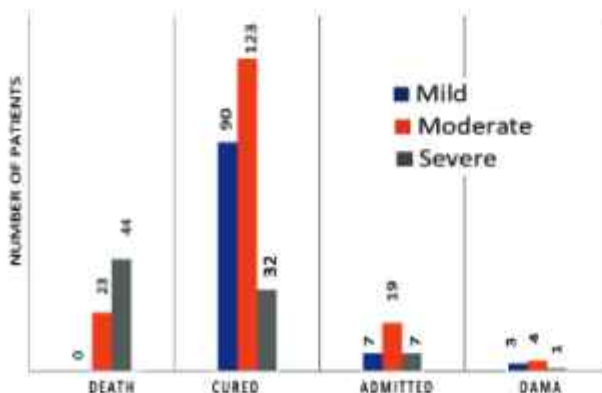


Fig 3 — Outcome comparison among different groups.

Parameters	Hb gm%	TLC per microliters	Lymphocytes per mm <sup>3</sup>	Neutrophils per mm <sup>3</sup>	Ferritin ng/mL	LDH IU/L	Positive Chest x-ray
Mild	12.46	6281	25.55	62.82	129.7	391	47
Moderate	11.87	8918	16.26	75.88	330	436	107
Severe	11.39	14329	8.12	85	416	594	33

Hb - Haemoglobin; TLC - Total Leucocyte Count

CPT		Remdesivir		CPT+ Remdesivir		No CPT No Remdesivir	
Total Patients	Expired (%)	Total Patients	Expired (%)	Total Patients	Expired (%)	Total Patients	Expired (%)
11	6(54.54)	128	31(24.60)	91	20(21.98)	25	10(40)

mask and social distancing and societal factors such as occupation and workplace exposure and traditional social roles like sharing the majority of outdoor responsibility<sup>5,8-10</sup>. The severity and mortality of the illness also had a male preponderance in our study. However, there is disparity in observations with few studies showing positive correlation between severity as well as mortality and male gender like<sup>6,11-17</sup> and others showing negative or no correlation with male gender<sup>8</sup>. It is important for future research to investigate the mechanisms behind this disparity to form targeted interventions and public health strategies

Our study confirms previous findings that increased age is linked with higher disease severity and mortality<sup>18</sup>. This population requires particular focus on prevention, early detection and management strategies.

Furthermore, the study reported that the majority of patients seeking admission were from Cachar district (68.83%), followed by Karimganj (18%) and Hailakandi (10%) districts. It was also seen that both the disease severity and mortality were higher among cases from Karimganj and Hailakandi. These regional variations might be influenced partly by factors such as population density, accessibility to healthcare facilities and the level of awareness about COVID-19 in different regions and also because most of the cases from these two districts were referred. The study provides important regional data that can aid in resource allocation and public health planning at the local level though further studies with particular focus on these factors are awaited.

The common presenting complaints in our study were fever, cough and dyspnoea in the descending order of presentation followed by sore throat, diarrhoea, chest pain, headache and loss of taste and smell the last being the least frequent symptom. These findings are consistent with the typical

symptoms associated with COVID-19, as reported by various studies<sup>6,20,21</sup>.

Co-morbidities were found to be present in a significant proportion of the patient, among which diabetes and hypertension were the most prevalent. It was also observed that Pulmonary Co-morbidity was strongly associated with increased mortality rates, surpassing other Co-morbidities in terms of mortality risk. These findings are consistent with previous studies that have highlighted the association between these Co-morbidities and increased morbidity and mortality in COVID-19<sup>5,17,22,23</sup>. It is thus crucial for healthcare providers to be aware of and address these underlying Co-morbidities in the management of COVID-19 patients.

Increasing disease severity correlates with escalating abnormalities in vital signs particularly increase in respiratory rate, SpO<sub>2</sub> and blood pressure reflecting respiratory distress and multiorgan dysfunction in severe COVID-19. A progressive decrease in the lymphocyte count and an increase in the neutrophil count, LDH and ferritin levels with increasing disease severity was also observed as a finding that aligns with previous studies<sup>21,24</sup>.

The outcome in terms of mortality was seen to be favourable in patients who received a combination of plasma therapy and Remdesivir as compared to those receiving either of the two therapies though outcome was slightly better in Remdesivir group as compared to Plasma therapy alone. This finding of ours was in accordance with another study by Diaz G<sup>25</sup>. Further focussed Randomized controlled trials are required to establish the efficacy and safety of these treatment modalities.

It was observed that the severe group had the highest mortality rate which highlights the critical need for timely and appropriate management of severe COVID-19 cases to improve patient outcomes.

It is important to acknowledge the limitations of this study. First, the study design was retrospective, which introduces inherent biases and limitations in data collection. Prospective studies with larger sample sizes and control groups are needed to further validate and expand upon these findings. Second, the study was conducted at a single centre, which may limit the generalizability of the results to other settings. Multi centre studies involving diverse populations are necessary to obtain a more comprehensive understanding of COVID-19 characteristics and outcomes.

## CONCLUSION

This study at Silchar Medical College and Hospital highlights the impact of factors like demographics, Co-morbidities, vital signs and treatment outcomes on COVID-19 severity and mortality in the population of Barak valley. The findings can inform Government policies for improved clinical management and public health interventions. Further research is needed to validate and explore additional factors influencing COVID-19 outcomes.

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## Original Article

# Levels and Risk Factors of Diabetes Mellitus among Tuberculosis Patients Attending District Tuberculosis Centre, Vijayapur

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**Background :** The co-existence of diabetes and tuberculosis is becoming a public health problem in India, as they are the cause of morbidity, mortality and pose a burden on healthcare system.

**Aims and Objectives :** To assess the risk factors of diabetes mellitus and its status among Tuberculosis patients. To compare the response to treatment and drug resistance among diabetic and non-diabetic patients. And to study the prevalence of MDR-TB among Diabetic patients with Tuberculosis.

**Methodology :** It was a cross sectional study done in Vijayapura district during June, 2019 to July, 2019. The patients who had attended the District Tuberculosis Centre in previous 3 months of the beginning of the study were considered and data was collected from the records maintained in the center. The sample size calculated to be 300 cases. Data was collected from them.

**Results :** The majority of 21.7% of study participants belonged to the age group 26-35 years. The overall prevalence of diabetes was 21.6 % among TB patients. Among males the prevalence was 67.3% and among females was 32.7%. When prevalence of diabetes mellitus was compared with the age it was found that majority (30.7%) of the diabetes were in the age group of 56-65 years and it was statistically significant.

**Conclusion :** Diabetes is a prevalent comorbidity in both drug sensitive and drug resistant tuberculosis. Age group of more than 55 years is significantly associated with diabetes mellitus and other factors like alcohol consumption is also a associated factor.

[J Indian Med Assoc 2024; 122(12): 29-34]

**Key words :** TB, Diabetes Mellitus, MDR TB.

Worldwide Tuberculosis being one among the top 10 leading cause of death<sup>1</sup>. 24% of TB patients & 29% deaths are due to TB in India. The factors attributed for this are HIV, Diabetes Mellitus, Smoking & Malnutrition<sup>2</sup>. Among 10.4 million new active TB case, one million of them have TB-DM comorbidities<sup>3</sup>. There is an evidence showing association between diabetes and tuberculosis referred as 'intersecting epidemic' by WHO<sup>4</sup>. According to International Federation of Diabetes, about 382 million adults had Diabetes in the year of 2013, among which 80% belong to low-middle income countries, with prediction of increase in global burden reaching 592 million by 2035<sup>5</sup>. India is stepping towards becoming the Diabetic capital, as every fifth diabetic in the World is Indian<sup>6</sup>. Diabetes increases the risk of active infection, progression of latent to active case and transmission of infection, besides these it has led to poor outcome

### Editor's Comment :

#### ■ What's Already Known :

Diabetes Mellitus (DM) is a significant comorbidity among tuberculosis (TB) patients, contributing to worse treatment outcomes and complications. The association between DM and TB is well-established globally, but regional variations in prevalence and risk factors remain underexplored.

#### ■ What This Study Adds :

This study reports a 21.6% prevalence of diabetes among TB patients in Northern Karnataka, identifying key risk factors such as age, education level, alcohol consumption and family history of diabetes. It underscores the dual burden of TB and DM in the region.

#### ■ How It's Useful for Policy :

The findings advocate for integrated screening and management of both TB and diabetes. Policy should promote bidirectional screening to improve treatment outcomes and reduce complications, enhancing public health interventions in areas with high TB burden.

of treatment with increased risk of failure of treatment<sup>4</sup>. In addition glycemic control is being worsened by TB infection. Added to this Drug interaction is deteriorating the effectiveness of both TB and Diabetes<sup>7</sup>. DM also increases the risk of TB by 3 times and thus rendering for slow decline of global TB incidence which may hinder the goal of achieving global milestone of 50% reduction in TB incidence and 75% reduction of deaths due to TB by 2025<sup>8</sup>. Hence, this bidirectional association between TB-DM

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is being major concern for physicians, as DM affects the disease prognosis and treatment outcome of TB vice versa<sup>9,10</sup>. Bidirectional screening and integrated management will help in early diagnosis and health outcomes of both conditions, unfortunately there is inadequate evidence for this on feasibility and effectiveness of this approach<sup>4</sup>. The impact of these two converging epidemics has led WHO to declare Tuberculosis and Diabetes as global epidemics<sup>11</sup>.

Apart from this the emergence of Multi Drug Resistant Tuberculosis (MDR-TB) across the world is posing a major threat, as treatment is difficult and expensive hence causing a large economic burden on the developing nations. In addition to this Diabetes is an added risk factor for the development of MDR-TB because many studies have shown increased risk of MDR-TB among Tuberculosis patients with comorbid Diabetes Mellitus, although Diabetes Mellitus is not an independent risk factor for MDR-TB<sup>12-17</sup>.

Tuberculosis and Diabetes Mellitus co-morbidity is one of the raising public health problems. Data available regarding tuberculosis co-morbid with diabetes mellitus is very sparse in this part of Northern Karnataka, hence the study was undertaken.

#### AIMS AND OBJECTIVES

- (1) To study the risk factors of diabetes mellitus and its status among Tuberculosis patients.
- (2) To compare the response to treatment and drug resistance among diabetic and non-diabetic patients.
- (3) To study the prevalence of MDR-TB among Diabetic patients with Tuberculosis.

#### MATERIALS AND METHODS

It is a Cross-sectional study done in 2 months from June, 2019 to July, 2019. The patients who had attended the District Tuberculosis Centre in previous 3 months of the beginning of the study were considered and data was collected from the records maintained in the centre and also by contacting the patient (after obtaining their consent) with the help of contact details available in the records for further information. With anticipated prevalence rate of diabetes among TB cases is 24%<sup>18</sup> at 95% confidence level and 5% absolute error, sample size calculated is 280.

**Using statistical formula :**  $n = Z^2 p^* q / d^2$ , 280 sample size was obtained which was rounded to 300 cases.

Tuberculosis patients (18 years and above) who attended District Tuberculosis Centre for past 3 months are included in the study. Pregnant lactating mothers and patients with incomplete records were excluded from the study.

**Data Analysis :** The data obtained will be entered in a Microsoft Excel sheet and statistical analysis will be performed using statistical package for the social sciences (Version 20). Results will be presented as Mean (Median)  $\pm$ SD, counts and percentages and diagrams. Categorical variables will be compared using Chi square test. Association between psychosocial changes and resiliency factors will be assessed using regression analysis,  $p < 0.05$  will be considered statistically significant. All statistical tests will perform two tailed.

#### RESULTS

Table 1 shows that out of 300, majority (21.7%) of them belonged to the age group 26-35 years followed by 56-65 years (21%) and 36-45 years (17%). This shows that most of population belong to the reproductive age group. In our study males were predominant (64.3%) and female constituted about (35.7%).

Majority of study participants belong to urban (51.7%) when compared to rural background (49.3%). Most of the study participants studied upto Primary

Table 1 — Distribution of Socio-demographic Characteristics of Study Populations (N=300)

Study variable	Number(n)	Percentage (%)
<b>Age (years) :</b>		
15-25	43	14.3
26-35	65	21.7
36-45	51	17
46-55	48	16
56-65	63	21
>65	29	9.7
<b>Sex :</b>		
Male	193	64.3
Female	107	35.7
<b>Place :</b>		
Rural	145	48.3
Urban	155	51.7
<b>Education Status :</b>		
Illiterate	44	14.7
Primary	162	54
Secondary	73	24.3
PUC	20	6.7
Graduate	1	0.3
<b>Marital Status :</b>		
Married	268	89.3
Unmarried	19	6.3
Widowed	13	4.3
<b>Type of Family :</b>		
Nuclear	285	95
Joint	15	5
<b>Socio-economic Status :</b>		
Upper class	7	2.3
Upper middle class	10	3.3
Middle class	25	8.3
Lower middle class	93	31
Lower class	165	55

school (54%), followed by secondary school (24.3%), 14.7% were illiterates.

89.3% of them were married, 6.3% were unmarried and 4.3% widowed participated in study. 95% belonged to nuclear family and only 5% belonged to joint family.

In our study 55% belonged to lower class followed by lower middle class (31%) (Modified BG Prasad's classification).

In our study among 300 TB patients 65 were Diabetic (21.6 %)(Fig 1). Prevalence of diabetes in male and female is 67.3% and 32.7% respectively (Fig 2)(Table 2).

When prevalence of diabetes mellitus was compared with the age it was found that majority (30.7%) (Fig 3) of the diabetes were in the age group of 56-65 years and it was statistically significant with the p value of <0.001 (Table 3).

On comparing the association between prevalence of diabetes mellitus and educational status, it was found that among diabetes most of the study



Fig 1 — Prevalence Of Diabetes Among TB Patients

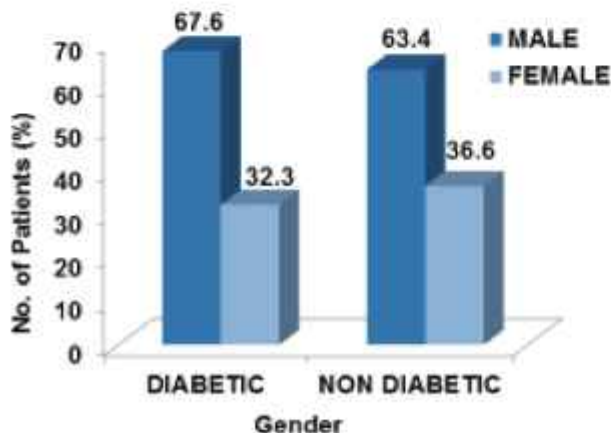


Fig 2 — Distribution of Male and Female Among Diabetic and Non Diabetic TB Patients

Age (Years)	Diabetic		Non Diabetic		Chi square test	P value
	n	%	n	%		
15-25	0	0	43	18.3	$\chi^2=60.252$	P<0.0001 HS
26-35	2	3.1	63	26.8		
36-45	8	12.3	43	18.3		
46-55	18	27.7	30	12.8		
56-65	20	30.7	43	18.3		
>65	17	26.1	12	5.1		
Total	65	100	234	100		

HS - Highly significant

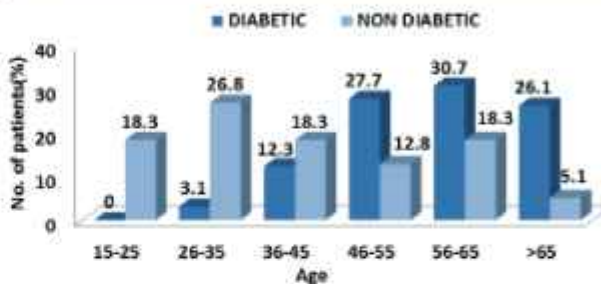


Fig 3 — Distribution of Male and Female among Diabetic and Non Diabetic TB Patients

Educational Status	Diabetic		Non Diabetic		Chi square test	P value
	n	%	n	%		
Illiterate	14	21.5	30	12.75	$\chi^2=$	P= 0.0024 HS
Primary	43	66.15	119	50.6		
Secondary	4	6.15	69	29.36		
PUC	4	6.15	16	6.8		
Graduate	0	0	1	0.4		
Total	65	100	235	100		

HS - Highly significant

participants (66.2%)(Fig 4) studied upto primary school and it was statistically found significant (Table 4) ie, illiteracy and primary education was significantly associated (Table 4).

The prevalence of was more in non-alcoholic 70.8% (Fig 5) and this was found statistically significant (Table 5). Hence, consumption of alcohol was not risk factor in our study.

We found that prevalence of diabetes was not significant when compared with BMI (Table 6).

89.2% of Diabetes Mellitus prevalence was found

Habit of Alcohol	Diabetic		Non Diabetic		Chi square test	P value
	n	%	n	%		
Alcoholic	19	29.4	28	11.9	$\chi^2=$	P= 0.0007 HS
Non Alcoholic	46	70.6	207	88.1		
Total	65	100	235	100		

HS - Highly significant

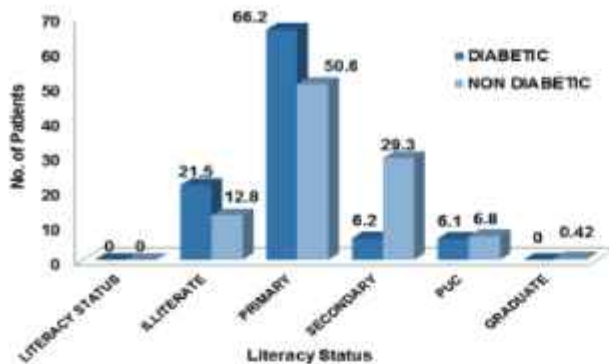


Fig 4 — Distribution of Educational Status among Diabetic and Non Diabetic TB Patients

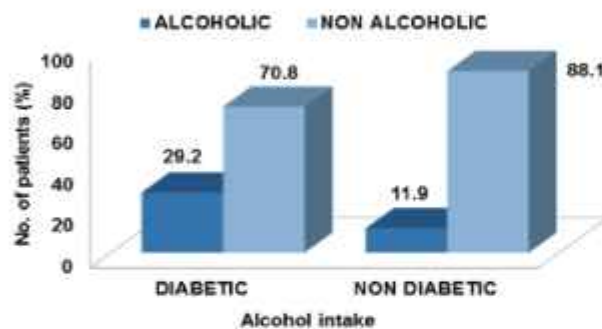


Fig 5 — Distribution of Alcohol Intake among Diabetic and Non Diabetic TB Patients

BMI	Diabetic		Non Diabetic		Chi square test	P value
	n	%	n	%		
Underweight	40	61.5	177	75.3	$\chi^2=4.897$	P=0.0864
Normal	24	36.9	55	23.4		
Overweight/Obese	1	1.59	3	1.27		
Total	65	100	235	100		NS

NS - Not significant

among patients not having family history of DM [Figure no.07] and was statistically significant (Table 7).

We found that prevalence of DM was not significant when compared to HIV status (Fig 8).

**DISCUSSION**

The present study was conducted to determine the levels and risk factors of Diabetes mellitus among Tuberculosis patients registered under RNTCP in District Tuberculosis centre Vijayapura.

In our study it was found that large number of TB patients were in the age group 26-55 years (21.7%) most of them were in reproductive age group. Similar results were found in a study done by Damtew E, *et al*<sup>11</sup> in Addis Ababa Ethiopia where majority of patients were in age group 25-44 years of age.

In study done by Balakrishnan S, *et al*<sup>19</sup> in Kerala

Family History	Diabetic		Non Diabetic		Chi square test	P value
	n	%	n	%		
No	58	90.2	232	98.7	$\chi^2=14.239$	P=0.0002
Yes	7	9.8	3	1.3		
Total	65	100	235	100		

HS - Highly significant

HIV Status	Diabetic		Non Diabetic		Chi square test	P value
	n	%	n	%		
Postive	4	6.15	27	11.48	$\chi^2=1.564$	P=0.2110
Negative	61	93.85	208	88.52		
Total	65	100	235	100		

NS - Not significant

most of the patients belong to the age group 45-54 years. Other studies done by Kishan, *et al* in Patiala, Punjab and Dutt N, *et al*<sup>20</sup> in Ahmedabad revealed 40-60 year's age group as most commonly involved. This difference in age group may be due to varied geographical condition and study design setting.

In our study 64.3% (193) subjects were male and 35.7% (107) were females similar to the study conducted by Tahir Z, *et al*<sup>21</sup> in Pakistan where 69.1% were males and 30.9% were females. In study done

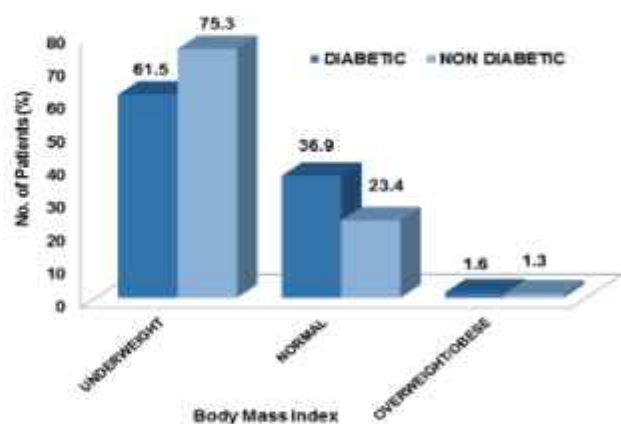


Fig 6 — Distribution of BMI among Diabetic and Non Diabetic TB Patients

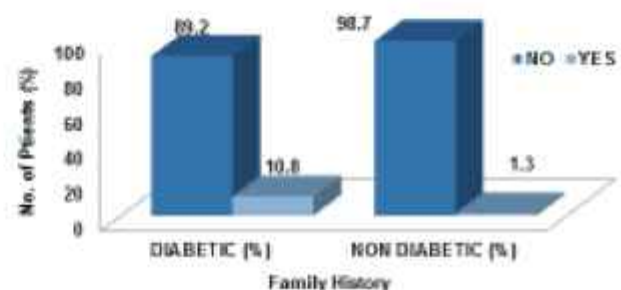


Fig 7 — Distribution of Family History among Diabetic and Non Diabetic TB Patients



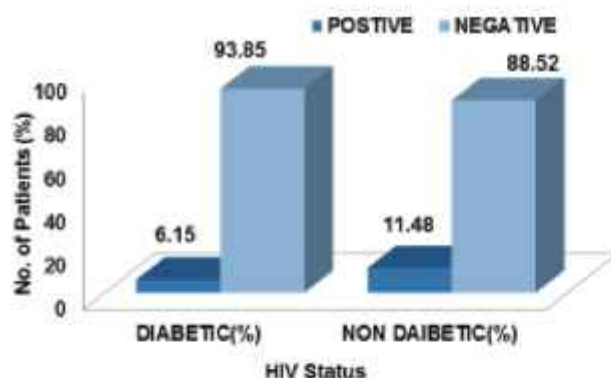


Fig 8 — Distribution of HIV Status among Diabetic and Non Diabetic TB Patients

by Alisjahbana B, *et al*<sup>22</sup> in Indonesia in which 52.4% of patients were males. The reason is fear and stigma associated with tuberculosis which resulted in under-notification in case of females and also the tendency to seek health care.

In our study 51.7% (155) of the patients were from urban back ground and 48.3% (145) of were from rural back ground, in other study conducted by Damtew E, *et al*<sup>11</sup> in Addis Ababa, Ethiopia in which 70% of patients belong to Urban back ground. In the study done by Vishwanathan V, *et al*<sup>23</sup> in Tamil Nadu which had majority of Tuberculosis from urban back ground. This difference is due to different study setting.

In our study more than half 54% (162) tuberculosis patients studied up to primary schooling, 24.7% (73) of them completed high school education and 14.7% (44) were illiterates, where it was observed that most of tuberculosis patients had received less schooling which was consistent with other studies.

In contrast with the study conducted by Sarkar M, *et al*<sup>24</sup> in Bangladesh 40.7% of patients were illiterates, 25.1% received primary schooling and 19.8% of them received secondary schooling.

Another study done by Tahir Z, *et al*<sup>1</sup> in Pakistan has shown 51.6% as illiterates, 34.7% as primary schooling and 10.7% as secondary schooling.

In our study 89.3% (268) were married followed by 6.3%<sup>19</sup> unmarried and 4.3%<sup>13</sup> widowed, this finding was similar with study conducted by Damtew E, *et al*<sup>11</sup> in Ethiopia 59.2% were married, 36.7% were unmarried and 1.7% widowed.

In our study, 55%(165) of participants belonged to lower class, 31 %(93) belonged to lower middle class and 8.3%(25) belonged to middle class according to modified B G Prasad's Socio-economic classification. These findings were similar to the study

conducted by Agarwal A K, *et al*<sup>7</sup> in Madhya Pradesh in which 37.8% belonged to lower class and 15.7% belonged to lower middle class.

The prevalence of DM among TB patients in our study is 21.6%.

Other studies like institutional based cross sectional study done by Padmalatha P, *et al*<sup>18</sup> in Andhra Pradesh showed prevalence of DM as 30.6%.

Another study conducted by Raghuraman S, *et al*<sup>25</sup> in Pondicherry (2017) reported 29% as DM prevalence.

In contrast to above findings, another study in Nigeria by Oliyanka AO, *et al*<sup>26</sup> found prevalence to be 5.7% which could be attributed to difference in demographic characteristics.

In our study 30.7% of Diabetes Mellitus prevalence was found among tuberculosis patients aged between 56-65 years which was similar to the study done by Kottarnath MD, *et al*<sup>27</sup> in Pariyaram Kerala where it was >61 years. In the study conducted by Ekeke N, *et al*<sup>28</sup> in Nigeria where 16.9% of DM prevalence was found among 56-65 years of age.

In our study majority (67.6%) of prevalence among males similar to the study by Agarwal AK, *et al*<sup>7</sup> in Madhya Pradesh (77%) and in another study conducted by Vishwanathan V, *et al*<sup>23</sup>. The higher prevalence of DM among males might be due to risk factors such as smoking tobacco and consumption of alcohol, which affects both TB and DM.

In our study prevalence of DM was high among who had less education (66.1% primary school and 21.5% illiterates) which is similar to the study done by Kornfeld H, *et al*<sup>29</sup> in South India where 51.4% of diabetic patients were illiterates. This is due to lack of awareness about disease among less educated patients.

Our study has shown significant association between prevalence of DM and Alcohol consumption which is similar to the study conducted by Mkhontfo MM, *et al*<sup>30</sup> in the state of Florida.

### CONCLUSION

The present study showed that, the prevalence of DM among TB patients registered under RNTCP in District Tuberculosis Centre Vijayapura, was 21.6%. The DM TB were more between 56-65 years of age majority of them studied upto primary school and belonged to lower socio-economic status. Most of them were underweight due to DM TB co-morbidity. Various factors like age, educational status, addictive habits, family history of DM have influenced the prevalence.

**Acknowledgement :** I am thankful for ICMR STS to fund this project.

**Conflict of Interest :** None

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## Original Article

# Extent of Disability and Behavioral Disturbances of the Children with Intellectual Disability and the Coping Mechanisms of their Parents : An Observational Study from a Tertiary Care Hospital of Eastern India

Paramita Patra<sup>1</sup>, Amitava Dan<sup>2</sup>, Sharmila Sarkar<sup>3</sup>, Asish Mukhopadhyay<sup>4</sup>, Debasish Sanyal<sup>5</sup>

**Background :** Parents experience great challenge in bringing up their children with Intellectual Disability (ID). The present study was undertaken to examine the level of disability, magnitude and pattern of Behavioral Disturbances of the children with ID and the coping mechanism of their parents to combat against this great challenge.

**Materials and Methods :** The current observational study was conducted on consecutive 92 children ( $\leq 18$  years) with mental retardation [Intellectual Disability (ID)] as per International Classification of Mental and Behavioral Disorders, Tenth Edition, Diagnostic Criteria for Research version (ICD-10, DCR) and their parents (<65 years) who was living with their children with ID. Socio-demographic data of both children and parents, Intellectual Quotient (IQ), level of disability of the children were assessed. Behavioral Disturbance of the children was assessed by Behavioral Assessment Scale for Indian Children with Mental Retardation (BASIC-MR) and coping mechanism of the parents was assessed by Brief Cope Questionnaire (BCQ).

**Results :** Majority of the children were male with mean age of the sample was 11.34 (SD 5.07) years with mean IQ was 79.87 (SD 11.28). Majority of the children (53%) had severe disability ( $\geq 90\%$ ). Children had high level of behavioral problems having higher scores in domain 1, 2 and 3 of BASIC-MR with mean scores were 105.79, 113.13 and 118.48 respectively. Majority of the parents were above 40 Years. A large portion of families came from upper middle class followed by lower middle-class background. Among the domains of BCQ, both parents had applied 'acceptance' (mean score of fathers 6.89, mothers 7.00), 'positive refraining' (mean score of fathers 5.93, mothers 6.00) and 'active coping' (mean score of fathers 6.13, mothers 6.00) mostly.

**Conclusion :** Parents, both the fathers and the mothers were using their coping strategies well to combat against their stress, on account of care-giving their disabled children.

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**Key words :** Intellectual Disability (ID), Disability, Behavioral Disturbances, Coping Mechanisms, Parents.

According to World Health Organization, Mental Retardation (MR) or Intellectual Disability (ID) is a condition of arrested or incomplete development of the mind, characterized by impairment of skills and overall intelligence in areas such as cognition, language and motor and social abilities (WHO, 1993)<sup>1</sup>. In developing country like India families especially parents have to take the prime role to raise their children with disabilities at home and in the society. Greater financial stress, frequent disruption

### Editor's Comment :

- Children with intellectual disability attending Tertiary Care Hospital were at a significant level of disability and behavioral disturbances.
- The therapists should educate the parents as primary caregivers to enhance on several components of coping skills such as humor, planning, venting, self distraction etc to continue their battle of upbringing of their children as well as improve their own quality of life.

in family functioning, reduced social interaction outside the family etc. are the basic issues that the parents have to deal with. It often becomes very challenging for parents to provide long term care to the child, can become a strain and may result into impacts on psychological and physical health and overall Quality of Life of the parents<sup>2-8</sup>.

Parents of children with developmental disabilities experience higher level of stress to upbringing their children in comparison to the parents with normally developed children<sup>9-12</sup>. Parents can experience stress in several spheres of their life facing the challenges of caregiving of their children, regarding relational

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problem<sup>13</sup>, with financial constraints<sup>14</sup>, feeling of decreased parenting efficacy<sup>15</sup> etc. The severity of stress perceived by the parents depends on the severity of the adversities in various sub-domains of their lives and their cognitive appraisal about the issues. Chronic unresolved stress can often compromise their psychological health<sup>16</sup>. By natural effort parents always try to cope with their stress by their own way actively or passively, that often depends on their psychological, social and cultural background and availability of resources. The term 'coping' refers to the behavioral strategies that an individual applies to reduce the effect(s) and or demand(s) of stress<sup>17</sup>. Folkman and Lazarus narrated coping efforts as the interaction of two separate cascades, ie, management of the person-environment relationship and regulation of associated stressful emotions. Lazarus (1980) defined coping as "the cognitive and behavioral efforts made to master, tolerate, or reduce external and internal demands appraised as taxing or exceeding the resources of the individual". These coping styles or mechanisms were described in the literature in different categories, subcategories and items<sup>18</sup>. In comparison to using maladaptive pattern of coping strategies such as negative emotion focused coping, using of healthy coping strategies such as problem focused coping, persons may manage their stress relatively in rational way and protect their psychological health better. There are studies available in the literature on the coping mechanism of parents with developmental disabilities but Indian studies are very scant<sup>19-24</sup>. The pattern of using coping of Indian parents might be different from the western counterpart as there is significant difference in their socio-cultural-economic milieu. Even fathers and mothers may have contrast in pattern of using coping strategies as per their social role in that specific family and in that society or community at large.

This present study was undertaken in a Tertiary Care Hospital of Eastern India, to understand magnitude and pattern of behavioral disturbances and the extent of disability in the children with ID and the pattern of coping behaviors of their parents, observed differentially for fathers and mothers.

#### MATERIALS AND METHODS

In the current observational cross-sectional study, which was conducted at Psychiatry OPD of a tertiary care teaching hospital in Kolkata, West Bengal and consecutive 92 children ( $\leq 18$  years) with ID as per ICD-10, DCR version<sup>1</sup> and their parents (<65 years, having children living with them) were included.

Parents with chronic medical illness or ID were excluded from the study. Research protocol was approved from the Institutional Ethics Committee. Intelligence Quotient (IQ) was tested using standard scales [eg, Vineland Social Maturity Scale (VSMS)<sup>25</sup>, The Denver Developmental Screening Test (DST)<sup>26</sup>, Seguin Form Board (SFB)<sup>27</sup> or Binet Kamat Test (BKT) for Intelligence<sup>28</sup> as applicable by an authorized clinical psychologist. Level of disability of the children was measured in percentage as per Gazette of India notification<sup>29</sup>. Behavioral assessment of their child was done using Behavioral Assessment Scale for Indian Children with MR (BASIC-MR)<sup>30</sup>. Coping mechanisms of the parents were assessed using Brief Cope Questionnaire (BCQ)<sup>31</sup>. BASIC-MR is a scale to assess the current behavior of the children with Intellectual Disability (ID). As Brief Cope Questionnaire (BCQ) is a self-rater's scale, the scale was validated in Bengali and used in the current study by following a standard procedure of validation. Assessment will be done by an expert such special educator, psychiatrist. Standard Package of Statistical Software Version 20 was used for statistical analysis of the collected data.

#### RESULTS

The study comprised of 92 children with ID and their parents (both father and mother).

##### (1) Description of Children :

The median age of children was 9.00 years, mean 11.34 years and Standard Deviation 5.07. Among the whole population 62% (n=57) of children were male and 38% (n=35) were female. Median, Mean, Standard Deviation of IQ and disability percentage of the children were 80.00, 79.87, 11.28 and 50, 38.83, 11.39 respectively. Among all children, 8 (8.7%) children had 50% or minor disability, 35 (38.04%) children had 75% or moderate disability and 49 (53.06%) children had 90% or severe disability (Table 1).

##### (2) Behavioral Disturbances of the Children :

Behavioral problem of the children in the current study were assessed by BASIC MR Part A and Part B. The distribution of scores across seven sub domains of BASIC MR Part A and Part B is described in Table 2.

Table 1 — Distribution of Age, IQ and Disability percentage of the Children (N=92)

Variables	Median	Mean	Standard Deviation (SD)
Age (in years)	9.00	11.34	5.07
IQ	80.00	79.87	11.28
Disability	50	38.83	11.39

Table 2 — Distribution of the Scores of BASIC-MR of the Children (n=92)

	Part A (domain wise scores)							Part B (composite score)
	Domain 1	Domain 2	Domain 3	Domain 4	Domain 5	Domain 6	Domain 7	
Mean	105.79	113.13	118.48	58.69	50.15	58.05	41.99	14.60
Median	108.00	110.50	113.50	52.50	53.00	48.00	29.00	10.00
SD	46.02	51.09	95.87	40.41	32.48	42.15	42.13	12.14

### (3) Description of Parents and their Families :

The median age of the fathers who participated in the study was 50.00 years, mean 51.00 years, Standard Deviation 8.85. The median age of mothers was 45.00 years, Mean 44.32 years, Standard Deviation 8.65. Among the families 71.7% (n=66) were nuclear and 28.3% (n=26) joint. Regarding socio-economic status, 46.7% (n=43) belonged to upper middle class, followed by lower middle (n=35, 38%), upper lower (n=10, 10.9%) and upper (n=4, 4.3%) according to Modified Kuppuswamy's classification.

### (4) Coping Mechanism among Parents :

The Brief Coping Scale doesn't yield any summary score. But for convenience of applying statistical tests the scores of 2 specific questions (which denote a specific type of coping mechanism, as per the scales) were added to calculate a score for each coping mechanism. Tables 3 show the distribution of these scores in 12 different areas of coping for both fathers and mothers.

## DISCUSSION

A cross-sectional observational study was done in a Tertiary Care Medical College in Kolkata to know the extent of disability and behavioral disturbances of the children with ID and coping mechanism of their parents.

With ID, the children have deficit in several domains in adaptive functions and different types of

behavioral disturbances in the form of stereotypes, aggression, and violence that might lead to injury to self, to others, or destruction of property etc<sup>31,32</sup>. These behaviors are detrimental not only to the person himself who exhibits such behavior but pose a challenge to their teachers and caregivers. A behavior becomes challenging when it is of such intensity, frequency or duration that it threatens the safety of self or others. It is likely to lead to restrictive or aversive responses and exclude social participation. Earlier studies from the west have found that ~10% of persons with ID manifest severe challenging behavior ranging from self-injury, destructiveness, aggression, and disruptive behavior<sup>33</sup>. When milder forms of behavioral problems such as verbal aggression and temper tantrums are included, the prevalence goes up to 22.5 to 55%<sup>34</sup>. A study from India reported that violent and destructive temper tantrums and self-injurious behavior among persons with ID vary according to its severity<sup>35</sup>.

In the current study, BASIC MR scores was used to assess the level of behavioral problem in these children. Part-A deals with skills behavior and higher score indicates higher skills behavior. It has 7 domains with 40 items each. The scoring is done from 0 to 5 so a maximum score that can be obtained by a child is 1400. The average BASIC MR-A score of the sample of current study was 569 with maximum score of 1281 and minimum score of 46. So, it can be understood that most of the children had average skill set but definite conclusion cannot be reached as it was a heterogeneous group. The BASIC MR, Part-B

score is the indicator of behavioral issues or undesirable behavior. Total 75 tests are done and scored from 0 to 2. So, the maximum score that a child scored is 150. In the current study sample the average score was around 15 with maximum score was 50 and minimum score was 0. Which indicates a low level of behavioral problem in this particular group with a wide variation that's not always corroborated with IQ level. But this study still shows that a significant number of behavioral problems is found in children with MR.

In the current study most of the parents had applied positive modes of coping such

Tables 3 — Distribution of scores of Brief Coping Scale of the parents (N=92)

Items of Brief Coping Scale	Fathers			Mothers		
	Mean	Median	SD	Mean	Median	SD
Self blame	3.14	2.00	1.43	3.11	3.00	1.48
Religion	3.97	4.00	1.72	3.62	3.00	1.65
Acceptance	6.89	7.00	1.57	6.43	7.00	1.78
Humor	2.23	2.00	0.79	2.13	2.00	0.54
Planning	5.82	6.00	1.65	5.57	6.00	1.83
Positive reframing	5.93	6.00	1.59	5.79	6.00	1.74
Venting	2.97	2.00	1.29	2.97	2.00	1.36
Instrumental support	4.87	5.00	1.85	4.68	5.00	1.88
Emotional support	4.63	4.00	1.72	4.27	4.00	1.76
Substance use	2.04	2.00	0.29	2.09	2.00	0.45
Behavioral disengagement	2.85	2.00	1.38	2.89	2.00	1.29
Active coping	6.13	6.00	1.77	6.04	6.00	1.93
Denial	2.92	2.00	1.82	2.80	2.00	1.64
Self distraction	4.03	4.00	1.76	3.82	4.00	1.56

as acceptance, positive refraining and active coping to combat against their stress out of caring their disabled children. Education level of both fathers and mothers of the current sample were reasonably high and most of them belonged higher socio-economic classes in reference to national average level. Similar observation was reported from other Indian study<sup>22</sup> where the association between higher education and use of healthy pattern of using coping strategies by the parents was also noted. Few other Indian research tried to study the gender difference among the parents in terms of perceived stress on account of the caregiving of children with developmental disabilities. In general, it was reported in the literature that the Indian fathers would perceive and cope to their stress more positive way than the mothers<sup>17</sup>. The difference in social role among the fathers and mothers in Indian society can explain this differential observation. However, in the current study no significant difference was observed among the parents in this regard. Current social reforms in the Bengali community and at large in the Indian society might be the possible explanation.

### CONCLUSION

Parents with children with ID having significant disability and behavioral disturbances were using their coping strategies well to combat against their stress, out of caregiving their disabled children, being comparable for both fathers and mothers in Indian community.

### Limitations :

It was a hospital-based study done in a metropolitan city on a relatively small study population. The current research was planned as a descriptive study. So, inferential statistics was not attempted which would have greater significance and larger clinical implications. Multicentric study with a large and variable sample is needed in future to explore the issue further.

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— Hony Editor

## Original Article

# Neutrophil to Lymphocyte Ratio (NLR) as an Inflammatory Marker in Predicting Severity in Acute Ischemic Stroke Patients

Deepti Sharma<sup>1</sup>, Gordhan Lal Nagar<sup>2</sup>, Narendra Fageria<sup>3</sup>, Anup Kumar Mangal<sup>4</sup>, Pawan Kumar<sup>4</sup>

**Background :** Inflammation plays an important role in Acute Ischemic Stroke (AIS). Chemokines and cytokines released from ischemic tissue and recruit peripheral circulating leukocytes mainly neutrophils into the brain which precipitate ischemic brain injury and increases stroke severity. Lymphocytes on the other hand represent the protective or regulatory component of inflammation which decreases due to increased release of cortisol in response to stress.

**Aims and Objectives :** To find the role of Neutrophil to Lymphocyte Ratio (NLR) in predicting the severity in patients of AIS.

**Materials and Methods :** This study included 100 patients of AIS admitted in Government Medical College and Hospitals, Kota with all relevant exclusion criteria. Peripheral blood sample was taken before initiating any treatment and CBC test was performed from which NLR was calculated. The ratio was then compared with healthy control group and also among patients of AIS .

**Results :** Mean value of NLR in AIS patients was 3.44 which was higher than NLR of control group which was 1.89 (p=0.001).

**Conclusion :** Thus, NLR is a cost effective, easy to calculate and newer inflammatory marker that can help in predicting severity of acute ischemic stroke score.

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**Key words :** Acute Ischemic Stroke (AIS), Neutrophil to Lymphocyte Ratio (NLR).

Hippocrates, the father of medicine, first recognized stroke over 2,400 years ago. At this time stroke was called apoplexy<sup>1,2</sup>. Stroke is the most common neurological disorder Worldwide and it is the most frequent of all the neurological disorders. Stroke is also known as Cerebrovascular Accident (CVA) derived from Greek word in the year 1599 which means 'StruckDown'<sup>3</sup>. It is the disease of developed nations.

According to the World Health Organization, 15 million people suffer from stroke worldwide every year. Of these, 5 million die and another 5 million are permanently disabled<sup>4</sup>.

Neutrophil to Lymphocyte Ratio (NLR) is an effortless and basic parameter that is readily obtained from the complete blood count, even in peripheral hospitals. Inflammation is regarded as a set of interactions between and among immune related cells such as lymphocytes, neutrophils which in turn lead to killing of tissues and destruction which is going on in stroke. One of the inflammatory markers in stroke

### Editor's Comment :

- The Neutrophil to Lymphocyte Ratio (NLR) is a simple, accessible, and cost-effective inflammatory marker. An elevated NLR on admission is associated with greater stroke severity, worse outcomes and increased risk of complications like infarct expansion and mortality. NLR can be used as an adjunct to traditional markers and imaging to help guide early risk stratification and management in acute ischemic stroke patients.

is NLR and also has its relationship between many diseases like, myocardial infarction, COPD, chronic renal failure etc<sup>5-7</sup>.

Inflammatory cascade following Acute Ischemic Stroke (AIS) is an important pathological process in damaged brain tissue. The inflammatory process in acute ischemic stroke involves cytokines and chemokines released from ischemic tissues, promoting the accumulation of leukocytes to the ischemic areas. Among circulating leukocytes, neutrophils have been regarded as crucial mediators of ischemic injury. Accumulated neutrophils release free oxygen radicals, various inflammatory cytokines, and neurotoxic substances, all of which cause cellular necrosis and apoptosis in ischemic tissues. Lymphocytes, a type of leukocyte, are also known to be involved in inflammatory responses to Acute Ischemic Stroke (AIS). Low lymphocyte counts increase sympathetic activity and baseline cortisol

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levels, which can cause an increase in the production of inflammatory cytokines that aggravate ischemic injury. Therefore, increased total White Blood Cell (WBC) and Leukocyte Counts and reduced lymphocyte counts are associated with poor outcomes in various cardiovascular diseases<sup>8</sup>.

Earlier researchers have studied Neutrophil to Lymphocyte Ratio (NLR) and Mean platelet Volume (MPV) as prognostic marker in acute ischemic stroke separately. But we would like to study the combined effect of NLR and MPV in patients of acute ischemic stroke as prognostic marker.

#### AIMS AND OBJECTIVES

To study Neutrophil to Lymphocyte Ratio (NLR) in patients of Acute Ischemic Stroke.

#### MATERIALS AND METHOD

The study was performed at the Government Medical College and attached groups of Hospitals Kota in year 2021-2022, after obtaining the approval of the Internal Ethical Committee of Government Medical College & Hospital, Kota and Informed written consent from all the patients considered for the study was procured before conducting the study.

**Study Design :** Hospital based prospective and observational study carried out on patients admitted and diagnosed as an Acute Ischemic Stroke.

**Study Place :** Department of medicine, Government Medical College & Associated Group of MBS Hospital, Kota (Rajasthan).

**Study Population :** patients with Acute Ischemic Stroke who had symptom onset within 7 days.

**Study Duration :** 2021-2022.

#### Inclusion Criteria :

(1) Patients of Age >18 years admitted in MBS Hospital, Kota diagnosed with Acute Ischemic Stroke

#### Exclusion Criteria :

- (1) Patients of Age <18 years.
- (2) Patients with other forms of stroke like ICH/SAH /post traumatic.
- (3) Patients with venous sinus thrombosis.
- (4) Serious ill/moribund patients.
- (5) Patients having hepatic or renal disease.
- (6) Systemic acute or chronic inflammatory or autoimmune or infectious disease, connective tissue diseases or prior myocardial infarction.
- (7) Individuals with missing data of lipid profile, monocyte count.
- (8) Pregnant patients.
- (9) Patient refusing to give informed consent for the study.

#### RESULT

Out of 100 subjects in the control group; 55 were males and 45 were females whereas in the study group of 100 subjects, 57 were males and 43 were females. Males were more than females with male to female ratio being 1.3:1. Thus, males are more prone to develop stroke as compared to female. The maximum number of patients were in the range of 50-59 years ie, 38 cases (38%) followed by in 60-69 years 35 cases (35%), in 70-79 years 15 cases (15%), in 40-49 years 8 cases (8%) and in  $\geq 80$  years of age group 4 cases (4%) so in 50-69 years cases 73%.

When the study group was compared on the basis of focal neurological deficit, maximum number of patients had either isolated left hemiparesis or isolated right hemiparesis amounting to 32% each. 17% of patients had right hemiparesis with cranial nerve palsy and 13% had left hemiparesis with cranial nerve palsy. Patients with the features of posterior circulatory stroke like vertigo, blurring of vision etc contributed 6% of the cases. ACS is 94% in compare to PCS is 6%.

Table 1 shows the comparison of control and study group on the basis of mean Neutrophil count at the time of admission. Mean Neutrophil count  $\pm$  SD of the cases in study group was  $4.472 \pm 1.1$  ( $10^3/\text{cu mm}$ ) which was higher than the mean value of  $3.4965 \pm 1.7$  ( $10^3/\text{cu mm}$ ) obtained in the control group and difference between the two was statistically significant with the p-value of 0.0001.

Table 2 shows the comparison of control and study group on the basis of mean total lymphocyte count. Mean Total lymphocyte count  $\pm$  SD of the cases in the study group was  $1.30 \pm 0.54$  ( $10^3/\text{cu mm}$ ) which was lower than the mean value of  $1.85 \pm 0.22$  ( $10^3/\text{cu mm}$ ) obtained in the subjects of control group and difference between the two values was statistically significant with the p-value of 0.0001.

Table 3 shows the comparison of control and study group on the basis of Neutrophil to Lymphocyte Ratio. Mean NLR  $\pm$  SD of all the cases in study group was  $3.44 \pm 2.56$  which was higher than the mean value of  $1.89 \pm 0.61$  obtained in the subjects of the control group

Table 1 — Comparison of Total Neutrophil Count in Control and Study Group

Neutrophil ( $10^3/\text{cu mm}$ )	Control group (n=100)	Acute Ischemic Stroke Group (n=100)
Mean	3.4965	4.472
SD	1.7	1.1
T	6.473	
P-value	0.0001	

Table 2 — Comparison of Total Lymphocyte Count in Control and Study Group

Total Lymphocyte count ( $10^3/\text{cu mm}$ )	Control group (n=100)	Study group (n=100)
Mean	1.85	1.30
SD	0.22	0.54
T	9.432	
P-value	0.0001	

Table 3 — Comparison of Neutrophil to Lymphocyte Ratio (NLR) Between Acute Ischemic Stroke Subjects and Control Subjects

Neutrophil-to-lymphocyte Ratio	Control Subjects (n=100)	Acute Ischemic Stroke Subjects (n=100)
Mean	1.89	3.44
SD	0.61	2.56
T	2.32	
P-value	0.021	

and the difference between the two values was statistically significant with the p-value of 0.021.

Table 4 depicts the comparison of Acute Ischemic Stroke group and control group on the basis of demographic and biochemical profile including risk factors. The Mean  $\pm$  SD of all subjects in control and Acute Ischemic Stroke study group was obtained including age ( $61.33 \pm 10.965$ ;  $60.79 \pm 13.86$ ) years,

Table 4 — Comparison of Demographic and Biochemical Profile Between Acute Ischemic Stroke Group and Control Group

Neutrophil-to-lymphocyte Ratio	Control Group (n=100)	Acute Ischemic Stroke Group (n=100)
Male (%)	55	57
Age (year)	$61.33 \pm 10.965$	$60.79 \pm 13.86$
Hypertension, n(%)	44	50
Smoker, n(%)	30	40
Alcoholic, n(%)	26	35
Diabetes mellitus, n(%)	25	36
HB (gm/dl), n(%)	$11.63 \pm 1.22$	$12.57 \pm 1.69$
B Glucose (mg/dL) (R)	$148.97 \pm 87.75$	$196.33 \pm 92.26$
B Urea (mg/dL)	$30.87 \pm 6.51$	$39.57 \pm 16.72$
S Creatinine (mg/dL)	$0.984 \pm 0.162$	$1.19 \pm 0.40$
Total cholesterol (mg/dL)	$190.2 \pm 31.29$	$198.48 \pm 62.71$
S Triglyceride (mg/dL)	$127.66 \pm 35.64$	$145.96 \pm 55.04$
Neutrophil count ( $10^3/\text{cu.mm}$ )	$3.4965 \pm 1.7$	$4.472 \pm 1.1$
Lymphocyte count ( $10^3/\text{cu.mm}$ )	$1.85 \pm 0.22$	$1.30 \pm 0.54$
Neutrophil to Lymphocyte Ratio	$1.89 \pm 0.61$	$3.44 \pm 2.56$

Table 5 — Distribution of Neutrophil Count, Lymphocyte Count and Neutrophil to Lymphocyte Ratio in Both Control and Study Group at the Time of Admission

	Control Group (Mean $\pm$ SD)	Study group at the Time of Admission (Mean $\pm$ SD)	t value	p value
Neutrophil Count ( $10^3/\text{cu.mm}$ )	$3.4965 \pm 1.7$	$4.472 \pm 1.1$	6.473	0.0001
Lymphocyte count ( $10^3/\text{cu.mm}$ )	$1.85 \pm 0.22$	$1.30 \pm 0.54$	9.432	0.0001
Neutrophil to Lymphocyte Ratio	$1.89 \pm 0.61$	$3.44 \pm 2.56$	2.32	0.021

Hb ( $11.63 \pm 1.22$ ;  $12.57 \pm 1.69$ ) gm/dl, B Glucose ( $148.97 \pm 87.75$ ;  $196.33 \pm 92.26$ ) mg/dl, B Urea ( $30.87 \pm 6.51$ ;  $39.57 \pm 16.72$ ) mg/dl, S Creatinine ( $0.984 \pm 0.162$ ;  $1.19 \pm 0.40$ ) mg/dl, Total cholesterol ( $190.2 \pm 31.29$ ;  $198.48 \pm 62.71$ ) mg/dl, Triglyceride ( $127.66 \pm 35.64$ ;  $145.96 \pm 55.04$ ) mg/dl, Neutrophil count ( $3.4965 \pm 1.7$ ;  $4.472 \pm 1.1$ )  $10^3/\text{cu mm}$ , Lymphocyte count ( $1.85 \pm 0.22$ ;  $1.30 \pm 0.54$ )  $10^3/\text{cu mm}$  and Neutrophil to Lymphocyte Ratio ( $1.89 \pm 0.61$ ;  $3.44 \pm 2.56$ ) respectively.

Table 5 clearly highlighted that the mean Neutrophil count, mean lymphocyte count and mean Neutrophil to mean Lymphocyte Ratio in study group was  $4.472 \pm 1.1 \times 10^3/\text{cu mm}$ ,  $1.30 \pm 0.54 \times 10^3/\text{cu mm}$  and  $3.44 \pm 2.56$  respectively which was higher than the mean control values of  $3.4965 \pm 1.7 \times 10^3/\text{cu mm}$ ,  $1.85 \pm 0.22 \times 10^3/\text{cu mm}$  and  $1.89 \pm 0.61$  respectively and the difference was statistically significant in both control and Acute Ischemic Stroke Study group with the p-value of 0.021.

## DISCUSSION

Atherosclerosis, especially intracranial atherosclerosis, is an intrinsic abnormality in the development of ischemic stroke. Inflammation and lipid abnormalities has been proposed as the main constituents of the pathophysiology of atherosclerosis development and progression.

In this study we evaluated mean Neutrophil to Lymphocyte Ratio (NLR) and Mean Platelet Volume (MPV) in patients of Acute Ischemic Stroke by comparing with age and sex matched control subjects. An attempt was made to find out the association between NLR and smoking, alcohol consumption, hypertension, diabetes mellitus. The Neutrophil to Lymphocyte Ratio (NLR) is a parameter of inflammation that is easy to obtain and has been proposed as an independent useful prognostic marker to predict the mortality and prognosis of some cardiovascular and neurologic diseases. Many studies have demonstrated that peripheral leucocyte levels increase following cerebrovascular ischemia and postulated that the initial peripheral leucocyte count following a stroke can help to predict stroke severity.

It has been supposed that the leucocyte count at the time of admission is predictive of the likelihood of AIS and the impact of any resulting neurologic disability on daily living activity.

100 patients of Acute Ischemic Stroke and 100 age and sex matched

control subjects were included in our study. Although the control subjects were free from Acute Ischemic Stroke, some of them were having risk factors for ischemic stroke and it can be expected that they represented a stage in the initiation and progression of ischemic stroke.

#### NLR and Acute Ischemic Stroke :

In our study, mean Neutrophil to Lymphocyte Ratio (NLR), which is obtained by dividing absolute Neutrophil count by Lymphocyte count, was  $3.44 \pm 2.56$  in Acute Ischemic Stroke patients, which was significantly higher than the mean NLR value of  $1.89 \pm 0.61$  obtained in control subjects. Another study by Celikbilek, *et al* 2013 showed that high NLR levels are associated with increased infarct volume and mortality.

The Neutrophil to Lymphocyte Ratio (NLR) is a parameter of inflammation<sup>4</sup> that peripheral leucocyte levels increase following cerebrovascular ischemia, and postulated that the initial peripheral leucocyte count following a stroke can help predict stroke severity. It has been supposed that the leucocyte count at the time of admission is predictive of the likelihood of AIS and the impact of any resulting neurologic disability on daily living activity .

#### NLR and Hypertension :

Hypertension is the major risk factor for Acute Ischemic Stroke in our study. We have tried to study the correlation between NLR and hypertension in both controls and cases. The NLR values of our cases were  $3.44 \pm 2.56$  in hypertensive patients and were  $3.25 \pm 1.95$  in non hypertensive patients. The NLR ratio in hypertensive controls and non-hypertensive controls were  $1.89 \pm 0.61$  and  $1.81 \pm 0.52$  respectively. This showed that there was a slight rise in values of NLR in hypertensive population but this was statistically non significant in our study.

A study conducted by Celik, *et al*<sup>9</sup>, found that the NLR values were significantly higher in the hypertensive group than in the control group. A similar finding was obtained in the study by Aydin, *et al*<sup>10</sup>. In their study found that NLR value was higher in hypertensive patients compared to controls and also added to their conclusion that asymptomatic organ damage in primary hypertension was higher in patients with high NLR values.

The statistically insignificant NLR value in hypertensive patients in our study may be due to the

fact that there may be some other risk factors of atherosclerosis like diabetes, smoking etc in the non hypertensive group too, which can cause a rise in their NLR value there by not making a statistically significant difference in NLR values between hypertensive and non-hypertensive group. Also in this study we have not considered the duration and control of hypertension which may also have interfered with the NLR value of the patients. Our study was conducted in a small group of 100 stroke patients, this low number of cases may have further influenced the observation.

#### CONCLUSION

NLR is a simple, cost effective and easily obtainable novel marker that may help in predicting the severity of disease as evidenced by its increased value in patients of acute ischemic stroke.

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## Original Article

# Microvascular Density of Invasive Breast Carcinoma as an Independent Prognostic Factor in Comparison with Already Established Ones : A Study from Northeast India

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**Background and Objectives :** Breast Carcinoma is the most common cancer in women Worldwide. This study was done to assess the tumour angiogenesis using CD34 immuno-reactivity and thereby see the relationship of the same with already established prognostic factors like age, histological type, tumour size, tumour grade (Modified Bloom Richardson Scoring System) and lymph nodal metastasis.

**Materials and Methods :** The 19 Breast Carcinoma cases included in this study were diagnosed in the Department of Pathology, Gauhati Medical College and Hospital within 1 year and Tumour Angiogenesis was assessed using CD34 immunoreactivity. The results were then compared with the already established prognostic factors.

**Results :** The relationship of MVD/HPF with tumour size, MBR tumour grade and lymph nodal metastases was found to be statistically significant at p-value <0.05. MVD/HPF with patient age was not statistically significant. Grade I & II IDC and medullary carcinoma had low MVD/HPF, whereas grade III IDC, metaplastic carcinoma and invasive papillary carcinoma had high MVD/HPF.

**Conclusion :** Tumour angiogenesis assessed by MVD/HPF following CD34 immunostaining can be used as a prognostic factor in Breast Carcinoma alongwith other known factors with more studies and standardized methods to calculate the MVD/HPF and can also be a potential targeted therapy with anti-angiogenic factors.

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**Key words :** Tumour Angiogenesis, Breast Carcinoma, Prognostic Factor.

**B**reast Carcinoma is the most common cancer in women worldwide, second only to lung cancer as a cause of cancer related deaths<sup>1</sup> with increasing prevalence in India<sup>2</sup>. It is seen in all age groups with peak incidence in 45-60 years age group<sup>3</sup>. For every two women affected by breast cancer in India, one is dying<sup>4</sup>. Breast cancers staged on the basis of tumour size, lymph nodal metastases and distant metastases seem to show different etiology and clinical behaviour even among those presenting in the same stage<sup>5</sup>. A number of prognostic factors, namely histologic type, tumour size, lymph node metastases, distant metastases, locally advanced disease, molecular subtype, ER/PR receptors, HER2 expression and proliferation rate (Ki-76 index) have been extensively studied and established. Recent studies suggest tumour angiogenesis (assessed by microvessel density) as an independent predictive and prognostic factor in breast carcinoma<sup>6</sup>.

### Editor's Comment :

- Microvascular Density (MVD) is an independent prognostic factor in invasive breast carcinoma and it has strong relationship with other prognostic factors. This new prognostic marker can be helpful for targeted therapy using antiangiogenic factor in future.

CD34 is an endothelial marker, sensitive to tumour angiogenesis representing the clear state of neovascularization during tumour growth<sup>7</sup>. Previous studies have suggested the importance of CD34 in cancer prognosis<sup>8</sup>. Some studies have, however, denied this association<sup>9</sup>. So, this study was done to assess tumour angiogenesis using CD34 immunostaining to see the relationship of tumour angiogenesis with other prognostic parameters.

### MATERIALS AND METHODS

This hospital-based cross-sectional study was conducted in the surgical specimens obtained in the Department of Pathology, Gauhati Medical College and Hospital, Guwahati in a one-year period.

**Inclusion Criteria :** All invasive Breast Carcinoma, irrespective of age and sex.

**Exclusion Criteria :** All in-situ Breast Carcinoma. The specimens were subjected to macroscopic examination, followed by histopathological

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examination and immuno-histochemistry with CD34. Microvessel Density (MVD) was calculated in the tumour sections by the technique developed by Weidner, *et al* and mean MVD per high power field (MVD/HPF) was calculated which was found to be 11.7. Any value lower than the mean was regarded as "low MVD" and any value above the mean was regarded as "high MVD". The p-value was calculated using Chi-square method and p-value <0.05 was considered as statistically significant.

**RESULTS**

Most common age group of the patients studied was 50-59 years (42.1%), followed by 40-49 years age group (21%). IDC was the most common histological type (78.9%). Most tumours were of MBR grade III (57.9%) with tumour size >5cm (T3) (57.9%). Lymph nodal metastases was seen in majority of the cases (73.6 %).

All the 19 cases were divided into high and low based on microvessel density/ HPF with respect to tumour angiogenesis based on CD34 immunoreactivity. The relationship between tumour angiogenesis with patient age, histological type, MBR score, tumour size and lymph nodal metastases was analyzed.

Most of the cases were IDC (15 out of 19). IDC and Medullary carcinoma mostly showed low MVD/HPF, whereas the high grade ones like metaplastic carcinoma, sarcoma and invasive papillary carcinoma had high MVD/HPF (Tables 1-5)(Figs 1-4).

**DISCUSSION**

In this study, statistically significant relation (p<0.05) was noted between MVD/HPF and MBR tumour grade, tumour size and lymph nodal metastases. Similar findings were noted in studies done by Pyakurel, *et al*<sup>10</sup>, Kwatra, *et al*<sup>11</sup>, Bhawna Agnani, *et al*<sup>12</sup> and Horak, *et al*<sup>13</sup>.

No statistical significance was noted between patient age and MVD/HPF in this study, which could be compared to studies done by Ebru, *et al*<sup>14</sup> and Wang G, *et al*<sup>15</sup>.

So, it has been observed that tumour angiogenesis assessed by MVD/HPF following CD34 immunostaining has a strong relationship with tumour size, MBR tumour grade and lymph nodal metastases. Thus,

MVD / HPF	Age Groups						
	20-29	30-39	40-49	50-59	60-69	70-79	80-89
Low (<11.7)	0	2	3	6	0	0	0
High (>11.7)	1	1	1	2	1	1	1
Total	1	3	4	8	1	1	1

The p-value >0.05

MVD / HPF	Histological Type				
	IDC	Medullary	Metaplastic	Sarcoma	Invasive papillary
Low (<11.7)	10	1	0	0	0
High (>11.7)	5	0	1	1	1
Total	15	1	1	1	1

MVD / HPF	MBR Grade		
	Grade I	Grade II	Grade III
Low (<11.7)	2	6	3
High (>11.7)	0	0	8
Total	2	6	11

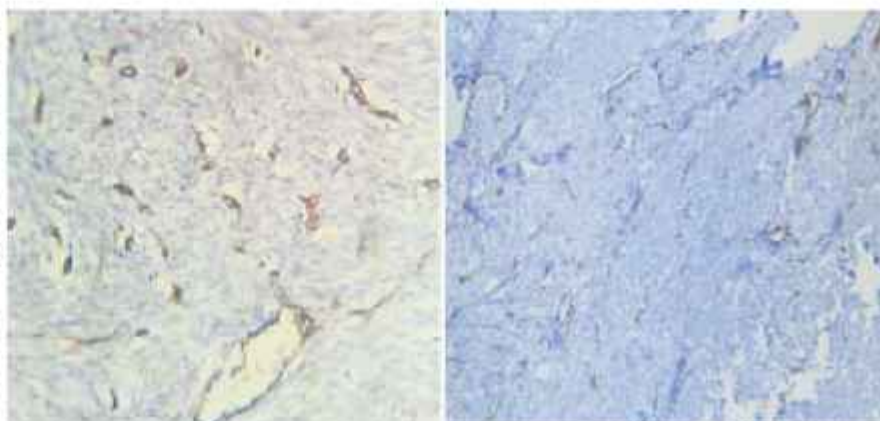
The p-value <0.05.

MVD / HPF	Tumour size		
	T1 (<2 cm)	T2 (2-5 cm)	T3 (> 5 cm)
Low (<11.7)	1	4	1
High (>11.7)	0	3	10
Total	1	7	11

p=0.02.

MVD/HPF	Lymph nodal metastases	
	Present	Absent
Low (<11.7)	3	4
High (>11.7)	11	1
Total	14	5

p=0.01.



Figs 1 & 2 — Breast Carcinoma with High Microvessel Density after CD34 immuno-staining, IHC Staining CD34, 10X10

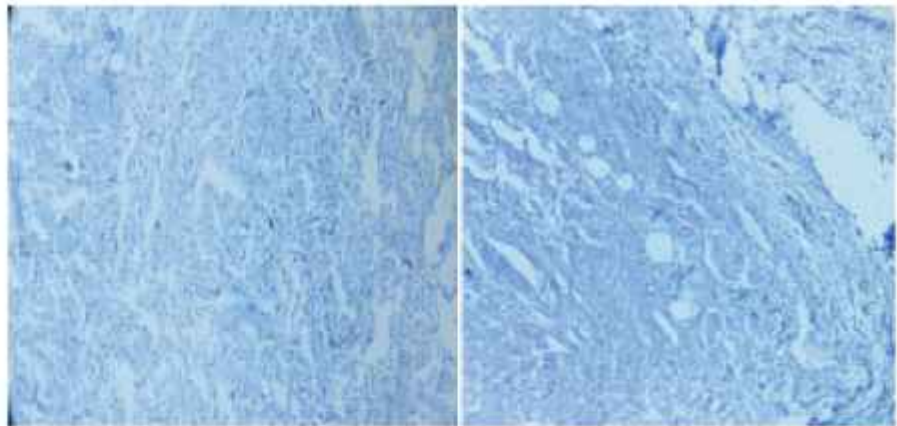
tumour angiogenesis can be used as a specific prognostic marker in breast carcinoma.

#### CONCLUSION

Breast Carcinoma continues to carry its havoc inspite of the tragic fact that it occurs in an exposed organ accessible to self-examination and continuous high clinical surveillance. With larger number of samples, newer prognostic parameters like tumour angiogenesis and more detailed studies on targeted therapies with anti-angiogenic factors, we will hopefully be able to treat and manage cases of Breast Carcinoma in better ways in the upcoming future.

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Figs 3 & 4 — Breast Carcinoma with Low Microvessel Density after CD34 Immuno-staining. IHC Staining CD34, 10X10

## Original Article

# Comparative Analysis of Sensitivity and Specificity of Creatinine Kinase MB and Cardiac Troponin I for the Diagnosis of Acute Myocardial Infarction

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**Background :** Early diagnosis is of crucial importance for the successful management of individuals with Acute Myocardial Infarction and is one of the leading causes of mortality and morbidity. We aimed to determine the sensitivity and specificity of two markers commonly used in our institution to diagnose patients with complaints indicative of Acute Myocardial Infarction.

**Material and Methods :** Patients admitted to the tertiary care center with complaints of chest pain were screened. Creatine Kinase Myoglobin Binding (CKMB) and Cardiac Troponin I (cTnI) were performed by following standard protocols. Depending upon the onset of chest pain subjects were divided into two groups, Group 1 : Within 24 hours of chest pain, Group 2 : Within 24-72 hours of chest pain. They were subdivided based on a diagnosis of MI. Results were used to calculate the specificity and sensitivity of CKMB, cTnI, and CKMB and cTnI together.

**Results :** Total of 368 patients were studied. Majority of them were >60 years of age. Of these, 133(36%) had confirmed diagnosis of MI. CKMB is more sensitive (82.19%) within 24 hours of MI but after 24 hours sensitivity decreases to (57.53%). CKMB is specific after 24 hours of MI (92.26%) compared to within 24 hours of MI (65.81%) whereas, cTnI is more specific (95.00%) after 24 hours.

**Conclusion :** For the diagnosis of Acute Myocardial Infarction (AMI), CKMB is more sensitive and cTnI is more specific, therefore it will be better if we perform cTnI rapid card test in combination with CKMB.

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**Key words :** CKMB, cTnI, Acute Myocardial Infarction, Sensitivity, Specificity.

Myocardial infarction, the most serious side effect of Coronary Artery Disease, results from an abrupt thrombotic process that alters the perfusion balance between supply and demand within the coronary arteries<sup>1,2</sup>. Acute Myocardial Infarction (AMI) has a significant chance of being diagnosed early, which could save or extend a patient's life<sup>3</sup>. The American Heart Association advises that choosing the best treatment plans in the Emergency Department (ED) requires accurate 30-minute preferred turn around time for the identification of cardiac biomarkers from the complex biological fluid<sup>4</sup>. Cardiac biomarkers play an important role in the detection of Acute MI when the patient's history and Electrocardiogram (ECG) are non-diagnostic or equivocal<sup>5</sup>. Cardiac troponin-I (cTnI), the gold

### Editor's Comment :

- There is a good probability that Acute Myocardial Infarction will be identified early, which could prolong or preserve a patient's life. When the patient's history and Electrocardiogram are non-diagnostic or ambiguous, cardiac biomarkers play crucial role in identification of Acute Myocardial Infarction.
- The most accurate is cTnI, which is the gold standard for identifying myocardial damage, as CKMB and cTnI are often administered to patients with symptoms suggestive of acute myocardial infarction, this study looked into their sensitivity and specificity for the better diagnosis of Acute Myocardial Infarction.

standard for detecting myocardial injury, is a highly specific biomarker to AMI<sup>6</sup>.

Traditionally, patients presenting with chest pain had their myocardial health assessed using the enzymes such as Creatinine Kinase (CK), Lactate Dehydrogenase (LDH) and Aspartate Aminotransferase (AST). These indicators were sensitive to cellular death but not specific to myocardial damage. Later, serum myoglobin levels and the Myocardial Band (MB) isoform of Creatine Kinase (CK-MB) were used to improve diagnosis and increase specificity for heart injury. The most used biomarker for the identification of myocardial necrosis over the past two decades is the

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assessment of serum troponin levels<sup>7</sup>. This study sought to investigate the sensitivity and specificity of CKMB and cTnI for the diagnosis of AMI because they are frequently performed in patients with complaints indicative of AMI.

#### MATERIALS AND METHODS

This retrospective study was performed at the SSG Hospital, Medical College Baroda between the months of December, 2018 and April, 2019. Patients who complained of chest pain were evaluated based on pre-determined criteria. Patients who underwent CKMB and cTnI between 24 to 72 hours of experiencing chest discomfort were included. They were managed according to standard protocol. Those who agreed to participate signed an informed written consent. CKMB and cTnI were done within 24 hours of the chest discomfort to calculate sensitivity, specificity, predictive value of positive test and negative test of these markers. Ethical Clearance was not applicable as this was the retrospective study done for poster presentation at the 15th Asia-Pacific Federation for Clinical Biochemistry and Laboratory Medicine Congress (APFCB) in 2019 and it was not mandatory at that period.

Thorough medical history of the individual with CKMB and cTnI data was obtained. CKMB and cTnI was performed within 24 hours of onset of chest pain and between 24 to 72 hours of chest pain by Immuno-Inhibition by blend of monoclonal antibody and chromatographic immunoassay fast card test respectively.

Depending upon the final diagnosis, patients were divided into two groups.

- i) Group 1: Within 24 hours of chest pain
- ii) Group 2: Within 24-72 hours of chest pain

They were further subdivided based on onset of chest pain.

- i) Patients with confirmed diagnosis of MI (n=133)
- ii) Patients without MI (n=235)

#### Statistical Analysis :

Data of CKMB and cTnI of all MI positive and MI negative patients were collected and

Sensitivity, Specificity, Positive Predictive Value and Negative Predictive Value of test (NPV) were calculated using following formula;

$$\text{Sensitivity} = \text{TP} / (\text{TP} + \text{FN}) * 100$$

$$\text{Specificity} = \text{TN} / (\text{TN} + \text{FP}) * 100$$

$$\text{Predictive Value of Positive test (PPV)} = \text{TP} / (\text{TP} + \text{FP}) * 100$$

$$\text{Predictive Value of Negative test (NPV)} = \text{TN} / (\text{FN} + \text{TN}) * 100$$

#### OBSERVATION AND RESULTS

A total 368 patients were enrolled with the complaint of chest pain in emergency. Majority of them were >60 years of age. The Age and Gender distribution is shown in Table 1.

In our study, we found that the complaint of chest pain was more in male as compared to females. Also the complaint of chest pain increased with the age, subjects upto 40 years were lower compared to subjects more than 60 years.

Of the enrolled patients, 133 had confirmed diagnosis of MI. CKMB and cTnI were performed in these subjects and the results were plotted in 4x2 table.

Table 2 represents the values of these tests within 24 hours of onset and Table 3 represents the values of these tests within 24 to 72 hours on onset.

Table 2 shows subjects within 24 hours of onset of chest pain; only 73 were with MI positive and 155 were MI negative. Out of these CKMB found positive in 113 subjects whereas in 115 subjects CKMB was negative. In addition to this cTnI found positive in 54 subjects and negative in 173 subjects.

Table 3 shows only 60 were with MI positive and 80 were MI negative. Out of these CKMB found positive in 85 subjects whereas in 55 subjects CKMB was negative. In addition to this cTnI found positive in 19 subjects and negative in 121 subjects.

Further, we calculated the sensitivity and specificity performed in both study Groups and represented in Table 4.

Table 4 shows the comparison of sensitivity, specificity, PPV and NPV of CKMB and cTnI within 24 hours of MI and within 24-72 hours of MI with 95% of CI.

Fig 1 shows that CKMB is more sensitive (82.19%) within 24 hours of MI but after 24 hours the sensitivity decreases to (57.53%). In addition to this CKMB is specific after 24 hours of MI (92.26%) compared to within 24 hours of MI (65.81%). On other hand cTnI is not sensitive but more specific (95.00%) after 24 hours.

#### DISCUSSION

Myocardial infarction is the main cause of

Table 1 — Age and Gender Distribution

Age	Males	Females
Upto 40 years	9	3
40-50 years	23	18
51-60 years	34	28
> 60 years	136	117
Total (n=368)	202	166



MI Positive n=73	Onset	CKMB>24 IU/L (TP)	CKMB<24 IU/L (FN)	cTnl Positive (TP)	cTnl Negative (FN)
	Within 24 hours	60	13	42	31
MI Negative n=155	Onset	CKMB>24 IU/L (FP)	CKMB<24 IU/L (TN)	cTnl Positive (FP)	cTnl Negative (TN)
	Within 24 hours	53	102	12	143

MI : Myocardial Infarction, ICCU : Intensive Coronary Care Unit,  
CKMB : Creatine Kinase Myoglobin Binding, cTnl : Cardiac Troponin I, TP : True Positive,  
FP : False Positive, TN : True Negative, FN: False Negative

MI Positive n=60	Onset	CKMB>24 IU/L (TP)	CKMB<24 IU/L (FN)	cTnl Positive (TP)	cTnl Negative (FN)
	24-72 hours	38	22	15	45
MI Negative n=80	Onset	CKMB>24 IU/L (FP)	CKMB<24 IU/L (TN)	cTnl Positive (FP)	cTnl Negative (TN)
	24-72 hours	47	33	4	76

MI : Myocardial Infarction, ICCU : Intensive Coronary Care Unit,  
CKMB : Creatine Kinase Myoglobin Binding, cTnl : Cardiac Troponin I, TP : True Positive,  
FP : False Positive, TN : True Negative, FN: False Negative

morbidity and mortality Worldwide. An acute ST-Elevation Myocardial Infarction (STEMI) affects more than 3 million people annually, while non-ST-elevation Myocardial Infarction (NSTEMI) affects more than 4 million. NSTEMI and unstable angina are identical. Cardiovascular indicators, however, are not increased<sup>10-12</sup>. The WHO states that at least two of the following three criteria must be met in order to diagnose MI : (1) a history of chest discomfort of the ischemia variety (2) progression on successive electrocardiograms (3) changes in the serum cardiac marker levels. The examination of serial cardiac indicators is currently the cornerstone of these diagnostic criteria<sup>13</sup>. The Acute Myocardial Infarction consequences peak in the first few hours<sup>14</sup>. Early MI diagnosis and treatment are essential for preventing myocardial damage and maintaining heart function<sup>15</sup>. Cardiac troponin and creatine kinase-MB isoform are two popular biomarkers used to diagnose Acute Myocardial Infarction.

Cytoplasmic CK is a M and/or B subunit-containing dimer that associates to generate the isoenzymes CK-MM, CK-MB and CK-BB<sup>16</sup>. Following myocardial injury, serum total CK activity and CK-MB concentration rise together, beginning to climb 4-6 hours after the damage, reaching peak serum concentrations after 12-24 hours, and reverting to baseline after 48-72 hours. Compared to serum total CK, which may be increased in many diseases where skeletal muscle is injured, serum CK-MB is far more specific for myocardial injury<sup>17</sup>. Therefore, CK should only be used in conjunction with other more precise cardiac markers to diagnose myocardial damage.<sup>[18]</sup>

The regulation of striated and cardiac muscle contraction is carried out by the troponin complex components; TnC, TnI, and TnT<sup>16</sup>. Troponin C is not highly selective for myocardial damage since its isoforms in skeletal and cardiac muscle are similar<sup>19,20</sup>. Troponin I has not been isolated from skeletal muscle and is very selective for the cardiac muscle. It is the excellent marker of myocardial damage because of its extreme specificity<sup>21</sup>. After myocardial damage, they are released into the bloodstream 6-8 hours later, reach their peak at 12-24 hours and then remain high for 7-10 days<sup>22</sup>. The only drawback is the late clearance of cTn, which makes it challenging to detect a recurrence of myocardial infarction<sup>23</sup>.

Finding the best and clear cardiac biomarker for evaluating AMI has always been an actively debated issue in research. Despite being more cardiospecific, new diagnostic assays were shown to have lower diagnostic efficacy when compared to the gold standard CK-MB<sup>5</sup>. The purpose of the current study

Statistics	Within 24 hours				24-72 hours			
	CKMB	95% CI	cTnl	95% CI	CKMB	95% CI	cTnl	95% CI
Sensitivity	82.19%	71.47% to 90.16%	57.53%	45.41% to 69.03%	63.33%	49.90% to 75.41%	25.00%	14.72% to 37.86%
Specificity	65.81%	57.77% to 73.23%	92.26%	86.87% to 95.94%	41.25%	30.35% to 52.82%	95.00%	87.69% to 98.62%
PPV	53.10%	43.48% to 62.55%	77.78%	64.40% to 87.96%	44.71%	33.91% to 55.89%	78.95%	54.43% to 93.95%
NPV	88.70%	81.45% to 93.84%	82.18%	75.68% to 87.56%	60.00%	45.91% to 72.98%	62.81%	53.56% to 71.42%

CKMB : Creatine Kinase Myoglobin Binding, cTnl : Cardiac Troponin I, PPV : Positive Predictive Value, NPV : Negative Predictive Value

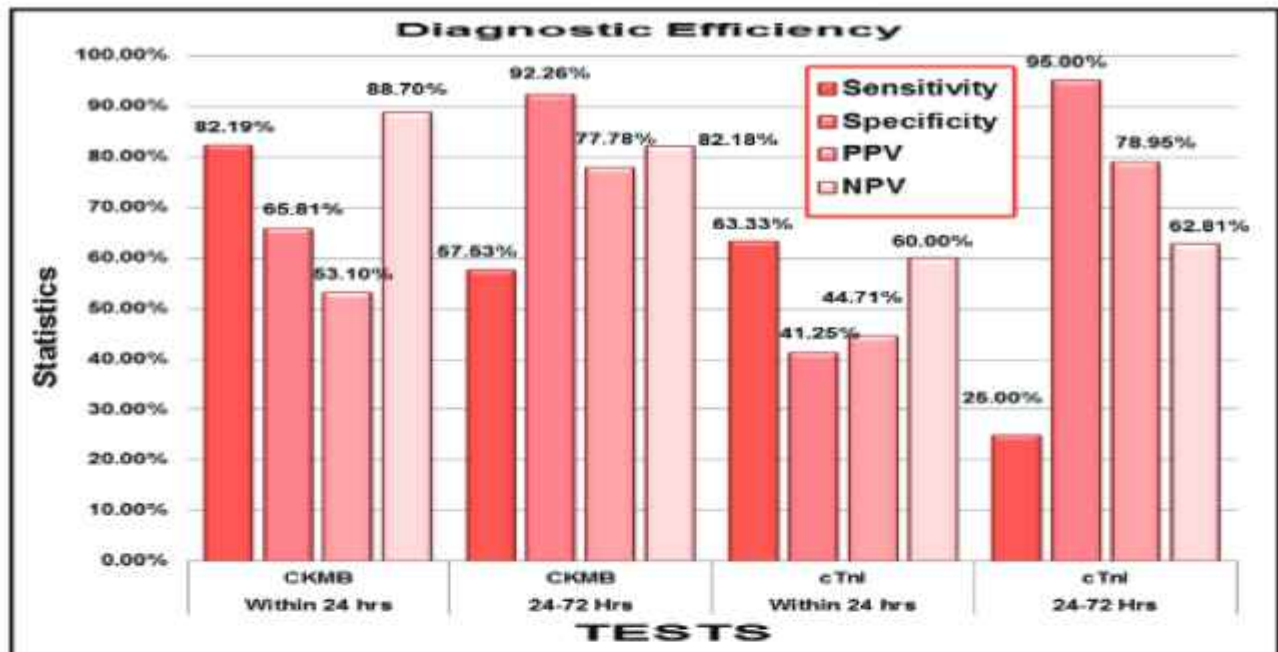


Fig 1 — Comparison of sensitivity, Specificity, PPV, and NPV between CKMB, cTn I and Combined CKMB with cTnI

is to evaluate the diagnostic performance of cardiac Troponin-I and CKMB for detecting acute MI in patients as soon as they arrive in the emergency room.

In 2000, Cardiac Troponin took CK-MB's status as the preferred biomarker for identifying myocardial infarctions<sup>24</sup>. The early clearance aids in the identification of reinfarction, is the only advantage of CKMB over Troponin. To diagnose myocardial infarction, the serum troponin level and CK-MB fraction level are therefore measured<sup>25</sup>.

In this study, the serum troponin level is measured for the diagnosis of myocardial infarction, the level of the CK-MB fraction is measured. We found CKMB is more sensitive (82.19%) while cTnI is more specific (92.26%). Compare to the study done by PS Mahalakshmi and PS Babu found that for cTnI the sensitivity and specificity was 96% and 98%<sup>7</sup> which was higher than our results and for CKMB the sensitivity and specificity was 62% and 68% which was lower than our results. Sharbari Basu, et.al. found that cTnI was 100% specific<sup>6</sup>, in our study it is 92.25% specific while CK-MB was a more sensitive marker in diagnosis of AMI.

#### CONCLUSION

In developing countries early diagnosis is crucial since AMI is the primary cause of mortality and morbidity. Serum cardiac biomarkers analysis is currently the mainstay of MI diagnosis. A serum

cardiac marker should be very sensitive and highly specific in order to accurately diagnose MI.

When compared to cTnI, the current investigation discovered a statistically extremely significant rise in CKMB levels in participants who had MI at the time of admission to the emergency department. High specificity (92.26%) and PPV (77.78%) were displayed by cTnI. It is the earliest marker for the confirmation and exclusion of acute MI within 24 hours after the infarction, in addition to the specificity increases after 24-72 hours of MI (95.00%).

In conclusion, It was found that CKMB, when compared to cTnI, is a more sensitive marker and a superior diagnostic accuracy for the identification of AMI, especially in the first 24 hours after an episode of AMI whereas cTnI is more specific.

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## Original Article

# Prevalence of Depression and Anxiety among Elderly Patients Visiting Tertiary Care Hospital

Samreen Kour<sup>1</sup>, Manmeet Singh<sup>2</sup>, Parul Gupta<sup>3</sup>, Raghav Arora<sup>4</sup>, Urvi Gupta<sup>5</sup>

**Background :** Among the elderly population, the most common psychiatric conditions include depression and anxiety, which often go untreated or unrecognized, owing to the lack of knowledge and misperceptions about these conditions. As the rise in ageing population is the current trend all over the World, these morbidities may result in decreased Quality of Life among elderly population if left untreated.

**Materials and Methods :** The study was conducted at Tertiary Care Hospital ASCOMS on 90 cases above 60 years of age. Data was collected by doing face to face interviews using Geriatric Depression Scale -10 and Geriatric Anxiety Scale-10.

**Results :** The mean age of the participants was 71.8±8.2 years. Most of the participants were Males (54.4%), 85.6% were physically independent and 81.1% had some physical problems. Regarding depression, 16.7% had mild Depression, 18.9% had moderate depression followed by 5.5% with severe Depression. Whereas, 7.8% had severe symptoms of anxiety. The anxiety and depression were significantly correlated with companion of living, education status, physical dependency and co-morbid physical problem.

**Conclusion :** Elderly cases have symptoms of depression and anxiety. Having physical health problems, being physically dependent are likely to result in poor psychological health in elderly. There is a need to recognize the mental health problem of elderly in community settings.

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**Key words :** Anxiety, Depression, Elderly, Psychiatric Conditions.

Ageing is an inevitable developmental phenomenon bringing along a number of changes in the physical, psychological, hormonal and the social conditions. The aged become increasingly dependent on others. As man grows, his reduced activities, income and consequent decline in the position of the family and society makes his life more vulnerable. An old person begins to feel that even his children do not look upon him with that degree of respect, which he used to get some years earlier. The old persons feel neglected and humiliated. This may lead to the development of psychology of shunning the company of others. Ageing begins with conception and terminates with death<sup>1</sup>.

Senior citizens are at risk of developing mental and physical health problems and are particularly vulnerable to major depressive episodes and also suffer from co-morbid anxiety disorders. Depression

### Editor's Comment :

- Anxiety and Depression is common among elderly patients. It is important to screen the patients with mental health issues in other medical speciality so that they can be appropriately referred to mental health professional for better care and management

and anxiety are the most common mental health problems and were identified as leading contributors to global disability<sup>2</sup>. Together with modernization, elderly in Asian countries also is living alone and are vulnerable to mental health. In such context, identification and treatment of mental health problems in older adults has become increasingly important<sup>3</sup>.

Depression is a major mental health problem, which is yet to be recognised as an important public health challenge. About 322 million persons are affected by Depression Worldwide<sup>4</sup>. Depression is single largest contributor to the global disability (7.50%, 2015) and suicides (about 8,00,000 annually)<sup>5</sup>.

In India, the elderly persons (above 60 years) constitute 8.60% of total population (Census 2011), which is expected to reach 19.0% by 2050<sup>6</sup>. Therefore, Depression among the elderly population is a major cause of the disease burden in future. Female gender, chronic morbidity, ignorance of elderly in household decision making, day-time spending without the work or hobbies and death of the close

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relatives were identified as the significant risk-factors of Depression in elderly<sup>7</sup>. With this background, this study has been taken up with the objective to assess and compare Depression and anxiety among the elderly people.

#### MATERIALS AND METHODS

It is a cross-sectional study. This study included 90 patients with age above 60 years both, Males and Females and providing informed consent were included in the study.

The present study was conducted at tertiary care hospital. Data was collected from elderly patients attending Tertiary Care Hospital and was screened for Depression and Anxiety.

Convenience sampling technique was used to obtain the sample. Appropriate ethical clearance was obtained from the Institutional Ethics Committee and measures were undertaken to maintain confidentiality of caregivers throughout the study and also during the analysis of data. All participants were fully informed about the purpose of the study. Written informed consent was obtained from each participant after the consent form was read by the participants. The consent form was in Hindi and in English and it stated that the participation was completely voluntary and that the participant could withdraw at any time from the study. Confidentiality was maintained throughout the study.

#### Inclusion Criteria :

- Patients above 60 years of age.
- Both genders and providing informed consent.

#### Exclusion Criteria :

- Patients with history of psychiatric illness / Dementia.
- Patients not giving informed consent and were too ill to be assessed.

#### Socio Demographic Data :

This arranged format was used to assess the variables of socio-demographic profile such as sex, age, marital status, religion, income, locality and type of family.

Geriatric Depression Scale (GDS-10) as mentioned by Yesavage J, *et al*<sup>8</sup> was used as the study proforma. It was transformed into local vernacular language. The severity of anxiety was assessed using Geriatric Anxiety Scale (GAS). GAS was developed by Segal and colleagues in 2010. The GAS investigates three dimensions of anxiety, namely Somatic, Cognitive, and Affective ones and this factorial structure has been confirmed in recent research<sup>10</sup>.

#### Statistical Analysis :

Microsoft Excel was used in creating the database and producing graphs, while the data was analysed using the Statistical Package for the Social Sciences (SPSS) version 23 for Windows<sup>11</sup>. Mean and Standard Deviation ( $\pm$ SD) were used to describe quantitative data meeting normal distribution. Continuous two independent groups were compared by parametric independent Student's t test. Discrete (categorical) groups were compared by chi-square ( $\chi^2$ ) test was used. P values less than 0.05 ( $p < 0.05$ ) was considered statistically significant.

#### OBSERVATIONS AND RESULTS

In present study the majority of the studied cases were in the age group ranging from 61-70 years (57.8%) with mean age 71.8 $\pm$ 8.2 years and slight male pre-dominance (54.4%).

In 16.7% were having mild Depression, 18.9% with moderate Depression and 5.5% with severe Depression. 78.8% were having minimal to mild anxiety followed by 13.3% with moderate anxiety level and 7.8% were having severe anxiety. Depression and anxiety were significantly higher in those elderly people who were living alone, having physical health issues, need support and feel difficult to walk even with support and whose educational status is very low ( $p < 0.05$ )(Tables 1-4 & Figs 1-2).

Table 1 — Demographics and Clinical Characteristics of study participants

Variables	No of cases (n=90)	Percentage
<b>Age in years :</b>		
61-70	52	57.8
71-80	31	34.4
>80	7	7.8
<b>Mean Age</b>	71.8 $\pm$ 8.2	
<b>Gender :</b>		
Male	49	54.4
Female	41	45.6
<b>Living Companion :</b>		
Family	61	67.8
Husband Wife only	22	24.4
Alone	7	7.8
<b>Having Physical health issues :</b>		
Yes	73	81.1
No	17	18.9
<b>Physical Dependency :</b>		
Independent	77	85.6
Need support	9	10.0
Difficult to walk even with support	4	4.4
<b>Educational Status :</b>		
Illiterate	10	11.1
Primary	21	23.3
Secondary	29	32.2
Higher School	11	12.2
Graduate	19	21.1

**Table 2 — Prevalence of Depression and Anxiety in elderly patients**

Mental Health		No. of cases (n=90)	Percentage
Depression	Normal	53	58.8
	Mild	15	16.7
	Moderate	17	18.9
	Severe	5	5.5
Anxiety	Minimal	4	4.4
	Mild	67	74.4
	Moderate	12	13.3
	Severe	7	7.8

**Table 3 — The association between Depression and Independent variables among the study participants**

Variables	Depression		p-value
	No (n=53)	Yes (n=37)	
<b>Age in years :</b>			
61-70	36	16	0.083
71-80	13	18	
>80	4	3	
<b>Gender :</b>			
Male	33	16	0.075
Female	20	21	
<b>Living Companion :</b>			
Family	39	22	0.039
Husband Wife only	13	9	
Alone	1	6	
<b>Having Physical health issues :</b>			
Yes	47	26	0.028
No	6	11	
<b>Physical Dependency :</b>			
Independent	50	27	0.017
Need support	2	7	
Difficult to walk even with support	1	3	
<b>Educational Status :</b>			
Illiterate	2	8	0.002
Primary	7	14	
Secondary	13	16	
Higher School	3	8	
Graduate	16	3	

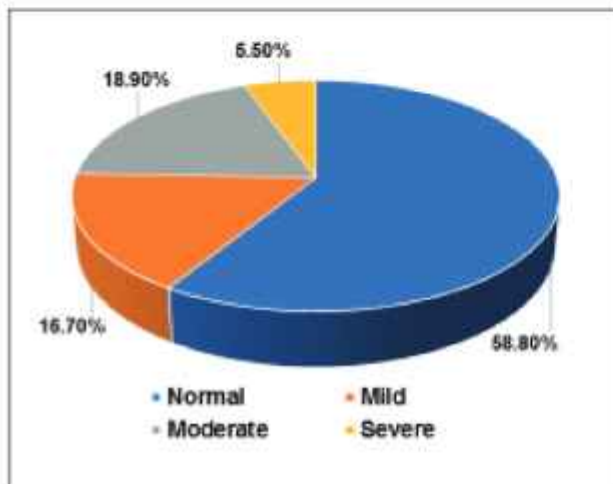


Fig 1 — Prevalence of depression in study participants.

**Table 4 — The association between Anxiety and Independent variables among the study participants**

Variables	Anxiety		p-value
	Minimal to Mild (n=71)	Moderate to Severe (n=19)	
<b>Age in years :</b>			
61-70	45	11	0.289
71-80	22	9	
>80	4	3	
<b>Gender :</b>			
Male	39	10	0.858
Female	32	9	
<b>Living Companion :</b>			
Family	58	3	<0.001
Husband Wife only	11	11	
Alone	2	5	
<b>Having Physical health issues :</b>			
Yes	55	18	0.048
No	16	1	
<b>Physical Dependency :</b>			
Independent	67	10	<0.001
Need support	3	6	
Difficult to walk even with support	1	3	
<b>Educational Status :</b>			
Illiterate	4	6	0.014
Primary	12	9	
Secondary	27	2	
Higher School	10	1	
Graduate	20	1	

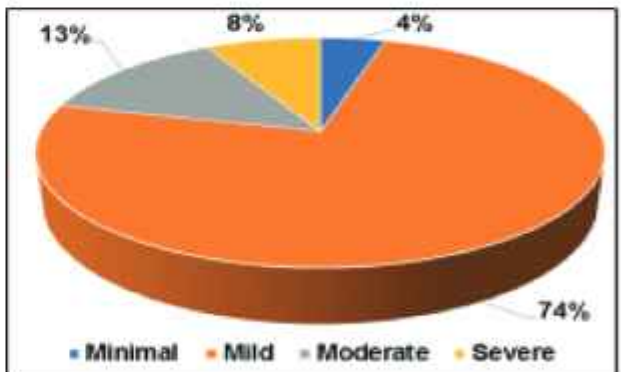


Fig 2 — Prevalence of Anxiety in study participants

**DISCUSSION**

Psychiatric morbidity is one of the domains which can significantly influence the Quality of Life of elderly people. Because depression and anxiety are the most common psychiatric morbidity among elderly persons, understanding this issue is vital for comprehensive geriatric assessment and care<sup>12,13</sup>.

In present study the majority of the studied cases were in the age group ranging from 61-70 years (57.8%) with mean age 71.8±8.2 years and slight male predominance (54.4%). 67.8% were living with their family and 81.1% were having physical health problems. Our findings were in accordance with the findings of Sharma M, *et al* who reported that among

the 245 senior citizens, mean age was 78.3±6 years. Majority respondents (52.2%) were female and 12(4.9%) were living alone in their home. Majority (54.2%) could not read and write, (68.2%) had some sort of physical health problems and (66.9%) were taking some types of regular medications for their health conditions<sup>2</sup>. According to Kumar P, *et al* majority of the elderly people were in the age group of 60-69 years. Overall mean age of the elderly population was 68.55 ± 6.54 years<sup>14</sup>. Joshi OS and Ghorpade N reported that in urban group, 50.0% were in age group 60-70 years, 45.0% in 71-80 years. In rural group 50.0% were in age group 60-70 years, 45.0% in 71-80 years. In urban group according to gender, 55.0% were males and 45.0% were females and similar data was in rural also. In urban group according to education, 11.0% were illiterate, 22.0% were educated up to primary, 33.0% up to secondary, 13.0% up to higher secondary and 21.0% were graduates. In rural group 16.0% were illiterate, 35.0% were educated up to primary, 25.0% up to secondary, 13.0% up to higher secondary and 11.0% were graduates.

In our study, the 41.1% had depression, 16.7% were having mild depression, 18.9% with moderate depression followed by 5.5% having severe depression. 78.8% were having minimal to mild anxiety followed by 13.3% with moderate anxiety level and 7.8% were having severe anxiety. Our findings were consistent with the findings of Sahni B, *et al* who reported 40.7% of the subjects reported depressive symptoms. However, out of the 66 depressed senior citizens in the total sample, 65.0% had only mild depression while moderate to severe depression was observed in 14.2%<sup>16</sup>. Kumar P, *et al* reported the overall study of depression and anxiety was 66.1% and 93.8%, respectively which was higher than our study which may be because they have conducted the study on elderly living in old age homes<sup>14</sup>. Sharma M, *et al* reported that overall anxiety score, 64.5% senior citizens in this study had minimal, 15.5% had mild, 11.8% had moderate, and 8.2% had severe symptoms of anxiety.

Depression and anxiety were significantly higher in those elderly people who were living alone, having physical health issues, need support and feel difficult to walk even with support and whose educational status is very low ( $p < 0.05$ ). Our findings were comparable to the findings of previous study among similar population by Beekman AT, *et al* had found concurrent anxiety and depressive disorder in 47.5% and 21.0% of elderly. Additionally, living without partner ( $p = 0.001$ ) and having lower education status ( $p = 0.000$ ) would likely to 3 times increase respondents' chances of having anxiety.

Moreover, anxiety was associated with having physical health problems and physical dependence of the respondents<sup>17</sup>. Similar to this finding, Sousa RD, *et al* found significant association of female sex and low educational level with anxiety symptoms<sup>18</sup>. Previous studies also reported higher prevalence of anxiety among women than male. However, anxiety was not significantly associated with the sex of senior citizens in this study<sup>19,20</sup>.

According to Sousa RD, *et al*<sup>18</sup> low educational levels significantly associates with Depression of elderly. On the other hand, education level, marital status, living companion and physical dependency were associated with depression in their study. A study by Perkovic R, *et al* found a significantly higher incidence of depression in male (63.0%) and anxiety among female (42.0%) respondents<sup>21</sup>.

Nautiyal A, *et al* stated that out of 53 depressive participants, 44 people were found to be males, reflecting depression conditions more in males<sup>22</sup>.

Another study by Rao AV, *et al* also showed that geriatric depression was more common among males<sup>23</sup>. In contrast, Jain RK, *et al* in their study reported that prevalence of depression was found to be more in females (57.8%) than in males (45.9%)<sup>24</sup>.

Elderly people living alone/living with their children without their spouse had increased rate of depression. These factors show that depression among geriatric people could be due to financial dependency on others/ loss of their partner. Similar results were reported by Nautiyal A, *et al*, Jariwala V, *et al*, Rajkumar AP, *et al* and Jones RN, *et al*<sup>22,25-27</sup>.

Swarnalatha N study states that the prevalence of Depression was found to be inversely proportional to the literacy status. Literacy reflects economic dependence<sup>28</sup>. Similar findings were observed by Rajkumar AP, *et al* and Ramachandran V, *et al* in India<sup>26,29</sup>.

Based on the first wave of the Survey of Health, Ageing and Retirement in Europe (SHARE), depressive symptoms of 28,538 persons aged 50 to 89 from eleven European countries and Israel are analysed using a negative binomial regression model. The results indicate that the number of depressive symptoms measured by EURO-D scores increase with age and are higher among women than among men. When including socio-demographic characteristics, health conditions and economic strains, the association between depressive symptoms and age vanishes for men and even reverses for women. Thus, the association between age and mental health is mediated by the health and living conditions of older persons; age by itself has no explanatory power.

### Limitations :

- The small sample size affects generalizability.
- Being a cross sectional study, causality cannot be established.
- The data cannot be generalized for larger area as the study was carried out in Tertiary Care Hospital.

### CONCLUSION

Senior citizens with Anxiety tend to have Depression too and vice versa. There are chances of increased anxiety level with lower education status and living without a partner. Having physical health problems increases the chances of having Depression. The senior citizens, living without companions and having physical health problems need to be assessed and cared for mental health status like Anxiety and Depression. Results from this study highlight the need for proper assessment and confirmation of Depression and Anxiety, especially among elderly persons.

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**Conflicts of Interest :** There are no conflicts of interest.

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## Original Article

# Evaluating Farmers' Knowledge, Attitude and Practice Regarding Pesticide Use and Its Impact on Human Health in Northern Karnataka — A Cross Sectional study

Nagendra Angirekula<sup>1</sup>, Shailaja S Patil<sup>2</sup>

**Background :** In India, a significant agricultural workforce operates with many relying on Pesticides for Farming. However, handling pesticides during mixing and spraying poses high exposure risks. Detecting these hazards early falls under occupational hygiene. Our study aims to assess rural Farmers' understanding, attitudes and behaviours concerning pesticide usage. This exploration is crucial for developing strategies to promote safer agricultural methods and protect Farmers' health.

**Aims and Objectives :** Assessing the Knowledge, Attitude and Practice of Farmers concerning pesticide usage and its harmful effects on human health.

**Methodology :** In Vijayapura district, a cross-sectional survey of Farmers was conducted. Convenience sampling was used to select study participants. Data was gathered from June, 2023 to October, 2023 using a semi-structured, pre-tested questionnaire. The data was then imported into Excel. Data analysis was done using SPSS V.26.

**Results :** Most of the Farmers commonly report symptoms like skin irritation, headaches and burning sensation of eyes after pesticide usage. In 51% lacked knowledge of the chemical names of pesticides and this was found to be statistically associated with their level of education. In Practice, 87.3% not using long gloves it was statistically associated with income. Over 61.8% of Farmers indicated that they would rinse their eyes with water in case of accidental pesticide spillage into their eyes. Farmers noted that Grapes, Toor dal and cotton require higher pesticide application compared to Jowar and Wheat, which requires less. While over 65% of participants do not use Personal Protective Equipment (PPE), a majority adhere to changing their clothes after Pesticide usage.

**Conclusion :** The majority of Farmers demonstrated a positive attitude and inadequate pesticide usage procedures; they did not wear PPE when mixing or spraying. Therefore, ongoing instruction in safe mixing or spraying will broaden their understanding and aid in preventing negative health effects.

[J Indian Med Assoc 2024; 122(12): 57-60]

**Key words :** Occupational Health, Pesticides, Farmers Knowledge, Health Awareness, Occupational Hazards.

The highest concentration of agricultural labourers exists in Asia, notably in India, which harbours over 20% of the global agricultural workforce<sup>1</sup>. A significant portion of these workers in India regularly uses pesticides. Over the last decade, there has been a significant surge in pesticide usage, leading to enhanced crop yields and decreased postharvest losses. Nonetheless, this extensive application has raised apprehensions about potential adverse effects on human health<sup>2</sup>.

In India, inadequate safety measures taken by those who use or manufacture pesticides, incorrect product labelling, improper home storage of chemicals and industrial pollution of the environment, often as a result of improper waste disposal, are the

### Editor's Comment :

- Farmers face health risks because of low awareness, limited income and not using safety gear, showing the need for better support and education.
- Promoting organic farming, safer pesticide options, and regular training can protect farmers and the environment.
- Stronger laws and enforcement are crucial to improve safety and encourage sustainable farming practices.

main causes of Occupational hazards<sup>2</sup>. Mixing and spraying are the tasks associated with the highest intensity of pesticide exposure because in this stage, Farmers come into contact with the concentrated product and often have high exposure episodes<sup>3</sup>.

The significance of spray deposition on the bodies of those applying pesticides is highlighted in studies on pesticide dermal contamination. These studies indicated that the Pesticides used by farmers posed significant risks to all individuals involved<sup>4</sup>. Occupational hygiene encompasses the early identification and evaluation of workplace hazards<sup>5</sup>. Therefore, it becomes imperative to understand Farmers' perceptions of Pesticides and their safety

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procedures in order to provide critical information to avoid or lessen the dangers to the environment and human health associated with Pesticide usage.

The purpose of this study was to evaluate Farmers' Knowledge, Attitudes and Practices about the usage of Pesticides and their detrimental consequences on human health.

#### MATERIALS AND METHODS

**Study Area :** Vijayapura, Northern Karnataka District.

**Study Population :** Farmers who have utilized pesticides in their agricultural practices previously.

**Study Period :** July, 2023 to October, 2023

**Study Design :** Cross-sectional survey

**Study Technique :** In the district of Vijayapura, a cross-sectional study was done on farmers. The research participants were chosen through the use of convenience sampling technique. After acquiring ethical clearance from the Institutional Ethics Committee, the questionnaire was initially created in English, then translated into the local Kannada language and subsequently administered following pilot testing. Socio-demographic details, Knowledge, Attitude and Practices about the pesticide usage and its impact on farmers health related data was obtained using pre-tested semi-structured questionnaire by conducting face to face interview.

**Sample Size :** Given that the anticipated proportion of farmers' knowledge on the frequency of pesticide spraying is 96.6%<sup>6</sup>, the study would need a minimum sample size of 180 with a 96% confidence level and 3% absolute precision.

Formula used –

$$n = \frac{z^2 p^*q}{d^2}$$

Dropout rate of 10% = 180 + 18 = 198

**Sampling Technique :** We included Farmers who visited the District Hospital and Rural Health Centre using convenience sampling. This method was specifically chosen because it made the process convenient and accessible. During the data collection period, we focused on selecting participants who were already present at these healthcare facilities. This approach allowed us to gather valuable insights from individuals easily reachable in these particular settings.

**Inclusion Criteria :** Among Farmers who had used Pesticides at least once, those who gave their oral consent to participate were included.

**Exclusion Criteria :** Farmers who declined to give consent were excluded from the study.

#### Statistical Analysis :

- Microsoft Excel was used to enter the data, and SPSS (Version 26) was used for statistical analysis.
- Diagrams, percentages and frequency were used to display the results.
- Chi square test was used to determine whether Categorical Variables were associated.

#### RESULTS

The study enrolled 204 Farmers, with 50.5% falling within the 26-49 age range. Over 95% of participants identified as Hindu, while 46% belonged to the general category. Among the participants, 49% had no formal education and the majority were married. Approximately 70.6% reported an annual income of less than 2 lakhs. Additionally, 27.9% had been using pesticides for over 15 years

The majority of Farmers noted that Grapes, Toor dal, and Cotton require higher pesticide application, while Jowar and Wheat demand less in this region. Regarding Farmers' awareness, 51% lacked knowledge of the chemical names of Pesticides and this was found to be statistically associated with their level of education. About 74% of farmers were aware that Pesticides should be stored separately and handled with care. Only 50% of Farmers believed it was essential to read and comprehend the Pesticide container label before use.

Regarding attitudes, 71.6% believed high-quality Pesticides pose no health risks, while 87.7% deemed Pesticide use necessary. Furthermore, 82.2% indicated that immediate bathing after Pesticide use reduces poisoning. In practice, only 33.8% used masks, statistically associated with their education level. 87.3% not using long gloves, it is statistically associated with income. While over 65% of participants do not utilize Personal Protective Equipment (PPE) and 26.5% didn't change clothes postapplication. In response to accidental Pesticide exposure in the eyes, most Farmers washed their eyes with water.

In 65.2% of Farmers clean their sprayer tanks in the fields' waterways. The majority of Farmers noted that Pesticides can penetrate the body through the nose, skin and eyes. Headache, nausea, skin irritation and a burning sensation of the eyes were the most frequently mentioned symptoms after pesticide use (Tables 1-3)(Figs 1-3).

#### DISCUSSION

Farmers expressed their intention to take a Pesticide-poisoned person to the hospital when

Characteristics	Frequency	Percentage
Age group		
26-49	103	50.5
50-69	101	49.5
Education level		
Never attended	100	49
Pre/primary	62	30.4
High school	27	13.2
PUC/Diploma	15	7.4
Religion		
Hindu	195	95.6
Muslim	9	4.4
Cast		
General	94	46.1
OBC	80	39.2
SC	20	9.8
ST	10	4.9
Marital status		
Married	197	96.6
Un married	7	3.4
Income		
≤2 lakhs	144	70.6
> 2 lakhs	60	29.4
Duration of pesticide usage		
≤15 years	147	72.1
> 15 years	57	27.9

encountered, Referencing guidelines from a World Health Organisation report<sup>2</sup>. Most Farmers in the study are males aged between 26 to 50 years old and married. Similar Socio-demographic traits were observed in a study conducted in Puducherry<sup>7</sup>.

In our research, the majority of Farmers are aware of the need to store Pesticides separately, which aligns with the findings of a study conducted in Chikkaballapur District, South Karnataka<sup>8</sup>. In this study, most farmers indicated that Pesticides can penetrate the body through the nose and skin. Similar research carried out in Sweden confirmed that pesticides can penetrate the body through the skin<sup>9</sup>.

In line with study from Uganda, our research showed that 37.3% of Farmers said that Headache was a common side effect of using Pesticides<sup>10</sup>.

Variables	n (204)	
	Frequency	Percentage
Through which route can pesticides enter the human body	Nose	95 46.6
	Skin	64 31.4
	Eyes	45 22.1
What are the symptoms have you experienced following pesticide usage	Headache	76 37.3
	Nausea	44 21.6
	Skin irritation	32 15.7
	Burning sensation of eyes	52 25.5
If you witnessed someone being poisoned by Pesticide, how would you respond	Take the person to hospital	182 89.2
	Find out the way how it's happened	22 10.8
How would you respond if you accidentally got Pesticide on your skin	Wash the exposed area with soap and water	58 28.4
	Wipe it off the cloths	146 71.6
What would you do, if Pesticides accidentally spilled into your Eyes	Take to nearest hospital	78 38.2
	Wash the eyes with water	126 61.8
Where you will clean the sprayer tank	Water way in the field	133 65.2
	In the Home	71 34.8

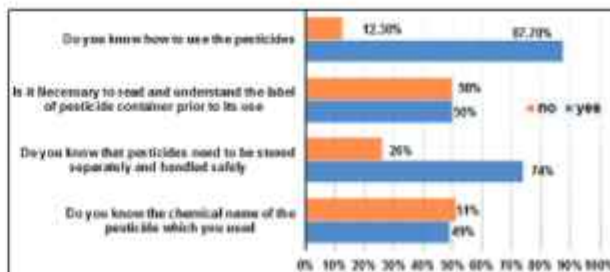


Fig 1 — Knowledge of the Farmers regarding Pesticide usage

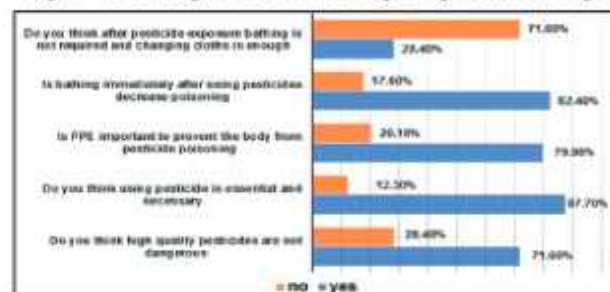


Fig 2 — Attitude of the Farmers regarding Pesticide usage

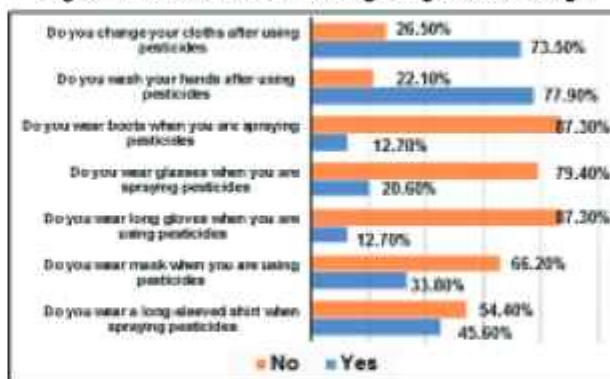


Fig 3 — Practice of the Farmers regarding pesticide usage

Some of the respondents among the 204 Farmers mentioned skin irritation and a burning sensation in the eyes as symptoms of Pesticide's adverse effects on health, which were similar to findings in Kuwait<sup>11</sup>.

Over 61.8% of Farmers indicated that they would rinse their eyes with water in case of accidental Pesticide spillage into their eyes. Comparable results were reported by the Department of Agriculture Development in Greece in a review study<sup>12</sup>.

In this region, most Farmers cultivate crops such as Jowar, Wheat, Toor dal, Groundnut, Cotton, Sugarcane and Grapes. Regarding application frequency, the majority mentioned that grapes require Pesticide application every alternate day, while Jowar and Wheat necessitate a single application or none at all. Commonly used Pesticide brands in this area include DAP,

KINGDOXA and PROCLAIM with a prevalent usage of DAP among the majority.

Following the data collection process, Farmers received in-depth instruction and awareness-raising sessions regarding the use of Pesticides, with a special emphasis on Pesticide handling and the significance of wearing Personal Protective Equipment (PPE). These education and sensitization sessions play a vital role in advocating for safer Pesticide handling methods to reduce health risks.

#### Limitation :

Implementing a convenient sampling technique with a limited sample size constrained our ability to precisely depict the wider and diverse Farming Community. As a result, this constraint hinders the universal application of the findings or the derivation of broad conclusions relevant to diverse farming communities or regions.

#### CONCLUSION

Majority of the Farmers are not using the Personal Protective Equipment (Mask, Gloves, Goggles, Boots) while mixing or spraying. They displayed a positive attitude but implemented inadequate practices concerning Pesticide usage. Just a small percentage of them are aware of the negative effects of pesticides and what to do in the event of accidental spills. In conclusion, Pesticide usage among Farmers is a complex issue with both benefits and drawbacks.

Along with addressing the health risks associated with Pesticide usage, initiatives should be made to promote responsible Pesticide use, provide access to safer alternatives such as natural chemicals and support organic Farming. Sustainable agricultural practices, education and Government regulations will continue to play vital role in shaping the future of Pesticide usage in agriculture.

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Table 3 — Statistical association

Level of Education versus Do you know the chemical name of the Pesticide		Do you know the chemical name of pesticide			Chi-square	P value
		No	Yes	Total		
Level of Education	Never Attended	60	40	100	8.65	0.03
	Pre/Primary	30	32	62		
	High School	9	18	27		
	PUC/Diploma	5	10	15		
<b>Total</b>		<b>104</b>	<b>100</b>	<b>204</b>		
Level of Education versus Do you wear Mask when spraying Pesticides		Do you wear Mask when spraying Pesticides			Chi-square	P value
		No	Yes	Total		
Level of Education	Never Attended	76	24	100	9.99	0.01
	Pre/Primary	38	24	62		
	High School	14	13	27		
	PUC/Diploma	7	8	15		
<b>Total</b>		<b>135</b>	<b>69</b>	<b>204</b>		
Annual Income versus Do you wear long Gloves when spraying Pesticides		Do you wear long Gloves when spraying pesticides			Chi-square	P value
		No	Yes	Total		
Annual income	≤2 Lakhs	130	14	144	4.02	0.04
	>2 Lakhs	48	12	60		
	<b>Total</b>	<b>178</b>	<b>26</b>	<b>204</b>		

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## Review Article

### Cardiac Steatosis — An Emerging Entity

Aradhya Sekhar Bagchi<sup>1</sup>, Ananda Bagchi<sup>2</sup>

In this era of obesity pandemic and increased global prevalence of Type 2 DM (T2DM) and Metabolic Syndrome (Met S), cardiovascular diseases are also increasing globally and is a real concern for morbidity and mortality. In modern lifestyle with sedentary habits, excessive intake of calories and with unfavorable genotypes leads to lipid overflow resulting in failure of Subcutaneous Adipose Tissue (SAT) to expand and store the excess circulating Free Fatty Acids (FFA). This excess FFA is being deposited as Visceral Adipose Tissue (VAT) in the major organs like Liver, Heart, Pancreas, Skeletal muscles causing Hepatic Steatosis, Cardiac Steatosis etc. Nowadays Cardiac steatosis is considered as an important predisposing factor for Diastolic Dysfunction, AV block and Sudden Cardiac Death.

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**Key words :** Triglyceride, Subcutaneous Adipose Tissue (SAT), Free Fatty Acids (FFA), Visceral Adipose Tissue (VAT), Non-alcoholic Fatty Liver Disease (NAFLD).

**C**ardiac Steatosis (the fatty heart), also known as lipomatosis cordis, where there is deposition of adipose tissue in the myocardium leading to fibrosis. This excessive adipose tissue deposition alters the normal physiology of the myocardium. Cardiac adiposity or steatosis has recently emerged as an important risk factor for the development of cardiovascular diseases, including diastolic dysfunction of heart and sudden cardiac death. The hypothesis is that accumulated fat impairs cardiac performance and induces structural remodeling as a result of lipotoxicity.

Now we are in the era of obesity pandemic and abdominal obesity in particular, which is associated with Insulin resistance and Type 2 DM (T2DM) causing serious metabolic derangements in our body leading to Metabolic Syndrome. Excess caloric intake and sedentary lifestyle combined with unfavorable genotype and several environmental factors result in lipid overflow, due to a failure of Subcutaneous Adipose Tissue (SAT) to expand and store the excess of circulating Free Fatty Acids (FFA)<sup>1</sup>. Consequently, the excessive fat is accumulated into different visceral organs like Liver, Heart, Pancreas and Skeletal muscles etc.

Ectopic fat deposits have been subdivided into those with local and those with systemic effect.

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#### Editor's Comment :

- The association of Non-alcoholic Fatty Liver Disease (NAFLD) with the Cardiovascular system is quite complex and incompletely understood. NAFLD is suggested to be implicated in cardiac steatosis in many ways and seems to worsen the prognosis of both the diseases. Moreover, as there is no definitive treatment for NAFLD as yet, many CV drugs show promising results in NAFLD treatment both biochemically and histologically with fibrosis regression. So the coupling between NAFLD and Cardiac steatosis exists in true sense and despite the suggested results, further studies are needed for better understanding of the two-way liver-heart interplay and the roles of drugs in the pathophysiology and treatment of NAFLD and cardiac steatosis.

Accordingly, perivascular, myocardial, and epi/pericardial fat have mainly local unfavorable effects, whereas visceral adipose tissue, or fat in the liver, heart or skeletal muscles have systemic effects due to the fundamental role of these organs in glucose, insulin, and lipid metabolism. Here both location and the amount of adipose tissue has got a bearing on the development of cardiovascular morbidity and mortality.

#### Cardiac Steatosis :

Though it is well recognised that, adipose tissue accumulation occurs in all three cardiac sites like pericardium, myocardium and epicardium, they differ in their capacity of fat accumulation. Pericardial site has got the highest capacity and cardiomyocytes have got the least. One study by Kristopher Nyman, *et al*, has shown that increased pericardial fat is more important than epicardial fat in causing LV Diastolic dysfunction. though the exact cause of it is not known<sup>2</sup>. Pericardial fat has also been reported to be associated with Insulin Resistance (IR) and also 10

years CAD risk more strongly than Epicardial fat. In Type 2 DM patients, increased myocardial Triglyceride (TG) concentration, which is an important marker for cardiac steatosis, is being related to the development of LV Diastolic Dysfunction though subclinical LV Dysfunction may also be associated with obesity and metabolic syndrome<sup>7</sup>. Increased myocardial fat has also adverse metabolic consequences like impaired lipid oxidation, oxidative stress and mitochondrial defects and this cardiac lipotoxicity is one of the important causes of LV Dysfunction and promotes cardiac fibrosis and apoptosis.

A recent study by Marit Graner, *et al*, has focused on different components of cardiac steatosis and its relationship with intra abdominal ectopic fat deposits and their association with different cardio-metabolic risk factors in non-diabetic individuals with or without metabolic syndrome.

In another large cohort study of 579 men with HIV with 353 men without HIV in the age group of 40 to 70 years, epicardial adipose tissue volume was more with HIV patients which is irrespective of BMI but was associated with increasing duration of combination ART.

#### Assessment of Cardiac Fat :

Assessment of cardiac fat can be done by using Cardiac proton Magnetic Resonance Spectroscopy (MRS) which is a reproducible and non-invasive technique for measurement of myocardial triglyceride content by measuring their unique resonance frequency when passed through a magnetic field. Both MRS & CMR techniques, allow determination of cardiac function, its lipid accumulation status and fibrosis.

#### Cardiac Steatosis, Non-alcoholic Fatty Liver Disease (NAFLD) & T2DM — Are they Interrelated ?

There is a vicious spiral of worsening disease when NAFLD coexists with T2DM. Current evidence suggests that, with NAFLD, both cardiac steatosis and liver fibrosis are associated with an increased risk of incident Cardiovascular Disease (CVD), although it is unclear whether any specific NAFLD histological type

contributes to a differentially greater risk of CVD. Presence of either NAFLD or T2DM increases the risk and development/progression of the other: liver fat raises the risk of incident T2DM; and further progression of liver disease to liver fibrosis further increases risk of T2DM. Coexistent T2DM and NAFLD often makes it difficult to achieve good glycaemic control due to marked hepatic and peripheral insulin resistance. T2DM also increases progression of liver disease with an increased risk of NASH, advanced fibrosis, cirrhosis and/or hepatocellular carcinoma. Both NAFLD and T2DM independently increase risk of Cardiac steatosis and other cardiac diseases. Fig 1 is a schematic illustration of the vicious spiral of worsening disease that manifests when NAFLD is accompanied by T2DM, thereby increasing the risk of Cardiac steatosis and other cardiac diseases (Fig 1A), and a summary of some of the potential CVD and cardiac risk factors in NAFLD (Fig 1B)<sup>7</sup>.

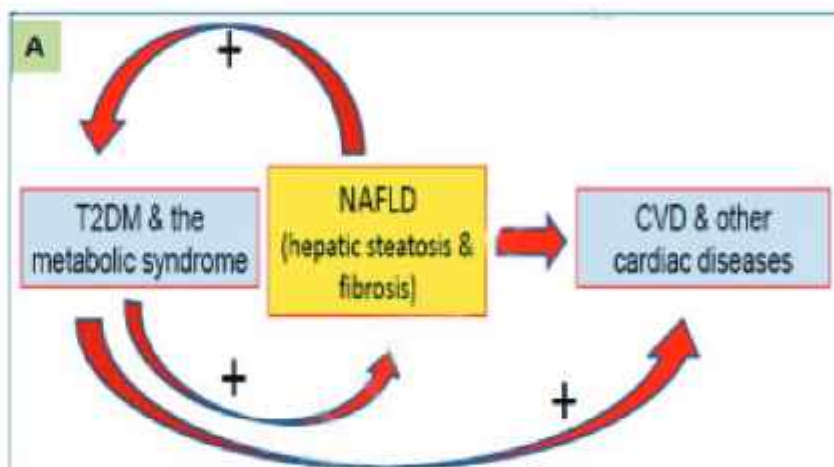


Fig 1(A) — Pathophysiological link between NAFLD, T2DM and Cardiac steatosis

B Established and potential risk factors for CVD/cardiac diseases in NAFLD	
	Atherogenic dyslipidaemia
	T2DM
	Other metabolic syndrome features such as hypertension, abdominal obesity
	Proinflammatory cytokines such as C-reactive protein, interleukin-6, fetuin-A
	Reactive oxygen species
	Steatotic hepatocyte-derived extracellular vesicles
	Plasminogen activator inhibitor-1
	Gut-derived factors (such as modified bile acids, trimethylamine oxide, lipopolysaccharide, aromatic acid metabolites, p-cresyl sulphate, indoxyl sulphate, short-chain fatty acids, incretins)
	NAFLD-related genotypes such as GCKR variants

Fig 1(B) — Risk factors for cardiovascular diseases in NAFLD

### Factors that Correlate with an Increased Incidence of Cardiac Steatosis :

It includes Aging, Female Sex, Obesity, Insulin Resistance, Diabetes Mellitus, CAD, Human Immunodeficiency Virus–Related Therapies. In many Endocrine and metabolic derangements Cardiac steatosis can be a part of redistribution of visceral fat. It is possible that the patient's truncal obesity, moon facies and abdominal striae were secondary to an under recognized Cushing syndrome. Cushing syndrome, either iatrogenic due to concomitant use of mirtazapine and budesonide or a cortical adenoma, could have deepened the intra-myocardial accumulation of fat.

**NAFLD & Cardiac steatosis :** Non-alcoholic Fatty Liver Disease (NAFLD) is associated with an increased risk of cardiovascular disease. In NAFLD where hepatic steatosis and fibrosis are cardinal features are also associated with subclinical myocardial dysfunction. This association is linked to altered myocardial glucose uptake and subsequent deposition.

Emerging data on the interplay between NAFLD and Cardiac steatosis show a complex two-way relationship between the two conditions. On one hand, as previously stated, NAFLD was suggested to be a major risk factor for Cardiac steatosis<sup>3</sup>. On the other hand, reverse relationship is also true regarding the effect of cardiac pathology, mainly acute and chronic heart failure, on hepatic disease.

### Prevention Strategies :

Due to the strong association between NAFLD and Cardiac steatosis, and the increased risk of mortality from CV events in patients with NAFLD<sup>6</sup>, a number of primary and secondary prevention strategies were recommended by the American College of Cardiology, the American Heart Association, the European Association for the Study of the Liver and the Italian Association for the Study of the Liver. Both NAFLD and CVD share and target the common traditional risk factors like healthy dietary pattern, moderate exercise and optimal body weight management for their Primary prevention strategies<sup>4</sup>. For instance, in one prospective study on 293 patients with NASH, lifestyle modifications that are beneficial for CVD (decrease in calorie intake and increase in exercise) achieved regression of fibrosis and resolution of steatohepatitis in 19% and 25% of patients, respectively reducing the incidence of cardiac steatosis also.

### Modifying NAFLD-related CVD Risk : Pharmacotherapy :

At present, there are no approved pharmacological treatments for NAFLD, and the cornerstone of NAFLD management remains lifestyle modifications which includes dietary restrictions and exercise. No FDA approved treatments are available for NAFLD but guidelines recommend : Vit E (if no Type 2 DM), Pioglitazone (if DM/pre DM), Metformin and Aspirin. For Diabetes, treatment of body weight as a coprimary outcome in obese patients with GLP1RA have emerging evidence of NASH resolution and also CV risk reduction and SGLT2 Inhibitors, which have emerging evidence for reducing liver fat and enzymes as well as CV risk reduction. Therefore, this section specifically focuses on the current pharmacological treatments for modifying NAFLD-related CVD risk<sup>5</sup>.

**Dietary Restrictions :** Carbohydrate restriction has rapid benefits in hepatic steatosis. Diet with <30 gm carbohydrates will cause weight loss of 1.8% and mean reduction of liver fat of 43.8% which will return to baseline within 1 to 3 months. So it is advisable to stick to low calorie, low carbohydrate, low fat and low dietary sugar content.

### Metformin Therapy :

In the management of NAFLD drugs including metformin, Thiazolidinediones (TZD) and aspirin have shown promising results. Though metformin has been very useful in improving liver functions, it failed to improve the histological features as shown in one meta-analysis of Randomized Controlled Trials (RCTs) involving a total of 417 participants. Moreover, metformin was shown to improve weight loss, improved insulin sensitivity and lipid profiles (decreased LDL and increased HDL levels) in NAFLD patients, which might in turn decrease the CV risk related to NAFLD.

### Thiazolidinediones (TZD) Therapy :

In another meta-analysis including 8 RCTs and a total of 516 patients evaluating TZD effect on histology of biopsy-proven NASH, TZD treatment (5 RCTs evaluating pioglitazone; 3 evaluating rosiglitazone) was associated with improved fibrosis and NASH resolution – a trend seen in patients with or without T2DM. Side effects of TZD therapy was weight gain and limb edema and because of the short duration of the trials with small sample sizes, reports of congestive heart failure or increased CV mortality could not be documented.

**Aspirin Therapy :**

In a recent prospective cohort study with 361 adults with biopsy-confirmed NAFLD with nine-year follow-up, daily aspirin use was associated with significantly lower odds for NASH and fibrosis with greatest benefit with at least four years of aspirin use – an association not seen with other non-aspirin NSAIDs. Furthermore, a cross-sectional study including 11,416 patients showed an inverse correlation between regular aspirin use (defined as 15 times in the prior month) and prevalent NAFLD, although this was limited to older men (>60 years). Aspirin, and not ibuprofen use, reduces liver fibrosis in adults with NAFLD.

**GLP-1 Receptor Agonists :**

GLP-1 Receptor Agonists (GLP-1R) were investigated as potential agents for the management of NAFLD. Early studies demonstrated decreasing and normalizing AST levels in T2DM patients receiving exenatide with elevated AST levels at baseline, compared to those who did not receive it. Recent meta-analyses showed association of GLP-1Ras, mainly exenatide and liraglutide and also semaglutide, with reduced Body Mass Index (BMI) and Waist Circumference (WC) and liver fat fraction.

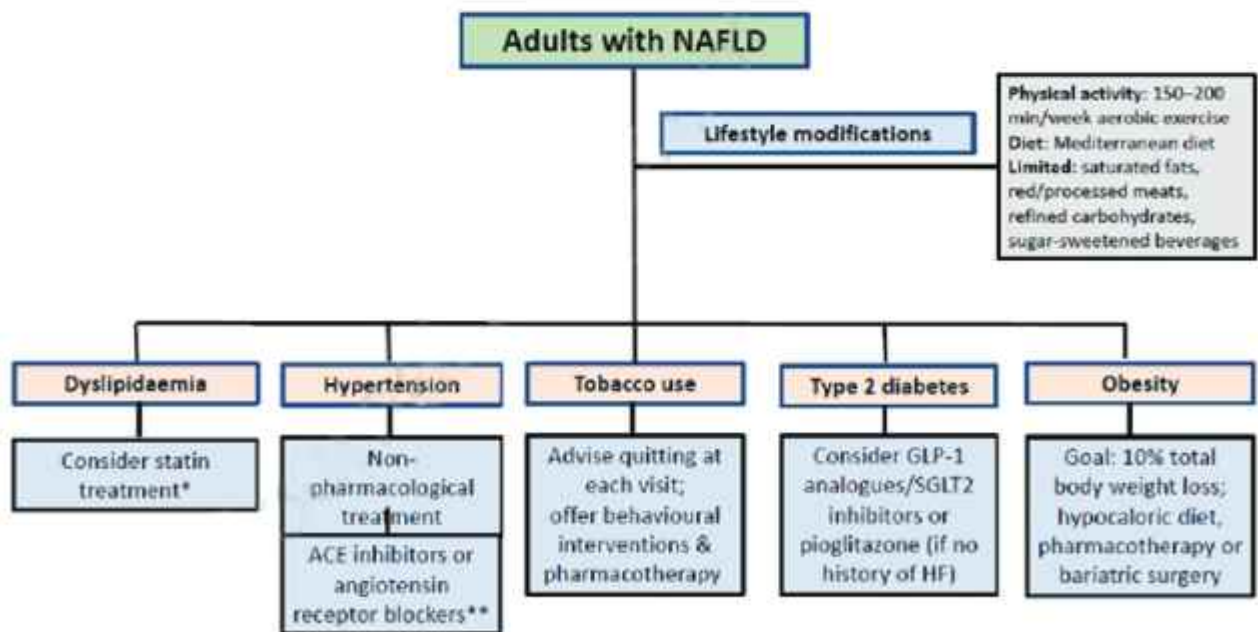
In a recent clinical trial, the Liraglutide Efficacy and Action in NASH (LEAN) by Armstrong, *et al*, 52 overweight patients with NASH were randomized to receive liraglutide or placebo (26 in each group)<sup>8</sup>. The

results of this small pilot study showed that patients in the experimental treatment arm had 4.3 times higher chance of histologically-proven NASH resolution along with documented CV mortality benefit (Fig 2).

**SGLT2 Inhibitors+ GLP-1 RAs :**

SGLT2 inhibitors are another class of anti-diabetic drugs with proven CV mortality benefit even in nondiabetics as well with recent beneficial evidences in NAFLD treatment. Recent phase III randomized controlled trial by Frias, *et al*, 695 patients with T2DM were randomized into 3 groups - First group received exenatide plus placebo, Second group received dapagliflozin plus placebo Third group received a combination of the two drugs and followed up for 28 weeks. The results of this study showed that all groups had a decrease in the traditional CV risk factors, such as Blood Pressure, HbA1c and glucose levels, that were more pronounced and superior in the group receiving both drugs. this was a very useful trial.

The trial showed that combination treatment had stronger effects than each drug alone in ameliorating markers of hepatic and cardiac steatosis and fibrosis in patients with T2DM. Another study showed that NAFLD patients with T2DM who received dapagliflozin alone had a significant decrease in Controlled Attenuation Parameter (CAP), liver stiffness and AST and GGT levels compared with controls<sup>9</sup>. Other



\* Lipophilic statins may have additional benefit for hepatocellular carcinoma risk reduction

\*\* Preferred for their possible antifibrotic hepatic effects

Fig 2 — Suggested treatment options for NAFLD with Cardiac Steatosis



studies also demonstrated the potential of dapagliflozin monotherapy to reduce liver fat assessed by MRI, liver injury biomarkers such as enzyme levels, and achieve histological improvement with fibrosis regression in NAFLD patients with T2DM and improvement in cardiac status.

#### RAAS Inhibitors :

RAAS activation was shown to be upregulated in NAFLD and to play a role in development of inflammation and insulin resistance, both of which are possible risk factors for NAFLD and Cardiac Steatosis. In an observational cohort study by Peluci, *et al* which included 118 diabetic pts with a median follow up period of 36 months have shown that ACEI or ARB reduces the histological fibrosis progression in NAFLD patients. There are some other studies with ARB which has also shown reduction of AST levels as well histological improvement.

#### Bariatric Surgery :

An effective treatment strategy for severe obesity – has been shown to cause a significant decrease in liver transaminases and histology improvement in NAFLD patients. Many studies have shown that morbidly obese pts with NASH improve remarkably when they underwent Bariatric surgery, NASH disappeared in 85% of them and levels of liver transaminases significantly decreased. Moreover, bariatric surgery was shown to improve the traditional CV risk factors reducing cardiac steatosis as well.

#### Vitamin E :

Vitamin E was also studied as a potential treatment for NAFLD due to its anti-oxidative properties. In patients with NASH, Vitamin E supplementation in one meta-analysis of three trials analyzing 242 patients with NASH, resulted in improved ALT levels, steatosis, lobular inflammation and ballooning but not fibrosis of the liver. However, Vitamin E supplementation was shown in other studies to have doubtful apparent effects on CV outcomes.

#### Obeticholic Acid, Saroglitazar and Elafibranor :

Other drugs, including obeticholic acid, saroglitazar, and elafibranor are currently being investigated for NAFLD in large clinical trials. Obeticholic acid is a bile acid derivative that can bind to and activate farnesoid X receptors, which in turn can increase insulin sensitivity, decrease hepatic gluconeogenesis, and protect against cholestasis liver injury. Elafibranor is a dual PPAR- $\alpha/\delta$  agonist - both receptors being implicated in the activation of inflammatory changes within the liver. Saroglitazar is a dual PPAR $\alpha/\gamma$  agonist indicated mainly for the treatment of Diabetic Dyslipidemia and hypertriglyceridemia not controlled by statins. This drug is currently being investigated as a potential treatment for NAFLD in an ongoing phase 2 trial with a very promising result. Further studies are needed before more stringent recommendations can be done on the use of obeticholic acid, saroglitazar and elafibranor.

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## Case Report

# Scrub Typhus with Unilateral Parotitis and Encephalopathy : A Rare Case Report and Literature Review

Umakanta Mahapatra<sup>1</sup>, Soham Das Bakshi<sup>2</sup>, Soumyadip Mukhopadhyay<sup>2</sup>, Biplab Kumar Gayen<sup>3</sup>

Scrub Typhus is an acute febrile illness recently re-emerging. Scrub Typhus is a zoonosis caused by *Orientia tsutsugamushi* (formerly *Rickettsia*). Though in majority of the cases Scrub Typhus has self limiting course, it may involve any organ resulting in multiorgan dysfunction. Scrub Typhus has to be thought of in the differential diagnosis of febrile illness. Here, we report a case of Scrub Typhus presenting as unilateral parotitis and multiorgan dysfunction. Doxycycline administration rapidly altered the clinical course. Knowledge about the non-specific clinical presentations and complications of Scrub Typhus, will help in early recognition and treatment so that complications can be avoided.

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**Key words :** Scrub Typhus, Parotitis, Multiorgan Dysfunction.

**S**crub typhus is caused by *Orientia tsutsugamushi*, a mite born obligate, intracellular gram-negative coccobacilli, which is widely distributed throughout the South Pacific Asia<sup>1</sup>. The original name of Scrub Typhus, that was given by Hashimoto in 1810, is "tsutsugamushi disease." It is transmitted by the bite of infected larvae of trombiculid mite (Chiggers). Primary vector for the disease is *Leptotrombidium deliense*. Humans are infected when they come in contact with infected mite. The hot and humid climate and tropical weather are favorable conditions for mite activity and disease transmission. Incubation period is 6-21 days<sup>2</sup>.

In India initial cases were isolated during the socio-political turbulent times of 1930s<sup>3</sup> and a large number of cases were initially described during World War II among the troops posted in the hilly regions of North East India<sup>4</sup>. The first outbreak of Scrub Typhus in India was reported in 2003-2004, when a cluster of paediatric patients presented with fever, hepatosplenomegaly and eschar. Scrub Typhus accounts for 25.3% of acute undifferentiated febrile illness in India with a community sero-prevalence of 34.2%<sup>5</sup>.

Scrub Typhus is an acute febrile illness with a wide range of clinical presentation starting from self-limiting illness with rash (50%), eschar (40%), lymphadenopathy, fever, headache, myalgia to life threatening complications including encephalitis<sup>6</sup>, interstitial pneumonia, ARDS, acute renal failure and acute hepatic failure. This possesses a great diagnostic challenge and dilemma while approaching an ill febrile patient. It is important to differentiate Scrub typhus from dengue, leptospirosis, malaria and enteric fever etc, so that appropriate treatment can be initiated.

### Editor's Comment :

- The first clue to diagnose a case of scrub typhus is high index of suspicion in primary care physician particularly in this subcontinental scenario. Every case of Fever of Unknown Origin (FUO) should be searched for Scrub typhus due to its wide spectrum of presentation. Hence diagnosing and treating early can easily prevent potentially lethal complications.

The main pathogenesis is either focal or disseminated vasculitis or perivasculitis that may damage organ such as the kidney, lung, liver, brain and skin<sup>7</sup>. Late diagnosis of Scrub typhus and inadequate treatment may lead to complications with multiorgan involvement. Though the median mortality rate of untreated case is 6%, that of treated case is 1.4%, the mortality rate may increase up to 70% without adequate treatment<sup>8,9</sup>.

Despite a few studies on this topic from this region, it is still being grossly under diagnosed due to its nonspecific clinical presentation, limited public awareness, low index of suspicion among the clinicians and lack of diagnostic facilities in some places.

### CASE REPORT

A 25-years-old, male, occasional alcoholic for 2 years, was admitted in Midnapore Medical College & Hospital, West Bengal with yellowish discolouration of eyes and urine for 14 days. He also complained of high grade fever for 10 days, right sided progressive painful facial swelling with difficulty in chewing and swallowing for 7 days and altered sensorium for 2 days. On admission he was febrile, dyspnoeic, pulse - 100/min, MAP - 58 mm of Hg, dry tongue with CRT >3 sec, jaundice +, SPO2 92% in room air and RBS - 85 mg/dl. One black eschar (1x1cm) was seen over the forehead and right parotid gland was swollen (Fig 2). On palpation, RUQ of abdomen exhibited tenderness without hepato-splenomegaly. On auscultation, S1 and S2 was audible, and vesicular breath sound in both the hemithorax was decreased (Right > Left). The patient was drowsy with a GCS of 10/15(E3V3M4), bilateral flexor

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plantar response and bilaterally reactive pupil without neck rigidity.

On admission, relevant investigations showed: TLC-22,600/mm<sup>3</sup> (N: 86, L:8, M:2, E:2), Haemoglobin - 9.5mg/dl, Platelet - 1,73,000/mm<sup>3</sup>, ESR - 62 millimetres/ hour, CRP - 41.53 mg/dL, microcytic hypochromic anaemia and toxic granules in neutrophils on peripheral blood smear. Thick and thin smear for MP/MPDA was found to be negative. Biochemical parameters revealed: serum urea - 220 mg/dl, creatinine - 2.69 mg/dL, serum Na<sup>+</sup> - 132 mmol/L, serum K<sup>+</sup> - 4.22 mmol/L, total bilirubin 35.79 mg/dl with conjugated bilirubin 26.03 mg/dL, ALT/AST 482/316 U/L, ALP 382 IU/L, serum albumin 2.6 g/dl, serum amylase/Lipase 132/78 IU/L, PT 22.32 sec and INR 2.4. Patient was found to be non-reactive for HIV I, II, HBsAg, Anti-HCV RNA, Hepatitis A IgM, Leptospira IgM, Dengue IgM and NS 1ag. After 48-hour, 3 sites blood (both aerobic and aeorobic), and urine culture and sensitivity showed no growth. Sputum for AFB/CBNAAT and subsequently TB Quantiferon Gold was found to be negative. USG whole abdomen showed mild hepatomegaly, grade I fatty infiltration and increased echogenicity of Kidney (B/L). Chest X-Ray AP in supine position showed right sided minimal pleural effusion. Scrub IgM antibody with ELISA method was found to be positive, which was confirmed by Immunofluorescence method.

Patient was shifted to CCU, where he was conservatively managed with IV fluid, vasopressors, broad-spectrum antibiotics, 6-units of FFP and subsequently 2 settings of bedside haemodialysis. After diagnosis of Scrub typhus was made, patient was put on injection IV Doxycycline 100 mg BD.

2D Echo with M mode was done to rule out vegetations. CSF study revealed lymphocytic predominance with 12 WBCS, sugar - 52 mg/dL and protein - 75mg /dl, with a negative Gram Stain and Z-N Stain. CT scan of the neck and face showed the features of Parotitis (Fig 1). FNAC was suggestive of necrotizing Parotitis.

After a 10 days course of IV doxycycline, the patient showed dramatic clinical improvements. He became afebrile, swelling decreased (Fig 2), mentation and appetite improved. The laboratory parameters before and after the treatment are enlisted below Table 1.

#### DISCUSSION

Scrub Typhus affects one million people around annually. Trombiculid mite (Chiggers) of the *Leptotrombidium* genus, which feeds on wild rats, infects human accidentally who are living in Sub Himalayan, dense forest area or the people whose livelihood depend

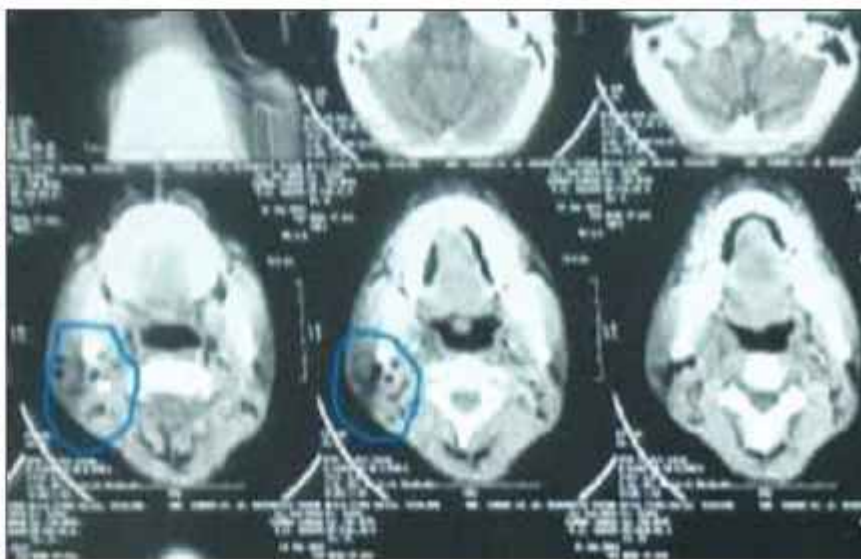


Fig 1 — CECT of neck and face showing the features of Parotitis



Fig 2 — Disappearance of Parotid Swelling after 10 days of Doxycycline therapy: right (before), I

mainly forest and agriculture<sup>2</sup>. The rickettsial diseases which were once thought to have disappeared from India, are re-emerging as zoonosis in several parts of India such as Kashmir, Himachal Pradesh, Sikkim, Darjeeling (West

Table 1 — Comparison of the laboratory parameters before and after Doxycycline therapy

Before	Parameters	After
22,600	TLC (/mm <sup>3</sup> )	4,300
41.53	CRP (mg/dl)	3.56
220	Urea (mg/dl)	16
2.39	Creatinine (mg/dl)	0.62
35.79	Bilirubin (mg/dl) (total)	4.25
26.03	Bilirubin (mg/dl) (conjugate)	3.15
316	AST (IU/L)	56
482	ALT (IU/L)	78

Bengal) and Western Ghat. Aetiological factors once thought eradicated have re-emerged due to migration of labour from other states, poor hygiene in public places and improper waste disposal.

The overwhelming clinical manifestations of Scrub Typhus are attributed to systemic vasculitis and endothelial dysfunction<sup>10</sup>. Signs and symptoms of Scrub Typhus are nonspecific and clinical features may mimic other febrile illness. Though most of the cases are self limiting in nature with spontaneous recovery, delay in diagnosis and inadequate treatment may lead to complications including Multi Organ Dysfunction (MOD). Though eschar is the most useful diagnostic clue of Scrub Typhus, many Indian studies revealed eschar in less number of patients<sup>11</sup>.

Early use of antibiotics can prevent life-threatening scrub typhus. The effective antibiotics against Scrub Typhus are doxycycline, chloramphenicol, tetracycline and azithromycin. Azithromycin may be more tolerable than doxycycline with same effect. The clinicians should avoid rifampicin as a first-line agent due to the low-certainty evidence and the risk of resistance in undiagnosed tuberculosis<sup>12</sup>.

Similar presentation of Scrub Typhus had been previously reported from Kasturba Medical College, Manipal in 2017, where a 38 year old male presented with fever, altered sensorium, parotid swelling and MODS<sup>1</sup>. AKI was reported in 13-27% of patients in two different Indian studies. Parotitis is rare clinical manifestation of Scrub Typhus with MODS. Only a very few literature is available to support its rampant in southern districts of West Bengal<sup>13</sup>. This case report will help the clinicians to get insight about the diversity of this potentially fatal condition and increase the index of suspicion while dealing with an acute febrile patient with MOD.

### CONCLUSION

Rickettsial diseases are prevalent but remain under-diagnosed in India. Scrub Typhus should be differentiated from other causes of febrile illnesses of short duration because of similar clinical and laboratory features. When patients present with fever and multi organ involvement, Scrub Typhus should always be considered in the differential diagnosis. High index of suspicion and prompt initiation of treatment will reduce the morbidity and mortality.

**Declaration of patient consent :** The authors certify that they have obtained all appropriate patient consent.

**Financial support and sponsorship :** Nil.

**Conflict of interest :** There are no conflicts of interest.

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## Case Report

# Neuropsychiatric Lupus with Apla Syndrome and Auto-immune Haemolytic Anaemia in a Patient of Hansen's Disease — A Diagnostic and Therapeutic Challenge

Sudipto Chakraborty<sup>1</sup>, Parthajit Das<sup>2</sup>, Kishalaya Karan<sup>3</sup>, Jayanta Sharma<sup>4</sup>

A 21-year-old gentleman of Hansen's disease on multi drug therapy presented with complaints of fever for 10 days and altered mental status for the last 5 days from the day of presentation. MRI brain which showed multiple infarcts in brain. He was evaluated with relevant investigations which were suggestive of Neuro Systemic Lupus Erythematosus with secondary Anti-phospholipid Syndrome and Auto-immune Haemolytic Anaemia. Immuno-suppressive therapy initiated with pulse dose of IV Corticosteroids but discontinued due to increasing TLC and new onset fever. Repeat Urine culture showed *Candida tropicalis* and he was started on IV Caspofungin. Then, Immuno-suppressive therapy with IV Cyclophosphamide started. He had remarkable improvement in sensorium, his fever remitted and started to walk with help. He was discharged with oral steroids, warfarin and advice of IV Cyclophosphamide as per protocol.

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**Key words :** APLA, Neuropsychiatric Lupus, Hansen, AIHA.

**H**ansen's disease is caused by slow-growing acid-fast rod-shaped bacilli *Mycobacterium leprae*. It is a chronic infectious disease that affects the skin, peripheral nerves, upper respiratory tract, eyes and lining of the nasal mucosa and the diagnosis is done clinically<sup>1</sup>.

Systemic Lupus Erythematosus (SLE) is a multi-system auto-immune disorder with multi-factorial causes which influence the loss of immunological tolerance against self-antigens leading to the formation of pathologic auto antibodies that cause tissue damage through various mechanisms and affects females more than males<sup>2</sup>.

Anti-phospholipid Syndrome (APS) is a multi-system autoimmune disorder characterised by persistent presence of anti-phospholipid antibodies directed against phospholipid-binding proteins and may present as venous and arterial thrombosis and or pregnancy loss. The most common sites of venous and arterial thrombosis are lower limbs and cerebral arterial circulation, respectively. The anti-phospholipid antibodies are anti-cardiolipin antibody IgG and IgM, anti-beta2-gp1 antibody IgG and IgM and Lupus anticoagulant. APS can be primary, without any previous underlying disease or secondary, having underlying disease<sup>3</sup>.

### CASE REPORT

A 21-year-old gentleman with previous history of Hansen's disease on multidrug therapy of Dapsone, Rifampicin and Clofazimine from rural India presented to the Emergency Department with complaints of fever for 10 days and altered mental status of drowsiness and

### Editor's Comment :

- APLA syndrome is common in SLE patients
- APLA syndrome can present as a very rare complication in patients with Hansen's disease
- Hansen's disease can mimic as Lupus. There are multiple reports where Hansen's disease were misdiagnosed as Lupus initially. Biopsy should be done when there is any diagnostic dilemma.
- Hansen's disease may also act as a trigger to cause SLE.
- Active infections should always be ruled out for patients planned for therapeutic immunosuppression. Presence of active Urinary Tract Infection delayed the commencement of immunosuppressive drugs in our patient.

restlessness for 5 days from the day of presentation. Fever was insidious in onset, gradually progressive, intermittent and low grade in nature. He also developed altered mental status of drowsiness and restlessness for the last 5 days following which family admitted him.

On further inquiry, family also said that he had headache, occasional nausea and vomiting for the same duration and one episode of loss of consciousness 2 days back. He did not experience any episode of neck pain, photophobia, sore throat, chest pain, cough, palpitations, abdominal pain, yellowish discoloration of eyes and urine, reduced urinary output or leg pains.

On examination, he was conscious and alert but drowsy at times and was only obeying to simple commands. Pulse rate was 110 per minute, regular in rhythm, normal in volume, normal in character, all the peripheral pulses were palpable and there was no radio-radial or radio-femoral delay. Respiratory rate 22 per minute regular, thoraco-abdominal in nature and no accessory muscles of respirations were working. BP 90/60 mm Hg. Temperature 100°F. Pallor was present, there was no cyanosis, icterus, clubbing or oedema. No lymph node was palpable. Jugular vein pressure was not raised. Multiple hypopigmented patches of varying sizes along with multiple digital gangrene were present in both upper and lower limbs.

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On neurological examination, GCS was E4V2M6. He was only obeying simple commands. There was neck stiffness; Kernig's sign and Brudzinski's sign were absent. Cranial nerve examination was within normal limits. There was reduced power in all the 4 limbs which was suggestive of quadriparesis. Deep tendon reflexes were all exaggerated with ankle clonus. On superficial reflex, Babinski's sign was positive. Sensory examination only revealed decreased sensation in the hypopigmented areas of the body along with multiple digital gangrene in both upper and lower limbs.

All the relevant investigations for fever work up were sent. He was initiated on IV fluids, empirical IV Meropenem, IV Vancomycin with IV antiviral Acyclovir and pulse dose of IV Methylprednisolone prophylactically. He did not improve with for the following treatment and there was persistent fever. MRI brain was done which detected multiple thrombo-embolic stroke. CSF studies detected increased protein level. Dermatological consult was taken in view of Hansen's disease and patient was continued on multi drug therapy of Dapsone, Rifampicin and Clofazimine. Rheumatology consult was taken. Additional blood reports were suggestive of Systemic Lupus Erythematosus with probable secondary antiphospholipid syndrome but could not be initiated on immuno-suppressive therapy in view of persisting fever, increasing trend of Total Leukocyte Count and Catheter related Urinary Tract Infection with *Candida tropicalis*. IV Caspofungin was initiated and IV Methylprednisolone was stopped. His blood reports showed a decreasing trend of haemoglobin levels and direct Coombs' test was positive. He was then initiated on with oral corticosteroids, oral Hydroxychloroquine and IV Cyclophosphamide on day 17 of admission. His fever subsided and his general condition improved dramatically. He was discharged in a hemodynamically stable afebrile condition with oral steroids and warfarin. On follow-up after 14 days of discharge, he had remarkable improvement, was walking and eating with assistance and is planned for further Cyclophosphamide doses.

#### OTHER REPORTS

**DAY 1 :** INR 1.21; COVID 19 RTPCR, MPDA, Dengue NS1 and IgM/IgG, Scrub Typhus IgM, *Leptospira* IgM, HBsAg, ANTI-HCV, HIV 1 AND 2, Blood CS and Urine CS Negative; Urine RE Normal.

**EEG BRAIN :** suggestive of encephalopathic pattern.

**MRI BRAIN :** Multiple scattered T1 hypotense, T2/FLAIR hypertense intraparenchymal non-enhancing lesions of variable sizes showing intense diffusion restriction are seen in the bilateral basal ganglia, thalami, bilateral insular and fronto-parietal cortex, midbrain. Possible septic-embolic encephalitis or multiple cardioembolic infarct (Fig 1).

**DAY 2 :** Trans-esophageal Echo No Abnormality Detected; CSF Studies- Cell Count 3, Cell Type 100% Lymphocyte, Glucose 75 (Serum Glucose 142), Protein 110, TB Gene Xpert/ Gram Stain/AFB Stain/CNS Comprehensive Panel All Negative.

**DAY 4 :** ANA 3+ (1:180 titre in ELISA) (Fig 2)

**DAY 7 :** ANTI ds-DNA Positive (>200); Antibody to nRNP 2+, SMITH 1+, SS-A 3+, Ro-52 3+, Rib P-Protein 2+, AMA-M2 2+; c-ANCA Negative; p-ANCA 3+ (Atypical Pattern); SERUM C3 59; SERUM C4 10; RA Factor Negative; Serum ACE 19; URINE ACR 21.

**DAY 10 :** Blood CS Negative; Urine CS *Candida Tropicalis* growth.

**DAY 11 :** Lupus Anticoagulant Negative; Anti Cardiolipin Antibody IgM Reactive; Anti Phospholipid Antibody Negative; BETA2 GP1 Antibody Negative.

**DAY 16 :** Direct Coombs' Test Positive; Stool For Occult Blood Negative (Table 1).

#### DISCUSSION

This patient of Hansen's disease on MDT and Systemic Lupus Erythematosus developed Secondary Anti-phospholipid syndrome with autoimmune haemolytic anaemia which was improved after administration of IV Corticosteroids and IV Cyclophosphamide.

The main differentials that required to be ruled out for this patient initially were Lucio phenomenon due to Hansen's disease and Acute Systemic Lupus



Fig 1 — MRI Brain : Multiple scattered T1 hypotense, T2/FLAIR hypertense intraparenchymal non-enhancing lesion

Table 1 — Regular Blood Profile during Hospital stay

Day of Admission	Day 1	Day 3	Day 7	Day 10	Day 14	Day 17	Day 21
Haemoglobin	9.5	9.3	9.8	8	7.6	8.5	9.1
TLC	19800 N81L7	12400 N84L12	21300 N84L5	17600 N71L11	15000 N70L15	7600 N62L33	11800 N84L11
Platelet	1.98	1.84	1.69	2.06	3.73	3.24	3.73
CRP / Procalcitonin		8.1/0.14			9.3/0.11		
Urea / Creatinine	57/0.9	72/0.8	45/0.6	32/0.7	30/0.6	39/0.5	36/0.6
Sodium / Potassium	136/4.4	135/4.2	126/4.1	133/3.3	127/4.2	130/4.1	126/4.2
Total / Unconjugated Bilirubin	0.8/0.6	0.6/0.5	1/0.7	1.4/0.9	1/0.7		0.6/0.5
Albumin / Globulin	2.7/3.3	2.6/3.2	1.9/2.3	2.5/2.4	2.7/2.8		2.9/3.1
SGOT / SGPT / ALP	175/65/80	66/71/44	36/38/51	29/38/74	27/28/830		25/40/87

Antinuclear antibody Panel ( 14 antibody panel) - (Line-Dot Assay)	
Antibody to n RNP/Sm	POSITIVE (2+)
Antibody to Sm(Smith)	POSITIVE (1+)
Antibody to SSB-A/Ro	POSITIVE (3+)
Antibody to SSB-La	NEGATIVE
Antibody to Rb-S2	POSITIVE (3+)
Antibody to Scl70	NEGATIVE
Antibody to PM-Scl	NEGATIVE
Antibody to Jo-1	NEGATIVE
Antibody to CENP B	NEGATIVE
Antibody to PCNA	NEGATIVE
Antibody to ds DNA	NEGATIVE
Antibody to Nucleosomes	NEGATIVE
Antibody to Histones	NEGATIVE
Antibody to Rib P-Protein	POSITIVE (2+)
Antibody to AMA-M2	POSITIVE (2+)
Report Status:Final	

Fig 2 — 14 antibody ANA panel suggestive of Neuropsychiatric Lupus

Erythematosus flare up, apart from the definitive diagnosis of Secondary APS which was contributed by Hansen's disease and or SLE.

Diagnosis of APS is based on a combination of clinical features and diagnostic findings as per revised Sapporo APS Classification Criteria. Clinical criteria include (if any one present): vascular thrombosis and pregnancy morbidity. Laboratory criteria include (if any one present): IgG and or IgM cardiolipin antibody, IgG and or IgM anti beta2 glycoprotein and Lupus anticoagulant<sup>4</sup>. This patient had clinical criteria of vascular thrombosis and laboratory criteria of positive IgM anti cardiolipin antibody.

Hansen's disease is associated with secondary Anti-phospholipid syndrome- with previous documentations of case reports published previously as by Kaliyadan, *et al* in 2009 from India<sup>5</sup>. Previous studies of Hansen's disease associated APS has shown predominance of IgM subtype of antibodies of APS<sup>6</sup>.

One of the most common causes of secondary APS is Systemic Lupus Erythematosus which is around 35 per cent of all APS patients<sup>7</sup>. APS is one of the main causes of thrombosis risk in patients of SLE with the presence of anti-phospholipid antibodies as they attach to negatively charged phospholipid surface that may induce platelet activation, interfere with coagulation inhibitors and antifibrinolytics and initiate formation of a thrombus<sup>8</sup>.

Lucio phenomenon is an unusual presentation of Hansen's disease, a form of cutaneous vasculitis probably mediated by immune-complex deposition and present as large, sharply demarcated ulcerative lesions and thrombosis of bigger vessels and dermis and is treated by anti-leprotic medications, systemic glucocorticoids and other supportive medications<sup>9</sup>.

Systemic Lupus Erythematosus flare up is defined as *a measurable increase in disease activity in one or more organ systems involving new or worse clinical signs and symptoms and/or laboratory measurements. It must be considered clinically significant by the assessor and usually there would be at least consideration of a change or an increase in treatment*<sup>10</sup>.

Hansen's disease and SLE can mimic each other and having one can increase the risk of the occurrence of other disease<sup>11</sup>. Also, there have been case reports that a case of Hansen's disease has been misdiagnosed as SLE<sup>12</sup>.

Auto-immune haemolytic anaemia in primary APLA syndrome is very rare. Co-existence of auto-immune haemolytic anaemia and primary APLA may define as a subgroup of patients who may later develop SLE<sup>13</sup>.

Hence, we have been able to diagnose a patient of Systemic Lupus Erythematosus with Hansen's disease and secondary APLA syndrome and auto-immune haemolytic anaemia, which is very rare to come across.

#### CONCLUSION

Hence, we present a rare case of Neuropsychiatric Systemic Lupus Erythematosus with secondary Anti-Phospholipid Syndrome and auto-immune haemolytic anaemia in the background of Hansen's disease treated successfully with immuno-suppressive and anti-thrombotic therapy. It was a big challenge for coming to a diagnosis considering the presentation and even bigger challenge was the treatment course which was done judiciously.

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## Letter to the Editor

[The Editor is not responsible for the views expressed by the correspondents]

### Does only Mupirocin enough for Nasal Decolonization in Methicillin-resistant *Staphylococcus Aureus* Carriers or Do we need more ?

SIR, — *Staphylococcus aureus*, particularly, its resistant variant Methicillin-resistant *S. Aureus* (MRSA), is one of the most commonly prevalent nosocomial pathogens, creating a concern for the world population. For the treatment of severe MRSA infections, vancomycin is the drug of choice for physicians<sup>1</sup>. However, due to the emergence of vancomycin-resistant MRSA, a topical glycopeptide antibiotic, Mupirocin is now frequently used for nasal decolonization of patients and Healthcare Workers (HCWs) to prevent the transmission of MRSA in a hospital setup<sup>2</sup>. But few recent studies have documented Mupirocin-resistant MRSA, making the situation even more critical and raising the question, what is next? Or should we move to alternative preventive strategies?

During a sudden hospital outbreak of MRSA, the Hospital Infection Control Committee (HICC) has to initiate nasal swab surveillance from staff to find out the source of infection. If the source is identified, the treatment strategy will be as per HICC protocol. If no staff is found to have MRSA positive, a root cause analysis would need to be conducted, which could lead to the OPD or emergency department, which serves as the hospital's main entrance. If MRSA grows in any specimen, confirm it again and start Mupirocin treatment for 5-7 days in accordance with institutional policy.

For infection prevention, isolation of the source is also necessary in addition to treatment. Once the treatment is completed, fresh samples must be collected, and if MRSA does not grow, the treatment is successful. But if there is a growth of MRSA, treatment should be resumed and the sample should be collected again after completion of treatment. If again MRSA grows, the medical history of the source Health Care worker needs to be investigated further. Many times, medical history can reveal the reason behind MRSA growth even after mupirocin treatment. Mupirocin susceptibility of an isolated MRSA strain can be tested, and if require (colonization persists even after completion of two courses of mupirocin treatment or specimen detect mupirocin resistance), another drug such as chlorhexidine or Rifampicin, which is not often used to treat MRSA, can be added<sup>3</sup>. After the treatment is completed, collect the sample again to check for MRSA growth. Usually, after combination therapy, there will be a lesser chance of MRSA colonization still existing. In our center, a similar incident was experienced before, and we addressed it in accordance with institutional HICC protocol and as described above.

For the treatment of MRSA nasal carriage in healthy adult patients and HCWs, nasal formulation of mupirocin is frequently advised. It interferes with bacterial protein synthesis but continuous genetic evolution and the emergence of resistant strain causes treatment failure<sup>4</sup>. Nasal swab surveillance is necessary at regular intervals as well as during the outbreak of MRSA<sup>5</sup>. The purpose of surveillance is not only to collect samples and make

treatment recommendations but also to retest samples after treatments to ensure that they were successfully completed<sup>6</sup>.

In conclusion, we would like to state that, although Mupirocin is the cornerstone of decolonization regimens, the existence of mupirocin resistance in MRSA strain is a cause for serious concern. It could be limited by the detection of Mupirocin resistance, regular surveillance, and effective infection control initiatives including standard precautions and environmental cleaning<sup>7</sup>. Nasal swab collection for MRSA carriers' detection during the pre-employment health checkup could be a successful strategy to prevent healthcare-associated staphylococcal infections. Based on our real experience, we also strongly suggest that during MRSA nasal carrier surveillance, root cause analysis, which includes the entrance of the hospital setup, must be done, even if there is some positive evidence scattered here and there<sup>8</sup>.

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# JOURNAL OF THE INDIAN MEDICAL ASSOCIATION

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### ABBREVIATIONS USED

(BR) Brief Report, (Commt) Commentary, (C) Correspondence, (CR) Case Report, (CS) Case Series, (DC) Drug Corner, (Ed) Editorial, (OA) Original Article, (PCME) Pictorial CME, (RA) Review Article, (SA) Special Article, (S Comm) Short Communication



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