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#### **HEALTHLINE JOURNAL**

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### Role of the Indian Association of Preventive and Social Medicine (IAPSM) in Combating Antimicrobial Resistance (AMR)

#### Purushottam Giri<sup>1</sup>, Venkatesh Karthikeyan<sup>2</sup>

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#### Introduction:

Antimicrobials are medicines used to prevent and treat infectious diseases in humans, animals, and plants. They include antibiotics, antivirals, antifungals, and antiparasitics.<sup>[1]</sup> However, the effectiveness of these medicines is under threat due to the growing issue of Antimicrobial Resistance (AMR). Antimicrobial Resistance occurs when bacteria, viruses, fungi, and parasites evolve and no longer respond to antimicrobial treatments, rendering these drugs ineffective. This makes infections increasingly difficult, or even impossible, to treat, thereby raising the risk of disease spread, severe illness, disability, and death. Although AMR is a natural process driven by genetic changes in pathogens, its acceleration is largely fueled by human activity, particularly the misuse and overuse of antimicrobials across various sectors.<sup>[1,2]</sup> As AMR continues to pose a global health threat, coordinated efforts to combat it have become crucial. Hence we are exploring the pivotal role of Community Medicine / Preventive and Social Medicine (PSM) in addressing the global challenge of antimicrobial resistance.

#### **Burden of AMR**

Antimicrobial resistance presents a major threat to global health, contributing to increased mortality

and morbidity rates. The World Health Organization (WHO) has declared AMR a "Silent Pandemic," emphasizing the critical need to tackle this issue.<sup>[2]</sup> AMR poses a worldwide threat, with drug-resistant diseases claiming the lives of 4.71 million individuals in 2021, of which 1.14 million deaths were directly related to AMR.<sup>[3]</sup> In India, the impact of AMR is profound, with 987, 254 deaths associated with AMR and 266,734 deaths attributable to AMR in 2021.<sup>[3]</sup> AMR adds to significant costs, for both health systems and national economies, posing a problem for all countries at all income levels. AMR creates the need for more expensive and intensive care, and affects the productivity of patients and caregivers through prolonged hospital stays.

#### **History of IAPSM**

The Indian Association of Preventive and Social Medicine (IAPSM) is a not-for-profit national-level professional body in the field of Community Medicine/ Preventive and Social Medicine/ Public Health, founded in 1974.<sup>[4]</sup> As on today, IAPSM has 8,800 plus members across India, serving in medical colleges, national and state government health departments, and various health institutes involved in research, training, epidemiology, and surveillance. Many of its members also work as experts with

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international development agencies, non-governmental organizations (NGOs), or as freelance public health consultants.

#### **Role of IAPSM in Public Health**

IAPSM addresses a wide range of public health issues, including personal and environmental health, national health programs, communicable and noncommunicable diseases, tobacco and alcohol control, adolescent and geriatric health, mental health, and health advocacy.<sup>[5]</sup> The association actively works to generate evidence for policy change while also training professionals in Community Medicine to strengthen the public health workforce. Its activities include organizing academic events such as national / state/ zonal conferences, workshops, webinars and seminars, offering courses, conducting research, and providing technical support. IAPSM is also involved in community intervention projects that tackle various public health challenges. These efforts are often carried out in collaboration with central and state government health authorities, international development agencies, NGOs, and corporate social responsibility (CSR) units of industries. Recognizing that health is inherently multisectoral, IAPSM collaborates with organizations from diverse fields such as agriculture, industry, urban planning, climate, and education to achieve its goal of fostering a healthier nation. Additionally, IAPSM plays a pivotal role in promoting research and evidence-based practices through its PubMed-indexed journal, the Indian Journal of Community Medicine, which serves as a vital platform for disseminating public health knowledge and advancing the field of public health.<sup>[5]</sup>

### Challenges in addressing Antimicrobial Resistance

Addressing AMR poses numerous challenges, requiring coordinated efforts across multiple sectors. These include the overuse and misuse of antibiotics in both human and veterinary medicine, non-prescription access to antibiotics, and irrational usage in community settings. The misuse of antibiotics in agriculture, animals, and fisheries further exacerbates the issue, contributing to the spread of resistant pathogens through the food chain and environment.<sup>[6]</sup> Inadequate infection prevention and control measures in healthcare delivery systems at all levels primary, secondary, and tertiary complicate efforts to manage AMR effectively. Additionally, there is a lack of emphasis on AMR in medical education, insufficient research into new antimicrobials, and gaps in evidence due to inadequate surveillance and data quality. Innovation in antimicrobial development is slow, and the need for stronger policy advocacy to regulate antibiotic use and foster stewardship across sectors is urgent.<sup>[7]</sup> Tackling these challenges requires a comprehensive, multi-stakeholder approach involving public health professionals, policymakers, researchers, and industry leaders.

IAPSM is uniquely positioned to lead the fight against antimicrobial resistance in India. With a robust network of over 8,800 plus members spread across the country, It brings together professionals working in medical colleges, national and state governments and leading health institutes. Many of its members allowing IAPSM to leverage diverse expertise and experiences in its efforts to combat AMR. Additionally, the association's close collaboration with the Government of India on a variety of public health initiatives places it in a powerful position to influence policy, advocate for effective AMR strategies, and ensure the implementation of evidence-based interventions. This extensive reach and influence across multiple sectors make IAPSM a vital player in addressing the growing burden of AMR and driving the national response forward.

#### National Alliance of Medical Professionals on Antimicrobial Resistance (NAMP-AMR) - IAPSMs Key Contribution in the Fight Against AMR

IAPSM plays a pivotal role as a key partner in the National Alliance of Medical Professionals on

Antimicrobial Resistance (NAMP-AMR), a groundbreaking initiative led by the Indian Medical Association (IMA) in collaboration with major stakeholders such as NITI Aayog, the Ministry of Health and Family Welfare (MoHFW), Directorate General of Health Services (DGHS), World Health Organization (WHO), National Centre for Disease Control (NCDC), National Accreditation Board for Hospitals and Healthcare Providers, and IAPSM itself<sup>(8)</sup>

As part of an alliance that unites 52 medical specialty organizations and associations, IAPSM has been instrumental in shaping comprehensive strategies to tackle AMR across various sectors. IAPSM Secretary General Prof. (Dr.) Purushottam Giri,was involved in deliberations with different stakeholders during the inaugural meeting of the National Alliance of Medical Professionals (NAMP) on Antimicrobial Resistance (AMR) at IMA Headquarter Delhi, on 07th July 2024. The alliance focuses on six critical areas: raising AMR awareness and advocacy, strengthening laboratory capacities and surveillance, enhancing infection prevention and control (IPC), optimizing antimicrobial use through stricter regulations and stewardship programs, advancing research and innovation, and fostering both national and international collaborations. IAPSMs deep-rooted involvement, through its members expertise in public health, research, and epidemiology, positions it as a key driver in developing this collaborative roadmap, which strengthens India's response to AMR and supports the forthcoming National Action Plan on AMR 2.0. This strategic initiative not only bolsters Indias efforts in combating AMR but also positions IAPSM as a leading force in global health efforts against this pressing challenge.

The NAMP- AMR meeting successfully established a framework for ongoing collaboration and outlined several actionable strategies for member associations to adopt. Among the key recommendations is the allocation of specific sessions on AMR at every national and state conference, ensuring continuous focus on the latest research and developments in the field. Each member association is also encouraged to appoint an AMR Coordinator responsible for overseeing the implementation of AMR initiatives and ensuring the continuity of efforts. The promotion of the AMR Pledge among members aims to foster a culture of responsible antimicrobial use and stewardship. Additionally, AMR and infection prevention and control (IPC) are to be officially recognized as priority focus areas, with enhanced visibility across member websites to boost commitment and awareness.<sup>[8]</sup>

Active participation in World Antimicrobial Resistance Awareness Week was also recommended as a vital initiative to raise public and professional awareness of AMR challenges and advancements. To contribute to global knowledge, scientific publications on AMR should be encouraged, ensuring that evidence-based practices are widely shared. Capacity-building programs for members are crucial to enhancing their expertise in effective AMR management. Regular review meetings are necessary for assessing progress, sharing best practices, and refining strategies under the NAMP-AMR framework. IAPSM is fully committed to following these recommendations and has already taken significant steps in this direction. Recently, IAPSM Secretary General Prof. (Dr.) Purushottam Giri has delivered a keynote talk on the "Role of IAPSM in Combating AMR" at 29th Annual Andhra Pradesh State Joint Conference of IAPSM & IPHA, held at Sri Venkateswara Medical College, Tirupati on 31st August 2024, reinforcing its leadership in the fight against AMR.

#### Way Forward

IAPSM holds significant potential to address AMR across various sectors, including primary healthcare, community settings, all levels of healthcare delivery, academia, research, and policy advocacy. By leveraging its expertise and network, IAPSM can drive impactful initiatives that enhance awareness, improve antibiotic stewardship, and influence evidence-based policies to combat the growing threat of AMR.

#### **AMR in Primary Healthcare Setting**

In primary healthcare settings, the challenge of AMR is exacerbated by factors such as the overprescription of antibiotics, lack of adherence to treatment guidelines, and limited diagnostic capabilities, often leading to irrational antimicrobial use. This is where IAPSM can be a game-changer. By utilizing its vast network of public health professionals, IAPSM can promote effective antibiotic stewardship and enhance training for primary care providers, ensuring they have the knowledge and tools to prescribe antibiotics judiciously. Additionally, IAPSM can lead communitybased education campaigns to raise awareness about the dangers of antibiotic misuse, ultimately reducing patient demand for unnecessary antibiotics and curbing the rise of resistance at the grassroots level.

### AMR in Secondary and Tertiary Healthcare Settings

In secondary and tertiary healthcare settings, the burden of AMR is intensified by factors such as inadequate infection prevention and control (IPC), overuse of broad-spectrum antibiotics, and insufficient antimicrobial stewardship programs.<sup>[9]</sup> These environments often serve as breeding grounds for resistant infections, further complicating patient outcomes and healthcare delivery. IAPSM, with its expertise in epidemiology, health management, and surveillance, can be a transformative force in addressing these challenges. By spearheading the implementation of robust IPC protocols and stewardship initiatives, IAPSM can help optimize antimicrobial use in hospitals and specialized care centers. Additionally, the association can promote regular AMR audits, training programs for healthcare

workers, and foster a culture of accountability and evidence-based practices, significantly reducing the spread of resistant infections in these critical care settings.

#### **AMR in Academia**

In academia, the fight against AMR faces a different set of challenges due to the insufficient integration of antimicrobial resistance education into medical and public health curricula. Many future healthcare professionals graduate with a limited understanding of antibiotic stewardship and infection prevention, which perpetuates the cycle of misuse in clinical practice. IAPSM, closely working with the National Medical Commission (NMC) in recent times, is uniquely positioned to change this narrative. By advocating for the inclusion of comprehensive AMR modules in medical education and providing expert-driven training programs, IAPSM can ensure that the next generation of healthcare professionals is well-equipped to tackle AMR.

#### **AMR in Research**

The global battle against AMR is hindered by a significant gap in research, with limited focus on developing new antimicrobials, innovative diagnostic tools, and alternative treatment strategies. Additionally, there is a lack of robust, localized data on resistance patterns, which impedes effective interventions. IAPSM can be a pivotal force in overcoming these challenges. With its vast network of experts in epidemiology, public health, and preventive medicine, IAPSM can foster collaborative research efforts aimed at generating critical evidence and developing novel solutions to combat AMR. By promoting research on antimicrobial stewardship, vaccinology, resistance mechanisms, and surveillance systems, IAPSM can help bridge the knowledge gap, guiding policymakers and healthcare providers in implementing evidencebased strategies to reduce the burden of AMR.

#### **Conclusion**:

In conclusion, the Indian Association of Preventive and Social Medicine stands at the forefront of India's battle against antimicrobial resistance, uniquely equipped to drive impactful change across the healthcare spectrum. With its extensive network of experts, strong collaborations with government bodies, and deep involvement in research, education, and policy advocacy, IAPSM is poised to address the multifaceted challenges of AMR. By fostering antibiotic stewardship in primary healthcare, enhancing infection prevention and control in secondary and tertiary settings, integrating AMR education in academic curricula, and promoting research and innovation, IAPSM can play a transformative role in shaping a coordinated, evidence-based response to AMR. As India faces the escalating threat of AMR, IAPSMs leadership is crucial in driving a national agenda that will not only combat this growing public health crisis but also set a global example of effective multisectoral collaboration.

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# Key Stakeholders in Addressing Gaps in Occupational Health in India: Areas where IAPSM can Play a Crucial Role

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#### Introduction:

Industrialization has been a driving force behind Indias economic growth, transforming the nation into one of the worlds largest industrial economies. Over the past few decades, the expansion of industries ranging from manufacturing to construction has contributed significantly to employment opportunities, infrastructure development, and technological advancements. According to the Ministry of Statistics and Programme Implementation, there were 249,987 factories in India in the year 2022. Tamil Nadu is leading the list with the maximum number of factories in one state, and that is 39,512.<sup>[1]</sup> While 92% of the Indian work force works in the unorganized sectors (agriculture, cottage industry, homework / services), 8% of the workforce is working in organized sectors (in the enterprises owned by government and the private sector).<sup>[2]</sup>

In both urban and rural areas, Worker Population Ratio (WPR) for persons of age 15 years have increased. The rise in rural setting is from 48.1% in 2017-18 to 59.4% in 2022-23 while for urban areas it increased from 43.9% to 47.7%.WPR in male in India increased from 71.2% in 2017-18 to 76.0% in 2022-23 and corresponding increase in WPR for female was from 22.0% to 35.9%.<sup>[3]</sup> Alongside these economic benefits, industrialization has brought with it a rise in occupational hazards and an increasing need for robust occupational safety and health (OSH) practices. As India continues to industrialize, ensuring the safety and well-being of its workforce is no longer a matter of choice but a pressing necessity for sustainable development.

Currently only 15% of workers worldwide have access to specialized occupational health services.<sup>[4]</sup> Indias occupational safety and health landscape has evolved over time, but it still faces significant challenges. Occupational health in India isgoverned by the Occupational Safety, Health and Working Conditions Code, 2020 (OSH Code), which aims to protect workers' rights and welfare. The code covers various aspects of occupational safety, health, working conditions, social security, and grievance redressal. The OSH Code subsumes 633 provisions of 13 major labor laws (e.g. Factories Act (1948), Employees' State Insurance Act (1948), and the Mine Act (1952) etc.) into one single code with 143 provisions.<sup>[5,6]</sup>

According to the International Labour Organization (ILO), India has one of the highest rates of workrelated fatalities in the world, with tens of thousands of deaths reported annually due to industrial

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accidents and occupational diseases. These statistics underscore the need for urgent attention to occupational safety and health issues.

#### Gaps in Occupational Health in India -

#### Fragmented Healthcare System:

Occupational healthcare in India is often fragmented, with little integration between occupational health services and the primary healthcare system. Occupational safety and health remain under the purview of the Ministry of Labour rather than the Ministry of Health. Even at places, where an Occupational Health Physician is employed, their role is typically cantered on curative treatment and administrative tasks, with limited attention given to occupational health concerns. Further more, there are significant social and cultural barriers to accessing healthcare in India. Many workers in lowwage, informal, or migrant labour jobs face stigma or fear associated with seeking help, particularly for issues related to mental health or chronic diseases.

#### Shortage of Occupational Health Professionals:

There is a severe shortage of trained occupational healthcare workers in India. There are around 1125 qualified occupational health professionals in India and only around 100 qualified hygienists as against a requirement of over 8000 qualified occupational health doctors.<sup>[7]</sup>

Furthermore, these physicians may not be adequately trained in occupational health, leading to under diagnosis and under-reporting of occupational diseases. Occupational Health Centres are mandatory at factories or units involved in hazardous processes, and a full-time occupational health physician must be appointed when the number of employees exceeds 200.<sup>[7]</sup> However, effective implementation of these guidelines is lacking.

#### Inadequate Regulations and Enforcement:

While India has laws governing occupational safety and health, the enforcement of these regulations remains weak and this is one of the primary obstacles to improving OSH in India, particularly in the unorganized and informal sectors where a significant portion of the workforce is employed. Enforcement is managed by the Directorate General of Factory Advice Service and Labour Institutes (DGFASLI), which operates at the state level through factory inspecting engineers and medical inspectors. The number of these enforcement officers is woefully inadequate for a nation with a rapidly growing workforce.<sup>[7]</sup>

#### Lack of Training and Research:

Occupational healthcare is a relatively underdeveloped field in India. There are only few institutions involved in training and capacity building. Occupational Health Institutes in India provide training and conducting research in occupational health are Central Labour Institute (CLI), Mumbai, National Institute of Occupational Health (NIOH), Ahmadabad, Industrial Toxicology Research Centre (ITRC), Lucknow, Central Mining Research Station, Dhanbad, Regional OHCs at Calcutta and Bangalore, Regional Labour Institutes at Calcutta, Madras, Faridabad and Kanpur and very few medical colleges and institutes.<sup>[7]</sup>

### Directorate General of Factory Advice Service and Labour Institutes (DGFASLI):

It is the only governmental agency conducting statutory courses in occupational health and safety which includes: 1) a three-month duration training program in Industrial Health, Associate Fellow in Industrial Health (AFIH) that enables Indian registered medical doctors of modern medicine to become competent occupational health physicians in various industrial establishments. Once limited to only 50 participants annually, since the last 15 years, the course has expanded and is now run by 17 institutions training about 600 doctors per year. About 4,400 doctors have been trained till 2023.<sup>[8]</sup> 2) To address the need of qualified safety professionals to manage the various health risks and help factory management meet the statutory requirements for

appointing safety officers under Section 40-B of The Factories Act, 1948, the Central Labour Institute in Mumbai, along with Regional Labour Institutes in Chennai, Faridabad, Kanpur, and Kolkata, offers ADIS (Associate Diploma in Industrial Safety), DIS (Diploma in Industrial Safety), and PDIS (Post-Diploma in Industrial Safety) course, a one-year Diploma in Industrial Safety. These courses are the only nationally recognized qualifications for the appointment of safety officers under The Factories Act, 1948. 3)To address the gap in equipping supervisors with Occupational Safety and Health (OSH) knowledge and assist management of factories involving hazardous processes in adhering to the statutory provisions outlined in Section 41C(b) of the Factories Act, 1948, the Industrial Safety Division of various institutes under the Directorate General of Factory Advice Service and Labour Institutes (DGFASLI) conducts a comprehensive one-month (four weeks) full-time certificate course in Safety and Health.

Additionally, DGFASLI empanels various institutes across India to conduct the course according to the guidelines issued by DGFASLI. This training, equip supervisors with the latest techniques and the understanding of current statutory requirements, enabling them to analyse process hazards and implement appropriate risk mitigating methodologies.<sup>[9]</sup> The Department of Occupational Health at the All-India Institute of Hygiene and Public Health (AIIH&PH) in Kolkata, established in 1949, works to address the shortage of trained professionals in occupational and industrial health by offering a range of training programs.<sup>[10]</sup>

#### National Institute of Occupational Health (NIOH):

It is a leading institute under the Indian Council of Medical Research (ICMR), is majorly involved in research in occupational health. The Institute also conducts short-term training programs for industrial medical officers, industrial hygienists, factory inspectors, workers, trade unions, and others. Additionally, it provides expert advice to the Ministry of Health, Ministry of Labour, Ministry of Environment, and Ministry of Commerce on matters related to occupational health, safety, and environmental concerns.

## Central Industrial Hygiene Association (CIHA) of India:

It is a national association promoting industrial hygiene in India. CIHA has conducted several training programs, webinars and international conferences on industrial hygiene and related subjects.<sup>[11]</sup>

## The Indian Association of Occupational Health (IAOH):

It is a non-governmental organization of occupational health experts, has launched a collaborative initiative to raise awareness and sensitize primary care physicians in India. This initiative includes in-person training courses, satellite-based sessions, webinars, conferences and the creation of training videos, which are available on social media platforms.

#### Various Stakeholders in Occupational Health -

In India, the occupational healthcare system functions across multiple levels.

#### Ministry of Labour and Employment (MoLE):

It is the apex body responsible for labour welfare and occupational safety in India. MoLE works with other stakeholders to formulate policies, regulations, and programs that aim to improve working conditions and reduce occupational risks.

## Directorate General of Factory Advice Service and Labour Institutes (DGFASLI):

It is the technical branch of MoLE responsible for drafting statutory guidelines and regulations. It plays a key role in monitoring compliance with safety regulations, conducting inspections, and offering technical guidance to industries regarding occupational health and safety measures. Additionally, it conducts intervention studies to assess the prevalence of occupational health disorders and diseases. The data gathered from these studies are used to evaluate the scope of the issue, helping the government incorporate occupational health concerns into national planning and policy development.<sup>[9]</sup>

#### Employees' State Insurance Corporation (ESIC):

It is responsible for providing medical care and social security benefits to employees covered under the Employees' State Insurance Act. Keeping pace with the process of industrialization, the Scheme has expanded in 35 States and Union Territories. As on 31.03.2023, 7.83 lakhs factories and establishments across the country are registered under the Act, benefiting about 3.43 crores insured persons/family units and total beneficiary stands at over 13.3 crores. Medical services are provided through a network of 1574 ESI dispensaries/387 ISM units, 161ESI hospital, medical colleges, panel clinics, 927 insurance medical practitioners (IMP) and 20 employers utilization dispensaries (EUD), making it a key stakeholder in occupational healthcare. For payment of Cash Benefits, the Corporation operates through a network of Branch Offices/Pay Offices, whose functioning is supervised by Regional/Sub-Regional and Divisional offices. The Corporation has also set up Occupational Disease Centers, for early detection and treatment of occupational diseases prevalent amongst workers employed in hazardous industries.<sup>[12]</sup>

#### **Employers' Role:**

Employers are critical stakeholders in the management of occupational health. According to Indian labour laws, employers are legally bound to ensure the safety and well-being of their employees.

#### Non-Governmental Industry Associations:

Industry associations, such as the Confederation of Indian Industry (CII), and the Federation of Indian Chambers of Commerce and Industry (FICCI), are important players in promoting best practices in occupational health and safety. These associations often collaborate with the government to advocate for worker safety standards, provide guidance on health regulations, and help their members implement health and safety programs.

#### Trade Unions and Worker Organizations:

Organizations like the Centre of Indian Trade Unions (CITU) and the All India Trade Union Congress (AITUC) have long been involved in exploring measures for improved working conditions and stronger safety regulations. They are also instrumental in highlighting unsafe conditions and demanding compliance with existing labour laws.

#### Professional Associations in Occupational Health

Professional associations related to occupational health provide specialized knowledge and expertise in the field. These associations not only train healthcare professionals but also play an important role in setting standards for occupational health practices, offering certification programs, and conducting research. Associations such as the Indian Association of Occupational Health (IAOH), Indian Society of Ergonomics (ISE), and the Occupational Health and Safety Association of India (OHSAI) are central to advancing occupational health in India. Considering the existing gaps in occupational health, it is essential to engage with other professional associations like Indian Association of Preventive and Social Medicine (IAPSM) to help address these shortcomings.

### Indian Association of Preventive and Social Medicine (IAPSM):

It is a National-level professional body in the field of Community Medicine/ Preventive and Social Medicine/ Public Health, founded in 1974. IAPSM was formally registered under the Society Act XXI of 1860 on February 13, 1984, in the office of the Registrar of Societies in New Delhi.<sup>[13]</sup> As a not-for-profit organization, it comprises specialists in

Preventive and Social Medicine, Community Medicine, Public Health, Epidemiology, Health Management, Health Promotion, and Family Medicine.<sup>[13]</sup> As on today, IAPSM has 8,800 plus members across India, serving in medical colleges, national and state government health departments, and various health institutes involved in research, training, epidemiology, and surveillance. Many of its members also work as experts with international development agencies, Non-Governmental Organizations (NGOs), or as freelance public health consultants. The association plays a crucial role in shaping public health policies, educating healthcare professionals, conducting research, and advocating for better health outcomes at the national and community levels. IAPSMs contribution to public health in India can be observed in various areas such as disease prevention, health promotion, medical education, policy development, capacity building, and research.

#### Key Areas where IAPSM Can Serve as a Stakeholder in Occupational Health -

#### 1. Raising Awareness and Education

Occupational health in India remains an underdeveloped field, with many workers and employers unaware of the risks associated with their work environments. IAPSM can leverage its network and resources to organize workshops, seminars, and awareness campaigns targeting both workers and employers. By empowering workers with knowledge, they can take preventive actions to protect themselves, leading to improved health outcomes.Furthermore, IAPSM can contribute to the training and education of healthcare professionals, including primary care physicians, who are often the first point of contact for workers experiencing health issues. By conducting specialized training programs, webinars, and creating educational content on occupational health, IAPSM can enhance the capacity of healthcare providers to diagnose, treat, and manage work-related health problems effectively.

# 2. Collaborating with Government Bodies and Policymakers

IAPSM, as a well-established professional body, has the influence and credibility to collaborate with government agencies and policymakers to advocate for stronger occupational health regulations. IAPSM can engage with government ministries such as the Ministry of Labour, Ministry of Health, and Ministry of Environment to contribute to policy formulation and implementation. By serving as a bridge between workers, employers, and policymakers, IAPSM can advocate for stricter enforcement of occupational health standards, the establishment of more comprehensive worker health surveillance systems, and the inclusion of occupational health in national public health agendas. This collaboration can help create a more robust legal and regulatory framework for occupational health across the country.

## 3. Promoting Research and Evidence-Based Interventions

Research is a critical component in improving occupational health outcomes. IAPSM can support and promote research in the field of occupational health by providing funding, resources, and platforms for the dissemination of new findings. Research initiatives can focus on identifying emerging occupational health hazards, studying the impact of specific industries on workers' health, and evaluating the effectiveness of existing interventions. The results of such research can be used to develop evidence-based guidelines for the prevention and management of occupational diseases, as well as to advocate for policy changes that address identified risks. Furthermore, IAPSM can collaborate with National Medical Commission (NMC) and research institutions to include occupational health topics in medical and public health curricula, thus nurturing a new generation of experts in the field.

#### 4. Improving Access to Quality Occupational Health Services

Access to quality occupational health services is a critical issue, particularly in Indias informal sector, where the majority of workers remain underserved. IAPSM can contribute by helping to develop and implement models for accessible, affordable, and effective occupational health services. This could include setting up mobile health clinics for workers in remote areas, establishing community-based health programs, or working with employers to integrate occupational health services into workplace wellness programs. Additionally, IAPSM can advocate for the inclusion of occupational health in primary healthcare settings, where many workers seek care for non-specific symptoms that may have occupational origins.

## 5. Advocating for Mental Health in the Workplace

While physical health risks in the workplace have received much attention, mental health in occupational settings is an often-neglected area. The rise of stress, anxiety, and depression due to jobrelated pressures such as long working hours, unsafe working conditions, and workplace harassment has profound implications for workers overall wellbeing. IAPSM can take a leadership role in advocating for mental health awareness in the workplace, emphasizing the importance of creating supportive work environments, and promoting stress-reduction interventions. Through awareness programs, policy advocacy, and collaboration with mental health organizations, IAPSM can work towards integrating mental health support into occupational health programs

# 6. Advancing Occupational Health in Vulnerable Populations

Certain groups of workers, such as women, and migrant labourers/workers who are often more susceptible to occupational hazards due to inadequate safety measures, lack access to health services and face disproportionate risks in the workplace. IAPSM can contribute by focusing on the specific occupational health challenges faced by these vulnerable populations.

#### **Conclusion:**

India's industrialization has brought significant economic growth, but it has also exposed the workforce to various occupational risks that require urgent attention. Occupational health in India faces numerous challenges that hinder the protection and well-being of workers. These challenges include inadequate regulation and enforcement, emerging hazards, limited access to healthcare services, and a lack of education and training for both workers and healthcare professionals.

Addressing these challenges requires a multifaceted approach. Only through a collaborative effort among governments, employers, workers, and professional organizations can significant progress be made in improving occupational health outcomes in India. The Indian Association of Preventive and Social Medicine (IAPSM) has the potential to make a notable contribution to improving occupational health in India. By focusing on education, research, advocacy, and collaboration with government and industry stakeholders, IAPSM can help bridge the gap between the current and the desired state of occupational health. Through its multifaceted approach, IAPSM can be instrumental in creating healthier workplaces, reducing occupational diseases, and improving the quality of life for millions of workers across the country.

#### **Declaration:**

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### Facilitators and Barriers of Treatment Compliance among Type 2 Diabetes Mellitus Patients Attending the Diabetes Clinic of a Tertiary Care Hospital, Kolkata: A Mixed-Methods Study

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#### Abstract:

Introduction: Type 2 diabetes mellitus is a disease of epidemic proportions and has emerged as a major healthcare problem. Compliance to medication plays a crucial role in achieving success in medical treatment and preventing complications. **Objectives:** The objective of this study was to assess the treatment compliance among the study participants and explore its perceived barriers and facilitators. Method: A descriptive crosssectional study was carried out using Morisky's Medication Adherence Scale (MMAS) among 308 type2 diabetes mellitus patients who were selected through systematic random sampling. Qualitative data was collected though in-depth interviews and were analysed by manual content analysis. Results: Out of the 308 study participants 47% were found to have high treatment compliance and 20% and 35% were found to have medium and low compliance, respectively. On binomial logistic regression, age, duration since diagnosis, family support and current treatment regimen were found to be significantly associated with treatment compliance. Multiple facilitators of compliance could be identified of which, self-awareness of disease, fear of complications and family support were most pronounced. Where asinability to purchase the medicines, forgetfulness, and lack of satisfaction with health services, were among the identified barriers of treatment compliance. **Conclusion:** High Compliance to diabetes medication was found among 47% of the study participants. Tailored interventions against the perceived barriers are necessary to promote compliance and improve glycaemic control.

Keywords: Mixed-methods study, Treatment compliance, Type 2 diabetes mellitus

#### Introduction:

Type 2 diabetes mellitus (T2DM) is a disease of epidemic proportions and has emerged as a major healthcare problem. It has been predicted that the absolute increase in the number of individuals with diabetes mellitus is expected to occur and the number of adults living with T2DM is estimated to increase from 463 million to 700 million by the year 2045.<sup>[1]</sup>

India is called the "Diabetes Capital of the world" as it accounts for 17% of the total diabetes burden which is further expected to cross the 100million

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marks by 2030. India is also the largest contributor to regional mortality due to diabetes.<sup>[2]</sup>

Type 2 Diabetes Mellitus can lead to multiple macrovascular (cardiovascular diseases, cerebrovascular diseases etc.) and microvascular complications (neuropathy, nephropathy etc.) and increase chances of premature mortality without optimum glycaemic control. Compliance to medication plays a crucial role in achieving success in medical treatment and preventing complications.<sup>[3]</sup>

It is often found, given the lack of symptoms of the said disease and lack of awareness among individuals regarding the complications that may arise of it, the disease is often a subject of neglect and even slightest of inconvenience becomes a cause for non-persistence with treatment.<sup>[4]</sup>

Multiple studies done in India have identified patient dissatisfaction, poor doctor-patient relationship and longer waiting time at healthcare facilities as important factors which increases the chances of non-compliance to medication.<sup>[5]</sup> Lack of a flexible, patient-friendly healthcare system consisting of multiple drugs cause patients feeling overburdened by their treatment regimen and imposes an economic burden on them, which eventually leads them to resort to non-compliance.<sup>[4]</sup> To identify and address the various facilitators and barriers of treatment compliance is of utmost concern and this study was done with the objective to explore them.

#### Method:

An explanatory sequential mixed-methods study was conducted in the diabetes clinic of Calcutta National Medical College and Hospital between October 2020 to October 2022. The quantitative part was a descriptive study of cross-sectional design, and the qualitative part was in the form of in-depth interviews. Adult T2DM patients who were diagnosed for at least 1 year were included in the study whereas pregnant, lactating women and seriously ill patients were excluded from the study.

**Sample size** : For the quantitative strand was calculated to be 308 (using Cochran formula, taking 76.2% prevalence of treatment compliance, obtained from a study by Chavan et al.<sup>[5]</sup>, 5% absolute precision and a non- response rate of 10%). For the qualitative strand, in-depth interviews were conducted till data saturation reached. Total 12 participants were interviewed.

#### Sampling technique:

#### Quantitative part:

As per the register of the clinic, the number of patients per day range between 50-60 patients, out of which on an average 30 patients fulfilled the inclusion criteria, thus a sampling interval of 10 was achieved. A complete list of the patients was taken from the register, a random number was selected ( $\leq$ 10 i.e., 7 in this study). Thus, the 7<sup>th</sup> patient of the register was the first participant. Then every 10<sup>th</sup> patient was chosen, each day by systematic random sampling, till the desired sample size was achieved. If any patient did not satisfy the inclusion criteria or fell in the exclusion criteria, the next patient was considered

#### **Qualitative part:**

Twelve patients (6 having good treatment compliance and 6 having poor treatment compliance) were selected purposively and interviewed till data saturation was achieved.

#### Methodology:

**Quantitative component**: Participants who provided a written informed consent were enrolled till desired sample size was achieved. The participants were interviewed with a using a predesigned, pre-tested, semi-structured schedule containing questions on socio-demographic and disease profile. Treatment compliance was assessed using **Moriskys Medication Adherence Scale** (**MMAS**)<sup>[8]</sup> Permission was obtained to use this 8item, structured, treatment compliance scale. Those found to have high and medium compliance according to the scale were clubbed as having good treatment compliance and those with low compliance were considered as having poor compliance.

**Qualitative component:** For the qualitative component in-depth interviews were carried out with the help of an interview guide to explore the facilitators and barriers. Interviews were conducted with the help of a semi-structured interview guide till data saturation was achieved. The interviews commenced with open-ended questions with probing done wherever indicated to obtain detailed information and generate possible themes.

#### Data entry and statistical analysis:

All responses were entered and analysed using MS Excel software and IBM SPSS software version 25.0.<sup>[6]</sup> Descriptive statistics were represented using frequency, percentages, mean and standard deviation. Chi-square test Followed by Binary Logistic regression analysis was performed for inferential statistics, to identify the factors associated with the outcome variable and p value of <0.05 was considered statistically significant. The in-dept interviews were transcribed verbatim from the audio recordings and manual content analysis was performed, generating themes and sub-themes which were then interpreted.

#### Ethical consideration:

Institutional ethics committee clearance and due written informed consent was obtained from each study participant. They were explained and assured about the confidentiality and anonymity of their information.

#### **Operational definitions**:

Treatment compliance: Medication compliance

(synonym: adherence) refers to the degree or extent of conformity to the recommendations about day-to day treatment by the provider with respect to the timing, dosage, and frequency. It may be defined as "the extent to which a patient acts in accordance with the prescribed interval, and dose of a dosing regimen."<sup>[7]</sup>

#### Morisky 8-item Medication Adherence Questionnaire:

The Morisky Medication Adherence Scale (MMAS-8) is a structured diagnostic self-report measure that is used to assess medication adherence. It consists of 8 questions, each scored from 0 to 1.<sup>[8]</sup> Total value was between 0-8.

A score less than 6 was considered as low compliance, 6-7 and 8 were considered medium and high treatment compliance respectively.

**Glycaemic control:** The glycaemic control was categorised as per ICMR (Indian Council of Medical Research) guidelines.<sup>[9]</sup> Study participants were categorised as per any of the three criteria given in the Box-1 based on available reports (no older than 3 months preceding the interview date).

#### **Results:**

#### Quantitative results:

The mean age of the study participants was  $57.6\pm10.6$  years out of which 54.2% were aged  $\geq 60$  years. There was a preponderance of female participants (59.4%) compared to males (40.6%). Majority of the study participants (72.5%) were unemployed and 30.5% of them were educated up to secondary level.

Over one-fourth of the study participants had type 2 diabetes for more than 10 years and more than half of them were on multiple oral hypoglycaemic

Criteria	Ideal	Satisfactory	Unsatisfactory
Fasting plasma glucose (mg/dl)	80-110	111-125	>125
2-hour post-prandial glucose (mg/dl)	120-140	141-180	>180
Glycated haemoglobin (gm%)	<7	<u>&gt;</u> 7-<8	<u>&gt;</u> 8

Box-1 : Criteria For Glycemic Control



#### Figure 1. Distribution of Study Participants according to Glycaemic Control (N=308)

agents. As per ICMR guidelines, only 42% of the study participants were found to have ideal glycaemic control whereas, 25% and 33% of them had satisfactory and unsatisfactory glycaemic control respectively. (Figure 1)

Forty-one percent of the study population had at least one other chronic comorbidity of which hypertension was the commonest comorbidity. Diabetic neuropathy was the commonest diagnosed complication, present among 68.9% of the study participants,

According to the Morisky Medication adherence Scale, only 47% of the participants were found to have high treatment compliance, while more than one-third (35%) of the participants had low compliance (Figure 2)

Good treatment compliance was found to be

#### Figure 2. Distribution of Study Participants according to Treatment Compliance. (N=308)



significantly higher among participants who were aged below 60 years, educated above secondary level, belonging to socioeconomic class I and II, employed and were diagnosed with T2DM for over 10 years. (Table 1)

On Binomial logistic regression, age, family support, duration since diagnosis and current treatment regimen were found to have a bearing on the participants treatment compliance. Older study participants (aOR= 9.14, 95% C.I. 5.57-17.53), those with the disease for over 10 years (aOR=2.03, 95% C.I. 1.38 -7.41), those with active family support (aOR=5.37, 95% C.I. 1.61-17.85) and those on multiple oral hypoglycaemic agents (OHA) for management of their disease (aOR=8.56, 95% C.I. 3.53-20.75) were found to have better compliance compared to their counterparts. (Table 2)

#### Qualitative results:

#### Facilitators in treatment compliance:

The following themes and subthemes were identified:

- Knowledge, which was further categorized into the following subthemes: a) Self-awareness and b) fear of complications of the disease
- Medication reminder system, further categorized into the following subthemes: a) Family support b) placing of medicines in favourable locations
- Adjustment of treatment regime as per requirement

#### Theme 1: Knowledge

Self-awareness of disease

According to the study participants, having knowledge about the disease condition and the dos and donts has helped them in being compliant to their treatment.

Participant 1, a 47-year-old male said "...I know I have type II diabetes. Since I got diagnosed, I have tried to know about this condition. I have also

Variables	Good Treatment	Poor Treatment	p value
	compliance, n (%)	compliance, n (%)	-
Gender			
Male	80 (64)	45 (36)	0.78
Female	120 (65.6)	63 (34.4)	
Marital status			
Married	125 (64.4)	69 (35.6)	0.8
Unmarried	75 (65.8)	39 (34.2)	
Education			
Secondary level and below	89 (57.4)	66 (42.6)	0.01
Above secondary level	111 (72.5)	42 (27.5)	
SES (As per Modified, B.G Prasad Scale, 2023)			
Class I & II	163 (75.5)	53 (24.5)	< 0.001
Class III &IV	37 (40.2)	55 (59.8)	
Employment status			
Employed	175 (78.5)	48 (21.5)	< 0.001
Unemployed	25 (29.4)	60 (70.6)	
Addictions			
Yes	85 (62.9)	50 (37.1)	0.52
No	115 (66.5)	58 (33.5)	
Duration since diagnosis (in years)			
<u>&lt;</u> 10	119 (60.1)	79 (39.9)	0.02
>10	81(73.6)	29 (26.4)	
BMI (as per WHO Asian classification)			
Underweight	7 (28)	18 (72)	< 0.001
Normal	72 (67.9)	32 (32.1)	
Overweight	74 (76.3)	23 (23.7)	
Obese	27 (33.8)	53 (66.2)	
Current treatment regimen			
Single OHA	44 (55)	36 (45)	0.01
Multiple OHA	117 (74.5)	40 (25.5)	
Insulin	23 (46.9)	26 (53.1)	
Insulin + OHA	15 (73)	7 (27)	
Family support			
Present	82 (60.7)	53 (39.3)	0.17
Absent	118 (68.2)	55 (31.8)	
Presence of other comorbidity			
Yes	113 (63.8)	64 (36.2)	0.6
No	87 (66.4)	44 (33.6)	
Complication due to diabetes			
Present	62 (68.9)	28 (31.1)	0.35
Absent	138 (63.3)	80 (36.7)	

### Table 1: Distribution of Study Population according to Sociodemographic and Disease Profile (N= 308)

Table 2. Factors Associated with Treatment Compliance. (N= 308)				
Variables	p value*	AOR (95% C. I.)		
Age (in completed years)				
<u>&gt;</u> 60	<.01	9.14 (5.66-17.52)		
<60		1		
Education				
secondary level and below	0.71	0.87 (0,42-1.80)		
Above secondary level		1		
SES				
Lower class	0.41	10.59 (0.16-2.09)		
Upper class		1		
Employment status				
Unemployed	0.44	1.73 (0.42-1.72)		
Employed		1		
Duration since diagnosis (years)				
<u>&gt;</u> 10	0.03	2.02 (1.38-7.41)		
<10		1		
Family support				
Present	0.01	5.37 (1.61-17.58)		
Absent		1		
Current treatment regimen				
Multiple OHA	< 0.01	8.56 (3.53-20.75)		
Insulin	0.67	1.39 (0.30-6.50)		
Insulin + OHA	0.07	0.16 (0.84-46.15)		
Single OHA		1		

\*Binary logistic regression, aOR: adjusted odds ratio, C. I: Confidence interval, SES: Socioeconomic status, OHA: Oral hypoglycaemic agents

asked questions to the doctor about the disease, such as what I should do, what I should not. I also know about the medicines and take them myself every day."

#### Fear of complications of the disease

Fear of the long-term complications of the disease emerged reiteratively among the study participants as an important factor for being adherent to their treatment regime.

Participant 5, a 59-year-old female said "One friend of mine who had uncontrolled sugar had skin disease on her legs which had to be cut off. Since then, I have been very careful with my

medication and diet. My blood sugar is now in control."

#### Theme 2: Medication reminder system

#### **Family support** •

Most of the participants were on multiple oral hypoglycaemic agents and forgetting to take them was a common problem identified among them. Being reminded to take medicines regularly by their family members in case of forgetfulness, helped them maintain good treatment compliance.

Participant 3, a 51-year-old female said "....I sometimes forget to take my medicines, but my granddaughter always reminds me and makes sure I take my medicines on time."

• Placement of medicines in favourable locations

Placing medicines in easy to spot locations was also a method adopted by participants to help them remember taking medications.

Participant 2, a 66-year-old male said, "… I have placed all my medicines on the centre of the dining table so that whenever I sit down to eat my food, I am automatically reminded to take them…"

### Theme 3: Adjustment of regime as per requirement

Adjustment of medications by the treating physician as per the requirement of the patients was another facilitator of treatment complianceas per study participants.

Participant 4, a 45-year-old male said " ....I told the doctor I am unable to take so many medicines due to my work schedule, so he gave me combination medicines which decreased the number of medicines. Now it is easier for me."

#### Barriers in treatment compliance:

The following themes and subthemes were identified:

- Financial constraints, which was further categorised into the following subthemes: (a) Unavailability of medicines and (b) Inadequate funds to purchase medicines
- Maladjustment with treatment regime, which was further categorised into three subthemes:

   (a) Feeling overwhelmed by multiple medications (b) Forgetting to take medications, and (c) fear of side-effects
- lack of satisfaction with current treatment, further categorised into following sub-themes:

   (a) delayed service delivery at health care facility and (b) Preference of an alternate system of medication.

#### Theme 1 : Financial constraints

• Unavailability of medicines and inadequate funds to purchase medicines.

Participants stressed on the fact that the prescribed medications, apart from basic ones are often unavailable at the Government Health facilities which lead them to resort to out-ofpocket expenditure. They also admitted to their inability to report to the Hospital every month to collect medications which inadvertently have led to discontinuation in medication due lack of financial resources to purchase the same.

Participant 6, a 69-year-old female said," I was given two types of medications for my sugar, but it was not controlled by it. Then doctor sir added one more medication which was not available at the medicine counter. I bought the medication and took it for two months, but I am unable to buy it anymore, so I stopped taking it"

Participant 7, a 70-year-old male said,"I am 70 years old; how can I travel every month and stand in the queue every month to collect medication? I no sons to help me. Some months I come to collect medicines if my health permits otherwise I let go. I have no money to purchase medicine form outside..."

#### Theme 2: Maladjustment with treatment regime

# • Feeling overwhelmed and forgetting to take the multiple medications.

The study participants admitted to feeling burdened by the multiple medications that were prescribed to them for the control of diabetes. They felt the multitude of restrictions accompanied by the treatment regime has impacted their life and they have often found themselves unable to comply with it.

Participant 8, a 49-year-old female said, "… I feel like I have been given more medications that the food I eat. How can I live like this?" Participant 10, a 47-year-old male said," ... as a frequent traveller it is very difficult for me to remember and take all the medicines with me. Taking medicines on time also becomes a challenge while travelling, thus I have often missed doses."

#### • Fear of side effects

Participants admitted that they are sceptical of the side-effects of the prescribed medications and have correlated multiple physical symptoms with them and often discontinued medications on that account.

Participant 9, a 53-year-old female said,"...whenever I take these medicines, I have severe gas and headache. I have been told there are side effects to these medications. Whenever I feel unwell, I skip the medicine..."

#### Theme 3 : Dissatisfaction with current treatment

#### • Delayed services delivery at the Hospital

According to several participants, coming to the Hospital to avail services consumed entire day. This and resultant fear of wage-loss has led to patients opting for private consultations and medicine procurement, which they often are unable to keep up with.

Participant 11, a 41-year-old male said, "… I have to stand in line since early morning to meet the doctor, after which I again have to stand in line for hours to take medicines, for blood tests there is additional line. Coming to the hospital means I cannot go to work on that day and earn my daily wage..."

#### Preference of alternate system of medicine

A few participants cited their preference for AYUSH system of medicine instead of Allopathy. According to them Allopathic medicines have side effects on long term use and other medicines such as homeopathy give better results. Participants 12, a 65-year-old male said, "I have always preferred Homeopathy and Ayurvedic medicines, but my sons force me to come here. My sugar is also not getting controlled by these medicines, so, I sometimes do not take them."

#### **Discussion**:

Diabetes Mellitus is a chronic disease which requires long term commitment to treatment regime. Non-compliance to treatment leads to inability to achieve optimum glycaemic control and development of life-threatening macro, microvascular complications, and mortality.

In this study nearly half of the study participants (47%) were found to have high treatment compliance, whereas 35% had low treatment compliance. Low treatment compliance was found to be present among all socio-economic classes, however, participants who were aged 60 years and above, those who had the disease for 10 years or more, those with family support and those who were on multiple oral hypoglycaemic agents were found to have significantly higher compliance to their diabetes medication. Contrarily in a study done in a teaching hospital in Nadia, West Bengal, by A Ghosh et al.<sup>[11]</sup> Only 1.7% of the participants reported high treatment compliance to their medication.

In a study done by Arulmozhi S et al.<sup>[12]</sup> in Puducherry, around 49.3% of the study participants were found to have high treatment compliance and those with good family support were found to have better compliance, which are similar to this study.

In another study done by Venkatesan M et al.<sup>[13]</sup> in rural Tamil Nadu, prevalence of low compliance to diabetes medication was found to be 45.4%. Level of education, comorbidity status, satisfaction with government health facilities and doctor-patient relationship were found to be significantly associated with treatment compliance. On the other hand, patients age, duration of illness, illness perception and knowledge regarding disease were found to be the guiding factors for improved treatment compliance as reported in a study by Sharma D et al.<sup>[14]</sup>

Results similar to this study was also obtained in a study done by Mishra Rakhi et al.<sup>[15]</sup> in Uttarakhand, where 44% of the study participants were found to have good compliance and additionally treatment compliance was found to be associated with the quality of life of diabetic patients.

The qualitative component of this study explored the possible facilitators and barriers of treatment compliance among the study participants.

In this study unavailability of the costly oral hypoglycaemic agents and insulin and inadequate financial support to purchase them was a barrier which was repeatedly mentioned by the patients. Along with this fear of side effect of the multi-drug regimen, forgetfulness and dissatisfaction with the time-consuming service delivery at the health facility were identified as other contributory barriers. Whereas the awareness of the disease and its possible complications and family support were some of the identified facilitators of treatment compliance. In a study done by Murugan Venkatesan et al.<sup>[13]</sup> Exploring the barriers in diabetes treatment compliance, similar themes emerged along with lack of transport facility to the health facility and inaccessible timing of health facility In a systematic review by Krishnamoorthy Yuvraj et al.<sup>[5]</sup>, evidence similar to this study was synthesized form 18 studies and lack of patients understanding of the disease and its complications, forgetfulness and misconception about the medications were found to be major barriers to treatment compliance, whereas patients self-awareness, positive peer influence, empathy from healthcare providers along with family support facilitated compliance to diabetes medication.

In another study by Divya S et al.<sup>[16]</sup>, factors such as illiteracy, economic problems, lack of information regarding prescribed medications, lack of awareness regarding regular medications were found to be the contributory factors of non-compliance, which is in line with the findings of this study.

In this study, along with the level of treatment compliance among the study participants, their perceived obstructions in achieving optimum compliance could be identified, which can help health care providers formulate interventions to mitigate these issues.

#### **Conclusion:**

Thirty-five percent of the study participants were found to have low treatment compliance in this study which was also reflected in their poor glycaemic control. With the ongoing epidemiological transition and progressive increase in the burden of type-2 diabetes and other non-communicable diseases, compliance to treatment remains a mainstay to achieve optimum glycaemic control and keep complications at bay. In this study awareness of the disease and its complications and family support were the identified facilitators, whereas forgetfulness, fear of side-effects of multiple medications and delayed service delivery at healthcare facilities were the most commonly mentioned barriers of treatment compliance. Based on these findings, tailored interventions such as optimisation of treatment regimen to meet the patients requirements and improvement in doctorpatient communication are necessary to promote compliance.

#### **Declaration:**

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Conflicts of interest: Nil

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# A Cross-sectional Study on Workplace Violence against Doctors in Goa, a Growing Threat?

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#### Abstract:

Introduction: Workplace violence (WPV) against healthcare professionals is a global concern, encompassing threats, verbal abuse, physical assaults, and even homicide. **Objectives:** This study aimed to determine the prevalence and types of WPV experienced by doctors in Goa from January 2023 to December 2023, assess its psychosocial impact, and evaluate its influence on the quality of patient care. Method: A cross-sectional study was conducted in December 2023 involving 270 Doctors of Modern Medicine practicing in Goa for at least one year. Participants were randomly selected and had a minimum qualification of a Bachelor of Medicine and Bachelor of Surgery. Data was collected through a semi-structured anonymous questionnaire administered via Google Forms. Statistical significance was determined using Chisquare and Fisher's Exact tests. Results: The prevalence of WPV among doctors was 38.5%, with the highest occurrence in the 20–30 years age group (63.4%). Verbal abuse (36.2%) and threats (7.03%) were the most frequent forms of violence. Government-sector doctors (68.2%) faced higher incidences of WPV compared to their private-sector counterparts. Half of the participants who experienced WPV reported negative impacts on their personal and mental well-being. However, nearly all respondents stated that WPV did not compromise the quality of care they provided to patients. **Conclusion:** WPV is a significant issue for doctors in Goa, particularly among younger and government-sector practitioners. While WPV affects personal wellbeing, it does not seem to impact patient care, highlighting the urgent need for targeted preventive strategies.

Keywords: Workplace violence, Doctors, Goa, Impact

#### Introduction:

Workplace violence has been defined as "incidents where staff is abused, threatened, or assaulted in the circumstances related to their work, including commuting to and from work, involving an explicit or implicit challenge to their safety, wellbeing, or health".<sup>[1-3]</sup>

Workplace violence can range from threats and verbal abuse to physical assaults and even homicide.<sup>[4]</sup> These acts of violence can occur either at the hospital, clinic or even during home visits. Workplace violence is twice as likely to occur in the health care setting as compared to any other sector.<sup>[5]</sup> Multiple factors like poor infrastructure, high cost of

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treatment, long waiting time, and miscommunication to name a few were found to be associated with workplace violence in the healthcare setting.<sup>[6,7]</sup>

Violence against healthcare professionals is not an isolated incident, healthcare professionals are at risk of workplace violence all over the world.<sup>[8]</sup> The prevalence of workplace violence against healthcare professionals was found to be higher in Asia than in Western countries.<sup>[9]</sup> The Indian Medical Association (IMA) reported that 75% of doctors face workplace violence at least once in their lifetimes.<sup>[7]</sup>

Violence against doctors not only hurts the psycho-social and physical health of the doctor but also compromises the quality of care put into patient management.<sup>[8]</sup> These incidents can cause stress, anxiety and fear among doctors. Concerns about their personal safety can compromise a doctor's decision-making ability and ultimately can affect patient care.

This study aims to determine the prevalence and type of workplace violence against doctors in Goa from January 2023 to December 2023; to study its psycho-social impact on the doctors and additionally, the study aims to evaluate how workplace violence influences the quality of care provided to patients by the affected doctors.

#### Method:

#### **Study Design and Participants**

This cross-sectional study was conducted in Goa over the month of December 2023. It gathered data on workplace violence experienced by doctors in the state throughout the year 2023. The study participants were doctors practising modern medicine in both private and government sectors and having a minimum work experience of at least one year. The study included MBBS (Bachelor of Medicine and Bachelor of Surgery) graduates, specialists and super specialists who gave informed consent to participate in the study. Doctors who were not practising in the state of Goa during the year 2023 were excluded from the study.

#### Sample size

The sample size was calculated to be 270 with a 95% confidence interval (CI), 5% absolute precision (d) and a prevalence (p) of 77.3% as found in a study done by Kaur et al.<sup>[7]</sup>

The formula used for sample size calculation was  $n = [Z_{(1-\alpha/2)}]^{2*}P(1-P)/d^2$  where, n = sample size,  $Z_{(1-\alpha/2)}=Z$ -score corresponding to the desired confidence level, i.e.1.96 based on a 95% coincidence interval, p = estimated prevalence based on the results of a previous study, d = absolute precision

#### Sampling and Data collection

A list of 614 phone numbers was created based on details of doctors registered with Indian Medical Association- Goa and from among the resident doctors currently practicing in the state. Participants were randomly selected from the list using simple random sampling and a message describing the purpose of the study along with the google form was sent to each participant.

The Google form was modified such that each participant could only respond once, and all questions were mandatory in-order to prevent incomplete entries. Names and email addresses of the participants were not collected in order to maintain confidentiality. Frequent reminders were sent to prompt responses from the participants. The link was sent to a total of 292 participants, out of which 22 (7.5%) did not respond. In case of nonresponse even after 3 reminders, another participant was randomly selected from the list. Once the sample size of 270 was achieved, the link for the google form was deactivated.

#### Study tool

The study tool used was a semi-structured, pretested anonymous questionnaire which was administered as a Google form. The questionnaire consisted of four sections and took 10-15 minutes to be filled out. A participant information sheet and a question on consent were included at the beginning of the questionnaire.

- Section one: Included sociodemographic characteristics and professional details.
- Section two: Details about workplace violence were included in this section. The questions were formulated after a careful review of literature and also included questions from a pre-validated questionnaire.<sup>[10]</sup>
- Section three: This section included questions on the psycho-social impact of workplace violence on doctors. The questions in this section were taken from a pre-validated freely available questionnaire and included questions on how WPV affected the personal well-being, mental well-being, family life and social life of the doctors. These variables were scored as "mildly affected," "moderately affected," and "severely affected,<sup>[10]</sup> where,

Mildly affected: Minor disruption with minimal long-term effects.<sup>[10]</sup>

Moderately affected: Noticeable disruption, but manageable.<sup>[10]</sup>

Severely affected: Significant and debilitating disruption with major consequences.<sup>[10]</sup>

• Section four: Questions regarding the effects of workplace violence on patient care were included in this section. The questions in this section were formulated after a thorough review of literature.

Sections one and two were mandatory for all participants while sections three and four were modified to be filled only by those doctors who had faced workplace violence.

#### **Ethical clearance**

The ethical clearance for this study was obtained from the Institutional Ethics Committee (IEC) of Goa Medical College.

#### **Statistical analysis**

The data was filled in MS Excel and was analysed using SPSS version 26. Categorical data was given as percentages. Chi-square and Fishers Exact test were used for determining statistical significance as appropriate. p < 0.05 was taken as the level of significance.

#### **Operational definitions**

**Verbal Threats** : Verbal abuse included the use of offensive language, derogatory remarks or obscene comments. Verbal abuse was defined as a persons perception of being professionally and personally attacked, devalued or humiliated via the spoken word.<sup>[7,11]</sup>

**Threats (VT):** This is defined as a persons perception of an intent to inflict personal pain, harm, damage, disadvantage or psychological harm.<sup>[11]</sup>

**Physical violence (PV)**: It includes kicking, beating, slapping, stabbing, pushing, biting and pinching to name a few. Physical violence is the use of physical force against a person.<sup>[12]</sup>

**Sexual abuse (SV):** It is defined as an unwelcome or uninvited action that involves sexual propositioning, sexual gestures and physical contact of a sexual nature.<sup>[7,11]</sup>

**Damage to property (DP)**: Damage to property typically involves physical damage to tangible property.<sup>[13]</sup>

**Personal well-being:** Encompasses aspects of daily life such as sleep patterns, eating habits, fitness routines, personal grooming, and dressing. These activities contribute to an individual's overall physical and emotional health.<sup>[10]</sup>

**Family life:** Refers to interactions and shared activities among family members who live together, such as parents, spouses, or children. It assesses how familial relationships and dynamics are affected by external factors, like workplace violence.<sup>[10]</sup>

**Social life:** Involves time spent engaging in enjoyable activities with friends, colleagues, or other community members outside the immediate family.<sup>[10]</sup>

**Mental well-being:** Reflects an individuals capacity to manage stress, maintain resilience, and achieve emotional stability. It includes elements like irritability, aggressiveness, and self-esteem challenges.<sup>[10]</sup>

#### **Results:**

Out of the 270 doctors who participated in the study, 104 (38.5%) had faced some form of workplace violence (WPV) in their practice over the past year.

#### Sociodemographic profile

Around half of the participants were females 138 (51.1%), while 132 (48.9%) were males. More female (n=57, 54.8%) doctors were found to face WPV than male doctors (n=47, 45.1%). Maximum percentage of WPV cases occurred in the age group of 20-30 years (n=66, 63.4%), followed by the >60 years age group (n= 14, 13.4%). Doctors working in the Government sector (n= 71, 68.2%) were more likely to face WPV than doctors working in the private sector (n= 33, 31.7%). Doctors holding an MBBS degree (n=67, 64.4%) were more susceptible to WPV than those holding higher degrees.

Table	1: Association	of Sociodemos	graphic Varia	bles with	WPV (	N=2	70)
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Variables	ariables Workplace violence faced		Total	Р	Test of
_	Yes	No	n (%)	value	Significance
	n (%)	n (%)			
Gender					
Female	57 (54.8%)	81 (48.7%)	138 (51.1%)	0.33	0.925*
Male	47 (45.2%)	85 (51.3%)	132 (48.9%)		
Age (in years)					
20-30	66 (63.4%)	90 (54.2%)	156 (57.7%)	0.45	3.67*
31-40	11 (10.5%)	16 (9.6%)	27 (10%)		
41-50	5 (4.8%)	16 (9.6%)	21 (7.7%)		
51-60	8 (7.69%)	16 (9.6%)	24 (8.8%)		
>60	14 (13.4%)	28 (40.3%)	42 (15.5%)		
Marital status					
Married	37 (35.6%)	67 (40.3%)	104 (38.5%)	0.164	3.23 <sup>\$</sup>
Single	67 (64.4%)	95 (57.2%)	162 (60%)		
Widower/widow	0	4 (2.4%)	4 (1.4%)		
Highest qualification					
MBBS	67 (64.4%)	100 (60.2%)	167 (61.8%)	0.29	2.12 <sup>\$</sup>
Specialists (MD/MS/DNB/Diploma)	36 (34.6%)	66 (39.7%)	102 (37.7%)		
Super specialists (DM/MCH/FNB)	1 (0.9%)	0	1 (0.3%)		
Work sector					
Government	71 (68.2%)	106 (63.8%)	177 (65.5%)	0.45	0.552*
Private	33 (31.7%)	60 (36.1%)	93 (34.4%)		
Area of practice					
Rural	37 (35.6%)	43 (25.9%)	80 (29.6%)	0.9	2.87*
Urban	67 (64.4%)	123 (74.1%)	190 (70.3%)		

*Note:* In this table, \* denotes the use of Chi-square test and <sup>s</sup>denotes the use of Fishers exact test as the test of significance

The doctors practising in urban areas (n=67, 64.4%) were more likely to face WPV than those who practised in rural areas (n=37,35.6%). The sociodemographic profile of the participants has been mentioned in Table 1.

#### Workplace violence

Verbal abuse was the most frequently reported form of workplace violence (WPV), affecting 98 doctors (36.29%), followed by verbal threats (n=19, 7.03%). Sexual abuse and physical violence, as well as property damage, were each reported by 6 participants (2.2%), with sexual abuse predominantly affecting female doctors. Approximately 31 doctors (29.8%) experienced multiple forms of WPV.

Most cases of WPV took place during the day (n=50, 48.1%), while 22 (21.1%) took place at night. Many doctors reported having experienced WPV during both daytime and night hours (n=32, 30.7%).

With regard to setting at which the WPV occurred, most doctors reported having faced WPV at their clinics/OPDs (n=55, 48.07%), followed by casualty (n=42, 40.3%) and wards (n=41, 39.4%), respectively. A few doctors also reported having faced WPV in the ICU setting (n=6, 5.7%) and on the street outside their workplace (n=5, 4.8%). One doctor (0.9%) also faced acts of violence at their own home by patients.

The primary perpetrators of workplace violence (WPV) against doctors were patients relatives (n=89, 85.5%), followed by patients themselves (n=36, 34.6%). Violence from bystanders unrelated to the patient was reported by 26 doctors (25%), while 7 cases (6.7%) involved political leaders or organizations. Additionally, 8 doctors (7.69%) faced WPV from co-workers, predominantly verbal abuse, with 2 reporting sexual abuse and 1 experiencing both verbal and physical abuse. Verbal abuse and threats were the most common forms of WPV perpetrated by political leaders and organizations.

#### Reporting of cases of Workplace violence

More than half the doctors who faced WPV had reported the incident to higher authorities (n=62, 59.6%). Action was taken against only a quarter (n=26, 25%) of the cases of WPV. Cases of verbal abuse were the least likely to have action taken against the perpetrator. (Table 2)

The most commonly cited reason for not reporting workplace violence (WPV) among all the participants was a belief that "no action will be taken" (n=234, 86.7%). Additionally, 224 participants (83%) attributed non-reporting to a "lack of organizational support," and 222 participants (82.2%) cited a "lack of provision to report." Timeconsuming reporting procedures were also a significant barrier, as reported by 219 participants (81.1%).

<b>Reporting status</b>	<b>Type of WPV</b>			Total
	<b>Verbal abuse</b>	Verbal abuse	Verbal abuse ± Verbal	n (%)
	n (%)	+ Verbal threats	threats ±Physical Violence	
		n (%)	<b>±</b> Sexual Violence <b>±</b>	
			<b>Damage to Property</b>	
			n (%)	
Reported	40 (57.14%)	11 (73.3%)	11 (57.8%)	62 (59.6%)
Not reported	30 (42.8%)	4 (26.6%)	8(42.1%)	42 (40.3%)
Action was taken	13 (18.5%)	6 (40%)	7 (36.8%)	26(25%)
against the perpetrator				

#### Table 2: Reporting Status of WPV Against Doctors (N=104)

Conversely, only a small number of participants indicated concerns about potential repercussions, such as "fear of affecting appraisal or promotion opportunities" (n=10, 3.7%), or feelings of "shame" associated with reporting incidents (n=3, 1.1%).

#### Perceived cause of WPV

Doctors who experienced workplace violence (WPV) identified several perceived causes for these incidents. The most frequently reported reasons were "lack of knowledge among patients and their relatives about the disease and its treatment" and "long waiting hours," each cited by 32 participants (30.7%). Other significant factors included "intoxication" (n=26, 25%) and "death of the patient" (n=23, 22.1%). Less common causes included "deterioration of the patients' condition" (n=12, 11.5%), "unavailability of medicines" (n=4, 3.8%), and "unrealistic demands by patients and relatives" (n=5, 4.8%).

#### Psycho-Social Impact of WPV on doctors

Among doctors who faced workplace violence (WPV), 19 (18.2%) reported considering an alternate career, and 18 (17.3%) noted a reduction in their work efficiency. Additionally, 15 doctors (14.4%) expressed a desire to change their workplace, while 11 (10.5%) indicated they no longer wanted to work due to their experiences. Disturbingly, 2 doctors (1.9%) reported thoughts of self-harm or suicide.

Psycho-social		Total		
variables	Verbal abuse n (%)	Verbal abuse + Verbal threats n (%)	Verbal abuse ± Verbal threats ±Physical Violence ± Sexual Violence ± Damage to Property n (%)	n (%)
Personal well-being				
Mildly affected	23 (32.8%)	8(53.3%)	11 (57.8%)	42 (40.3%)
Moderately affected	3 (4.2%)	2(13.3%)	1 (5.2%)	6(5.7%)
Severely affected	1(1.4%)	1 (6.6%)	2(10.5%)	4 (3.8%)
Not affected	43 (61.4%)	4 (26.6%)	5 (26.3%)	52 (50%)
Mental well-being				
Mildly affected	21 (30%)	7 (46.6%)	6 (31.5%)	34 (32.7%)
Moderately affected	7(10%)	2(13.3%)	4 (21.05%)	13 (12.5%)
Severely affected	1(1.4%)	1 (6.6%)	3 (15.7%)	5(4.8%)
Not affected	41 (58.5%)	5 (33.3%)	6 (31.5%)	52 (50%)
Family life				
Mildly affected	9(12.8%)	5 (33.3%)	12 (63.1%)	26(25%)
Moderately affected	3 (4.3%)	2(13.3%)	0	5 (4.8%)
Severely affected	0	1 (6.6%)	0	1 (0.9%)
Not affected	58 (82.8%)	7 (46.6%)	7 (36.8%)	72 (69.2%)
Social life				
Mildly affected	11 (15.7%)	6 (40%)	3 (15.7%)	20 (19.2%)
<b>Moderately affected</b>	1(1.4%)	1 (6.6%)	0	2(1.9%)
Severely affected	0	1 (6.6%)	2(10.5%)	3 (2.8%)
Notaffected	58 (82.8%)	7 (46.6%)	14(73.6%)	79(75.9%)

Table 3: Psycho-Social Impact of WPV on Doctors (N=104)

Half of the participants who experienced WPV reported a negative impact on their personal wellbeing and mental well-being. Family and social lives were also affected in 32 (30.8%) and 25 (24.1%) of the cases, respectively. Verbal abuse was found to have the least impact, while more severe forms of violence significantly disrupted the psycho-social well-being of the affected doctors. (Table 3)

#### Effects of workplace violence on patient care

In this study, most of the doctors said that having faced WPV did not affect their patient management. Around 60% of the doctors who had faced more

severe forms of WPV other than verbal abuse and threats said that the acts had not affected their patient care. (Table 4)

#### **Discussion:**

In this study, 38.5% of the participants had faced some form of WPV over the past year. These findings are similar to those found by Anand et al.<sup>[14]</sup> Similar studies done by Kunnath R et al.<sup>[15]</sup> and Debnath A et al.<sup>[12]</sup> showed a higher prevalence of WPV. The difference in the prevalence of WPV could be a result of different definitions of WPV used in each study along with different study tools. Geographic variation

Variables		Total		
	Verbal abuse	Verbal abuse	Verbal abuse ± Verbal	(N=104)
	(N=70)	+ Verbal threats	threats <b>±</b> Physical Violence	n (%)
	n (%)	(N=15)	<b>±</b> Sexual Violence <b>±</b>	
		n (%)	Damage to Property (N=19)	
			n (%)	
Prescribing drugs				
Decreased	5(7.1%)	1 (6.6%)	2 (10.5%)	8(7.6%)
Increased	5(7.1%)	1 (6.6%)	4(21.05%)	10(9.6%)
<b>Remained same</b>	60 (85.7%)	13 (86.6%)	13 (68.4%)	86 (82.6%)
Surgical or Medical inter	rventions			
Decreased	5(7.1%)	1 (6.6%)	3 (15.7%)	9 (8.6%)
Increased	3 (4.2%)	1 (6.6%)	3 (15.7%)	7(6.7%)
<b>Remained same</b>	62 (88.5%)	13 (86.6%)	13 (68.4%)	88 (84.6%)
Suggesting investigation	ıs			
Decreased	4 (5.7%)	1 (6.6%)	3 (15.7%)	8(7.6%)
Increased	7 (10%)	1 (6.6%)	4(21.05%)	12 (11.5%)
<b>Remained same</b>	59 (84.28%)	13 (86.6%)	12 (63.1%)	84 (80.7%)
Handling emergencies				
Decreased	4 (5.7%)	0	5 (26.3%)	9 (8.6%)
Increased	6 (8.5%)	1 (6.6%)	1 (5.26%)	8(7.6%)
<b>Remained same</b>	60 (85.7%)	14 (93.3%)	13 (68.4%)	87 (83.6%)
<b>Consultation time</b>				
Decreased	9 (12.8%)	1 (6.6%)	2 (10.5%)	12 (11.5%)
Increased	8(11.4%)	1 (6.6%)	3 (15.7%)	12 (11.5%)
<b>Remained same</b>	53 (75.7%)	13 (86.6%)	14(73.6%)	80 (76.9%)
Referrals				
Decreased	1 (1.4%)	0	0	1 (0.9%)
Increased	10(14.2%)	2(13.3%)	7 (36.8%)	19 (18.2%)
Remained same	59 (84.2%)	13 (86.6%)	12 (63.15%)	84 (80.7%)

in locations and different periods of exposure could also be other reasons for variation in prevalence. The findings of our study are in line with a pan-India study done by Kaur A et al.<sup>[7]</sup>

In current study female doctors (54.8%) were found to have faced WPV slightly more than male (45.1%) doctors which is similar to a study done by Anand et al.<sup>[14]</sup> Our study also found that doctors working in the government sector more likely to face WPV than those working in the private sectors. These findings may be due to higher patient load and limited infrastructure in government sectors.

Unmarried doctors less than 30 years of age were found to be at higher risk of WPV. These findings were consistent with those of Kaur A et al.<sup>[7]</sup> and Debnath A et al.<sup>[12]</sup> Doctors who held an MBBS degree were found to be more prone to WPV than their counterparts who held higher educational degrees. These findings are similar to those of Debnath A. et al.<sup>[12]</sup> Some of the reasons for these findings may be due to less experience by younger doctors and MBBS graduates handling all forms of patients, unlike the specialists who handle only a set patient base depending on their speciality.

Reports of WPV were found to be higher in the urban setting than in rural, which is similar to the findings of the pan-India study done by Kaur A et al.<sup>[7]</sup> The most likely reason behind this finding could be due to a higher number of doctors and patients in urban areas.

#### Types of violence

In present study, it was found that verbal abuse was the most common form of WPV faced by doctors followed by verbal threats which is consistent with other similar studies done in India and across the globe.<sup>[7,12,14-16]</sup> The immediate reaction of patients and their relatives to express dissatisfaction is in the form of verbal abuse. Verbal abuse is also least likely to have any legal repercussions which could be the reason behind it being the most common form of WPV.

### Perpetrators and settings at which WPV took place

In this study, the majority of the cases of WPV took place in the OPD/Clinics (48.07%), closely followed by the casualty (40.3%). The long waiting hours and overcrowding could be one of the reasons for the higher prevalence of WPV in OPDs. Long waiting hours can aggravate the frustration already faced by sick patients and their relatives and can act as fuel towards cases of WPV. The casualty setting is the second most common setting in which WPV occurred. Casualty and emergency departments are faced with critical cases and are found to be highly chaotic. These highly stressful conditions of the casualty can be the cause of the high prevalence of WPV in these situations. Wards were found to be the next most common setting in which cases of violence occurred. Deterioration and death of admitted patients along with a shortage of infrastructure and highly overworked and outnumbered doctors can contribute to this finding. It is necessary to know which settings are more prone to cases of WPV to set up preventive measures.

The majority of the cases of WPV took place at the hands of the patients relatives (85.5%) followed by the patients (34.6%). These findings were similar to those found by Kunnnath R et al.<sup>[15]</sup> Bystanders were involved in 25% of the cases. The perpetrators were said to have been intoxicated by 25% of the doctors.

Most of the doctors perceived "lack of knowledge about disease and treatment by patients and relatives" and "long waiting hours" to be the most common cause of WPV. Other causes of WPV were "Death of patient", "Deterioration of patients condition", "unavailability of medicines" and "unrealistic demands".

#### **Reporting status of WPV**

A little over half the cases of WPV were reported to higher authorities. Action was taken against only

25% of the cases of WPV. Action was taken against more severe forms of WPV more frequently (i.e., threats, sexual abuse, physical violence and damage to property). Only a few cases of verbal abuse had action taken against them (n=13, 18.5%). Cases of verbal abuse are less frequently reported and are not considered significant enough as no physical manifestation is visible of their effects. This could be the reason behind verbal abuse being less frequently reported and handled by higher authorities.

The most common reason given by the participants for not reporting cases of WPV was "A belief that no action will be taken" (86.7%) followed by "lack of organizational support" (83%), "lack of provisions to report" (82.2%) and the process of reporting being "time-consuming" (81.1%). Setting up proper provisions for reporting along with supportive measures and timely and prompt actions being taken would greatly improve the reporting status of WPV and could help reduce these cases.

#### Psycho-social impact of WPV

Half of the doctors who faced WPV reported it having a negative impact on their physical and mental well-being. The psycho-social impact of WPV varied with the severity of the act of violence. The doctors who faced only verbal abuse were less likely to be impacted by the act of violence. Doctors who had faced more severe forms of WPV were impacted more commonly.

In this study, 18.2% of the doctors said that they felt like opting for an alternate career as a result of WPV. Decrease In productivity (17.3%), wanting to change their workplace (14.4%), not wanting to work at all (10.5%) and thoughts of self-harm (1.9%) were also the impacts of WPV.

The ever-increasing workload and fear for their safety as a result of WPV can increase stress and anxiety among doctors.

#### Effects of WPV on patient care

Almost all the doctors who faced verbal abuse

and verbal threats said that the act had not affected their patient care. Unlike doctors who had faced verbal abuse and threats, around 60% of doctors who had faced more severe forms of violence said that their patient care was not affected by the act of violence. This shows that the severity of the act influences the above. Our study findings are not in line with those of other similar studies done by Kaur A et al.<sup>[7]</sup> and Debnath A et al.<sup>[12]</sup> which showed that surgical/medical interventions and handling of emergencies was decreased while there was an increase in referrals and suggesting investigations as a result of WPV. Our results could be influenced by the fact that more than half of our participants were junior doctors belonging to the 20-30 age group who are still at the start of their careers.

#### **Conclusion:**

In conclusion, workplace violence (WPV) against doctors in Goa is a prevalent issue, with 38.5% of participants reporting incidents in 2023. Younger doctors, females, and those working in government sectors were disproportionately affected. Verbal abuse was the most common form of WPV, with incidents primarily occurring in outpatient settings and casualty. The violence significantly impacted doctors' mental well-being, family, and social lives, though patient care remained largely unaffected. Under-reporting was widespread due to lack of organizational support and belief in inaction.

#### **Recommendations:**

Provisions must be established to enable the effective reporting of workplace violence (WPV) against doctors, supported by legislation to ensure timely action against perpetrators. Given that many doctors identified a lack of patient and relative understanding about diseases and treatments as a key cause of WPV, efforts should focus on enhancing communication between doctors, patients, and their families. Regular CMEs on doctor-patient communication and WPV prevention should be prioritized. Incorporating communication skills into medical education will equip future doctors to build trust and foster stronger doctor-patient relationships for mutual benefit.

#### Limitations:

The study involved the use of a Google form as the study tool, so the senior doctors who are not used to using new technology may not have been able to fill in the questionnaire. This study is also subjected to recall bias as some senior doctors may not recall minor acts of violence which they may have perceived as insignificant.

#### **Declaration:**

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#### Conflicts of interest: Nil

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### A Community-based Cross Sectional Study on Nutritional status among Elderly in Rural Telangana

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#### Abstract:

**Introduction:** The world is experiencing increase in geriatric population due to increase in life expectancies at global level. The complex issues leading to nutritional risk and malnutrition are inadequate food intake, social, economic, psychological and pathological factors. **Objective:** To assess the nutrition status of the elderly and to determine the factors associated with it. **Method:** A Cross-sectional study was done in the rural areas of Warangal, Telangana among 280 elderly people ( $\geq 60$  years) using systematic random sampling. A pretested semi-structured questionnaire and the Mini Nutrition Assessment tool were used for data collection. Anthropometric measurements were also estimated. Data entry was done in MS Excel and analysed using SPSS 20.0. Chi-square and Correlation tests were applied. **Results:** Among the 280 elderly, malnutrition was seen in 13.2% of subjects, 51.4% were at risk of malnutrition and 35.4% were adequately nourished. Females, unemployment, smoking habits, presence of comorbidities, inadequate vegetable intake and lack of social support were significantly associated with malnutrition. A strong positive correlation (r= 0.4) was observed between nutrition score and weight, waist circumference, and calf circumference. The difference was statistically significant. **Conclusion:** Most of the elderly (51.4%) were at risk of malnutrition thus emphasizing the need for effective nutritional interventions.

Keywords: Malnutrition, Mini Nutritional Assessment (MNA), Social support

#### Introduction:

The world is experiencing an increase in geriatric population exponentially because of improvement in health care which in turn leads to an increase in life expectancies. Globally the geriatric population is expected to reach 1500 million by 2050. This exponential change is predicted to be observed mostly in developing countries.<sup>[1]</sup> According to United Nations Population Division (UNPD) data, the proportion of elderly people in India has doubled to 10.1% in 2020 from 5.4% in 1950.  $^{\scriptscriptstyle [2]}$ 

Malnutrition in elderly is caused by a complex interplay of factors including social, economic, psychological, pathological factors and inadequate food consumption. Geriatric health and nutrition are often ignored. Malnutrition leads to decline in health thus causing increased consumption of healthcare services and mortality.<sup>[3]</sup>

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According to Global Burden of Disease (GBD) 2017, India experienced a mortality of 9,90,9501 deaths with 59% cases among elderly population.<sup>[4]</sup> In India, both communicable and non-communicable diseases have synergistic effect on malnutrition in the elderly. Malnutrition and morbidity form a vicious cycle. COVID-19 has directly and indirectly influenced the nutrition and health of the elderly by affecting the accessibility and affordability to nutritious food and adequate healthcare services. Hence this study was aimed at estimating malnutrition among elderly in rural Telangana and to determine the factors influencing it.

#### Method:

A cross-sectional study was conducted in the rural field practice area of a Medical College in Telangana among "elderly" ( $\geq$ 60 years of age) people from February to April 2022. Based on the previous literature,<sup>[5]</sup> the sample size was calculated using the prevalence 20.8%, 5% precision and a non-responsive rate of 5%. The estimated sample size was 276 and was rounded off to 280 samples.

The Rural Health Training Center (RHTC) consist of 5 villages with an estimated population size of 36,530 people. Systematic Random Sampling method was adapted to select the representative sample of 280. At first, list of elderly people details was obtained from the Wardhannapet municipality office. A total of 1321 elderly people were living in the field practice area. Based on the sample size and total number of elderly people, the sampling interval was calculated as k= 5. Using the Epi Info random number generator, the random number was calculated as 3. To begin with the sampling frame, 3<sup>rd</sup> elder was the first selected sample and consequent 5<sup>th</sup> elder was subsequent sample till the selected sample size was attained.

Prior permission from Institutional Ethics Committee was obtained(ECR/840/Inst/ TG/2016/RR/20/51). Subjects who gave consent to participate in the study were included while bedridden and elderly with dementia were excluded. Based on the data obtained from the local municipality office, the houses were visited for the informal interview. After taking Informed consent, the subjects were assessed for malnutrition using Mini Nutrition Assessment Scale (MNA) and anthropometry. The predictor variables such as socio-demographic factors, pension status, and comorbidity status, social and dietary habits were studied using a pre-tested, validated, semistructured questionnaire. Waist, hip and Calf circumference and body mass index (BMI) were measured using standardized techniques with the help of measuring tape and bathroom scale. Height and weight were measured to the nearest 0.1cm and 0.1kg respectively. Calf circumference was measured at the level of the largest circumference of the calf. For waist circumference 90cm was taken as cut off for males and 80cm for females<sup>[6]</sup> and for calf circumference 26.5cm was taken as cut off.<sup>[7]</sup> According to WHO Asian standards BMI less than 18.5  $kg/m^2$  were considered underweight, those within 18.5-22.9 kg/m<sup> $^{2}$ </sup> were normal weight, while BMI within 23.0-24 kg/m<sup>2</sup> were overweight and BMI above 25kg/m<sup>2</sup>were obese.<sup>[8]</sup>

MNA is a non-invasive validated questionnaire containing 18 items under two sections and is recommended as a screening tool to assess the nutritional status of "elderly".<sup>[9]</sup> It broadly assesses the food intake, stress, weight loss, mobility, psychiatric symptoms, BMI, living status, pressure sores, chronic drug intake, subjective assessment of health and nutrition status, mid-arm circumference (MAC) and calf circumference (CC).<sup>[10]</sup> Maximum score of 30 can be attained with score below 17 indicating "malnutrition", 17 to 23.5 indicating "atrisk of malnutrition" and  $\geq$  24 indicating "normal" nutrition status.<sup>[11]</sup>

Data was entered in Microsoft Excel and analysed in SPSS software version 20.0. Descriptive

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and inferential statistics were performed. Chi-square tests and correlation tests were used. P value <0.05 was considered as significant.

#### **Results:**

Among 280 subjects, there were 159 (56.8%) males and 121 (43.2%) females. The mean age of the participants was 64.8 yrs. About 259 (92.5%) were staying in their own house while 21 (7.5%) stayed in a rented house. In the present study 217 (77.5%) participants were getting social support from their children, 67.1% were illiterate, 72.9% were employed, 66.7% were married, 10.7% were smokers, 44.6% were alcoholics and 65.7% were receiving pension. (Table 1)

Out of the total participants, only 46 (16.4%) were consuming fruits daily, 264 (94.3%) were consuming vegetables daily and 109 (38.9%) were having co-morbidities.

According to mini nutrition assessment (MNA) the overall prevalence of malnutrition was 37 (13.2%), 99 (35.4%) had a normal nutrition status while 144 (51.4%) were at risk of malnutrition. (Figure-1)

Using only BMI as an indicator of nutrition status, 21.1% were underweight in the present study. Table 2 shows the association of variables with nutrition status of the elderly. Females, elderly who were unemployed, smokers and elderly with comorbidities had higher prevalence of malnutrition. The difference was statistically significant. There was no association between increasing age, getting pension and alcohol consumption with nutrition status.

Figure 2 shows correlation between waist circumference and nutrition score (MNA). As the waist circumference increased, the nutrition score of the elderly also increased. Significant positive correlation (r= 0.4, p<0.05) was observed between nutrition score and weight, waist circumference, calf circumference. Significant positive correlation

Cable 1: Socio-Demographic characteristics of           Starter by Departments (N=200)			
Variables	י <u>ו</u> ח	%	
Gender		,,,	
Male	159	56.80%	
Female	121	43.20%	
Age Group (Years)			
60-74	252	90%	
75-84	27	9.60%	
<u>≥</u> 85	1	0.40%	
Education			
Literate	92	32.80%	
Illiterate	188	67.20%	
Occupation			
Employed	204	72.90%	
Unemployed	76	27.10%	
Marital Status			
Married	187	66.70%	
Divorced/ widow/ never married	93	33.30%	
Smoking Habits			
Smoker	30	10.70%	
Nonsmoker	250	89.30%	
Drinking Habits			
Alcoholic	125	44.60%	
Nonalcoholic	155	55.40%	
Pension Status			
Receiving pension	184	65.70%	
Not receiving pension	96	34.30%	
Type of Family			
Nuclear	242	86.40%	
Joint	17	6.10%	
3 generation	21	7.50%	

Figure 1: Nutrition status of study participants according to MNA score



Variable	Malnourished	Atriskof	Normal	p value
	n=37	malnutrition	nutrition	_
		n=144	n=99	
Age				
60-74yrs	32 (12.6%)	130 (51.5%)	90 (35.7%)	
75-84yrs	5 (18.5%)	14 (51.8%)	8(29.6%)	0.572
<u>&gt;</u> 85yrs	0	0	1(100%)	
Gender				
Male	11(6.9%)	84 (48.3%)	64 (40.3%)	0.001
Female	26 (21.5%)	60 (49.6%)	35 (28.9%)	
Education				
Literate	10(10.8%)	39 (42.3%)	43 (46.7%)	0.021
Illiterate	27 (14.3%)	105 (55.8%)	56 (29.7%)	
Occupation				
Employed	21(10.3%)	124 (60.8%)	59 (28.9%)	0
Unemployed	16(21.1%)	20 (26.3%)	40 (52.6%)	
Pension status				
Receiving	27 (14.7%)	90 (48.9%)	67 (36.4%)	0.421
Not Receiving	10(10.4%)	54 (56.2%)	32 (33.3%)	
Smoking habits				
Smoker	15 (50%)	15 (50%)	0	0
Non-Smoker	22 (8.8%)	129 (51.6%)	99 (39.6%)	
Drinking habits				
Alcoholic	16(12.8%)	60 (48%)	49 (39.2%)	0.475
Non-Alcoholic	21 (13.5%)	84 (54.2%)	50 (32.3%)	
Comorbidities	-	-	-	
Present	20 (18.3%)	46 (42.2%)	43 (39.4%)	0.025
Absent	17 (9.9%)	98 (57.3%)	56 (32.7%)	
Social support from children				
Present	27 (12.4%)	102 (47%)	88 (40.6%)	0.003
Absent	10(15.9%)	42 (66.7%)	11(17.5%)	

\* P <0.05 was considered significant. Chi square test was applied.





(r=0.5, p<0.05) was observed between nutrition score and BMI, hip circumference. Significant weak negative correlation (r= -0.14, p<0.05) was seen between nutrition score and age.

#### **Discussion:**

The present study assessed the nutritional status of the elderly of rural Warangal. In the current study 90% of the elderly were in the age group of 60 to 74 yrs. Malnutrition was present in 13.2% of the elderly whereas in studies done by Joymati O et al.<sup>[5]</sup> and Rajan SP et al.<sup>[12]</sup> the prevalence of malnutrition were 20.8% and 21.4% respectively. Compared to

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previous studies the current study had relatively lower prevalence of malnutrition among the elderly. In the current study most of the elderly were "at risk of malnutrition" and this finding was consistent with other studies.<sup>[5,12,13]</sup> Higher prevalence of "at risk of malnutrition" reflects higher proportion of elderly with insufficient protein and energy intake without obvious signs of malnutrition. The above finding in the present study indicates that MNA tool can be used in screening and identifying the people who "at risk for malnutrition" from apparently healthy individuals thus helping to provide necessary interventions at the earliest.

In the current study higher literacy was associated with lower prevalence of malnutrition and these findings were consistent with other studies.<sup>[5]</sup> Elderly who were not receiving social support from their children were having higher prevalence of malnutrition. Lack of Social support form children can lead to loneliness and depression among the elderly, which in turn leads to inadequate food intake and psychological stress-induced malnutrition. Smokers and elderly with comorbidities were having higher prevalence of malnutrition and these findings were similar to a study done by Joymati O et al.<sup>[5]</sup>

Elderly women were significantly more malnourished in this study than men. The finding was consistent with a study done by Lahiri S et al.<sup>[14]</sup> This could be because of some traditional customs where the women eats after the men in the house finish eating. Age was negatively correlated with nutrition score in the current study. Similar observation was seen in a study in rural West Bengal.<sup>[14]</sup> Whereas few studies didnt exhibit an association between nutrition score and age.<sup>[15,16]</sup>

In the current study unemployed elderly were having a higher prevalence of malnutrition. This finding was consistent with previous literature.<sup>[17]</sup> Unemployed individuals are usually financially dependent on others, and this can affect their eating habits due to lack of adequate income.

#### **Conclusion:**

About 13.2% of the geriatric subjects were malnourished in the present study and it was higher among females, elderly living in joint families, unemployed, smokers, elderly without social support, and presence of comorbidities. The difference was statistically significant. Nearly half of them were at risk of malnutrition (51.4%). As malnutrition and morbidity are a vicious cycle, Effective nutritional interventions are needed for the elderly.

#### Limitations:

Nutrition status was assessed based on questionnaire method and routine anthropometric measurements. Laboratory investigations were not done to confirm the findings.

#### **Declaration:**

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Conflicts of interest: Nil

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### Sociodemographic Profile of Severely Malnourished Children Admitted to a Nutritional Rehabilitation Centre in one of the Districts of Maharashtra: A Cross sectional Study

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#### Abstract:

**Introduction :** Globally malnutrition remains the one of the leading causes of mortality contributing to 60% of deaths in under five children. Severely acute malnutrition children are admitted to Nutritional rehabilitation centre for promoting their clinical and psychological growth. **Objective:** To describe the sociodemographic profile of severely malnourished children admitted in NRC. Method: The cross sectional study was conducted in a Nutritional Rehabilitation Centre (NRC) of a District Hospital of Thane in Maharashtra among the under five children of age group 6 to 60 months who were admitted in NRC and staying in Thane block during study period. Complete enumeration method was used. A Total Sample size of 96(based on the inclusion criteria) was obtained for the purpose of record based data, while for interview sample size was 73(20 cases were non traceable and 3 death were reported) with the parents/guardians of the children. Data was collected using a pre-validated semi structured interview guide via face to face interview. The study was conducted during the 18 month period from March 2017 to August 2018. Data was analysed by using SPSS software version 22.0. Results: Majority of the children admitted to the NRC were male (55.2%). Majority of the mothers were educated till middle school (34.3%) as were the majority fathers (37%). Majority of children had birth order<3 (76.7%). Acute respiratory infection (34.4%), acute gastroenteritis (26%) and acute febrile illness (19.8%) were the most common comorbidities observed among the children. Prelacteal feed was given in 5.1% children and colostrum was given to 56.1%, exclusive breast feeding was not given in majority of the children (65.8%). **Conclusion:** Severe acute malnutrition appears to be more prevalent among households belonging to middle and lower middle class. Educational status of parents was found to be low among majority of the study participants. Exclusive breast feeding was also lacking in majority of the children.

Keywords: Nutritional Rehabilitation Centre, Severe Acute Malnutrition, Under Five Children

#### Introduction:

Nearly half of all deaths in under five children are attributable to undernutrition which puts the children at greater risk of dying from common infections and also increases the frequency and severity of such infections, and delays the recovery.<sup>[1]</sup>

In 2022 globally, 45.0 million children under five were wasted of which 13.7 million were severely

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wasted. This translates into a prevalence of 6.8 per cent and 2.1 per cent, respectively. Between 2000 and 2022, stunting prevalence globally declined from 33.0 per cent to 22.3 per cent, and the number of children affected fell from 204.2 million to 148.1 million.<sup>[1]</sup>

In India, 36% of children under five years are stunted which is a sign of chronic malnutrition.19% of children under five years are wasted while 32% of children under five years are underweight. The prevalence of undernutrition is same among the girls and boys, although girls are slightly less wellnourished than boys on all three measure (stunting, wasting, underweight). Forty-six percent of children born to mothers with no schooling are stunted, compared with 26 percent of children born to mothers with 12 or more years of schooling. The corresponding proportions of underweight children are 42 and 23 percent, respectively. Maharashtra has 35% stunting, 26% wasting in under five children.<sup>[2]</sup> Nutrition Rehabilitation Center (NRC) is a unit in a health facility where children with Severe Acute Malnutrition (SAM) are admitted and managed. Keeping this in mind this study was carried out with the objective to find the sociodemographic profile of severely malnourished children admitted in NRC.

#### Method:

A cross sectional observational study at a Nutritional Rehabilitation Centre (NRC) of a Thane District Hospital in Maharashtra. The study was conducted for 18 months period from March 2017 to August 2018.

#### Study population with inclusion and exclusion:

Study participants included the children suffering from severe acute malnutrition (SAM) in the age group of 6-60 months admitted to the NRC. Interview of their parents/guardians who were presently staying in Thane district were conducted.

#### Sampling method and sample size:

Complete enumeration method was used during the study. In a year, approximately 150 children were admitted in NRC. The children who failed to complete prescribed number of follow ups at NRC, were traced with the help of records available at the NRC and house visits were conducted. Total number of cases registered in NRC (as per the inclusion criteria) during the study period were 96. Out of these cases, 56 did not complete the prescribed number of followups at NRC, among these 33 cases were successfully traced in the community and home visits were conducted for interview, whereas 20 cases were non traceable and 3 deaths were reported. Therefore, for the purpose of record based data of the study sample size was 96, while for interview it was 73.

#### Study tool and Data collection:

Descriptive analysis of socio-demographic factors, birth history, breast feeding practices were presented in the form of tables. After taking the informed consent from the parents of SAM cases fulfilling inclusion criteria of the study, data was collected by analysing the records and using a prevalidated semi structured interview via face to face interview.

#### Data Analysis:

Institutional Ethics Committee approval was taken and other necessary permissions were taken before commencement of the study. All responses were tabulated by using Microsoft-Excel 2013 Software. Data was analysed by using SPSS software version 22.0.

#### **Results:**

It was observed that majority of the children admitted to the NRC were male (55.2%), and majority belonged to 13-24 months age group (44.79%), followed by 6-12 months age group (28.12%). (Table 1) Most of the participants were Hindu by religion (74%), belonging to general

**Table 2: Birth history and Feeding History of** 

category (64.6%), belonging to middle (42.70%) and lower middle (39.58%) socioeconomic class. Majority participants were from urban areas (57.2%) while rest lived in rural areas (42.8%). Family type of majority participants was nuclear (60.3%). Majority of mothers were educated till middle school (33.3%) as were the majority fathers (31.25%). By occupation majority fathers were skilled labour (38.4%) and mothers were housewives (93.2%). Majority mothers belonged to 21-23 years age group (56.2%). About living conditions, majority lived in a semi pakka house (46.6%), with overcrowding in their homes (56.2%). Majority had a piped water supply (43.8%).

Table 1: Socio-demographic details of the study participants (N=96)

Variable	n (%)
Gender	
Female	53 (55.20%)
Male	43 (44.80%)
Age-group (Months)	
6-12	27 (28.12%)
13-24	43 (44.79%)
25-36	16 (16.70%)
37-48	6 (6.20%)
49-60	4 (4.20%)
Religion (Years)	
Hindu	71 (74.00%)
Muslim	20 (20.80%)
Other 5 (5.20	
Socioeconomic status	
Upper	5 (5.20%)
Upper middle 12 (12.	
Middle	41 (42.70%)
Lower middle	38 (39.58%)
Fathers' education	
Illiterate	11 (11.45%)
Secondary and above	27 (28.12%)
Primary	28 (29.16%)
Middle school	30 (31.25%)
Mothers' education	
Illiterate	18 (18.75%)
Primary	31 (32.29%)
Middle	32 (33.33%)
Secondary and above	15 (15.62%)

Study Participants (N=73)			
Variable n (%)			
Place of delivery			
Home delivery	4 (5.50%)		
Institutional delivery	69 (94.50%)		
Term at time of delivery			
Preterm	16 (21.90%)		
Term	57 (78.10%)		
Colostrum given			
No	32 (43.90%)		
Yes	41 (56.10%)		
Exclusive breast feeding			
Yes 25 (34.20%			
No 48 (65.80			
Immunization status			
Partial immunization	19 (74.00%)		
Immunized as per age	54 (26.00%)		
Birth Order			
<u>&gt;</u> 3	17 (23.30%)		
<3 56 (76.709			
Birth weight (N=69)			
Normal birth weight 52 (75.40)			
Low birth weight	17 (24.60%)		
Prelacteal feed			
Yes	11 (15.10%)		
No 62 (84.90%			
Top fed			

No58 (79.40%)Mixed FedYes33 (45.20%)No40 (54.80%)Table 2 shows the details of birth history in andfeeding practices observed among the children.Majority of the children were delivered in aninstitution (94.5%), and were full term babies(78.1%), the birth order of majority was <3 (76.7%),</td>and majority had normal birth weight (75.4%)

15 (20.60%)

and majority had normal birth weight (75.4%). Breast feeding was initiated in 1st hour of birth in 24.7% of children. In 38.4% study subjects, breast feeding was started in 1 to 6 hours after delivery. In 23.2%, it was started in between to 6-24 hours and in 13.7% more than 24 hours of delivery. Pre lacteal feed was given in 15.1% children and colostrum was

Yes

given to 56.1%, exclusive breast feeding till 6 months was not done in majority of the children (65.8%). Also majority (74%) were partially immunised.

In 37 (50.7%) study subjects complementary feeding started in between 6-9 months. In 33 (45.2%) study subjects started before 6 months and in 3 (4.1%) it was started after 9 months.

The most common comorbidities observed among the children were Acute respiratory infection (34.4%), acute gastroenteritis (26%) and acute febrile illness (19.8%). Majority of the participants stayed between 7-15 days at the NRC (71.9%) while 25% required more than 15 days stay. Among the participants 80.2% were discharged for follow up. Majority of the participants (48.1%) showed weight gain between 5-9.9 gm/kg/day. Target weight defined as 15% gain from admission weight was achieved by 50% of the participants. Although it is worth noting that majority didn't complete all the stipulated 4 follow-ups which was completed by 41.7% participants while 24% didn't come for any follow-up. The average duration of stay required in between 7 to 15 days and most children admitted to the NRC show moderate rate of weight gain. Mean Weight, Height, and MUAC all showed improvement on discharge from NRC. The mean weight gain during the stay was 0.500 kg, mean height/length gain is 0.13 cm and mean gain in MUAC is 0.11 cm.

#### Discussion:

#### Socio demographic profile of the children

In the present study majority of the children admitted in the NRC were male, similar findings were reported in the study by Chaurasiya et al<sup>[6]</sup>, meanwhile females were reported to be more in studies conducted by Shalini et al,<sup>[3]</sup> Panigrahi et al<sup>[4]</sup> and Patel et al.<sup>[5]</sup> The differences in the findings could be due to different socio-geographical conditions of the study areas. Malnutrition seems to be more or less distributed equally among the sexes and no clear predilection towards any one sex. In the present study majority of the children affected were from 13-24 months age group followed by 6-12 months age group, similar findings were reported by Chaurasiya et al,<sup>[6]</sup> Panigrahi et al,<sup>[4]</sup> Majid et al <sup>[7]</sup>, the findings in the present study along with those observed by other authors suggest that the younger age group especially from 12-24 months seems more vulnerable to suffer from malnutrition.

Children with severe malnutrition often have other comorbidities as well, in the present study the major comorbidities noted were, acute respiratory infections followed by acute gastroenteritis and acute febrile illness. In the study done by Shalini et al<sup>[3]</sup> acute respiratory illness was also the major comorbidity, in the study by Das et al<sup>[16]</sup> the major comorbidity observed was anaemia, similar finding was observed by Chaurasiya et al.<sup>[6]</sup> Panigrahi et al<sup>[4]</sup>observed ARI as the major comorbidity, while Majid et al<sup>[7]</sup> and Nagar et al<sup>[8]</sup> observed gastroenteritis and respiratory infections as major comorbidities.

In the present study majority of the children stayed at the NRC for 7-15 days duration, in the study done by Panigrahi et al<sup>[4]</sup> majority of the patients stayed for <15 days. The duration of stay along with the weight gain also depends on the comorbidities present at the time of admission and the duration it takes for resolution. A child admitted with any severe infection or having major nutritional deficiencies may require a longer duration of hospital stay. The differing findings between studies can be a result of this.

In the present study majority of the patients were discharged for follow-up suggesting recovery rate of 80.2%, similar findings were reported by Shah R et al.<sup>[9]</sup> and Dhanalakshamiet al.<sup>[10]</sup> and The findings suggest that the interventions provided at the NRC are effective and put the children on a path to recovery from severe acute malnutrition.

In the present study majority of the patients gained weight at a moderate rate of 5-10  $\,\rm gm/kg/day,$ 

with mean weight gain rate being 7.484  $\pm$  3.49 gm/kg/day. on the contrary in study by Alka Mathur et al <sup>[11]</sup> more children gained weight at moderate to good rate with 8.5 gm/kg/day being the average weight gain. Hashmi et al <sup>[12]</sup> reported a rate of weight gain of 7.9+/-1.6 gm/kg/day while Dhanalakshmi et al<sup>[10]</sup> reported it to be 4.4 gm/kg/day. The difference in the weight gain can be attributed to different comorbidities, socio-economic condition and different geographic areas of the study participants.

In the present study 50% of the children achieved target weight, similar findings were reported by and Dasgupta et al.<sup>[13]</sup> Contrary findings with lesser percent of children achieving target weight were reported by Hashmi et al.<sup>[12]</sup>

In the present study, majority participants were from urban areas, similar findings were reported by Gamit et al <sup>[14]</sup> on the contrary Shukla et al<sup>[15]</sup> reported majority to be from the rural areas, similarly Das et al,<sup>[16]</sup> Majid et al,<sup>[7]</sup> reported majority to be from rural areas. The location of the NRC can be a factor responsible for this discrepancy in findings. NRC located near cities tend can have more urban population reporting to them for services while those away from cities can have major proportion of patients from rural areas.

In the present study majority participants lived in nuclear families, similar finding was reported by Majid et al,<sup>[7]</sup> Shukla et al.<sup>[15]</sup> Sekhar CC et al.<sup>[17]</sup> and Aprameya et al.<sup>[18]</sup> in the present study with regards to education 8.2% fathers and 17.8% mothers were illiterate, a higher proportion if illiteracy was reported by Shukla et al.<sup>[15]</sup> with 30.2% fathers and 46.6% mothers being illiterate, similarly in study by Shalini et al.<sup>[3]</sup> 43% mothers were illiterate while Dhara Patel et al.<sup>[5]</sup> reported 65% mothers to be illiterate. The difference in findings may be due to different socio-geographical conditions of the study participants.

In the present study majority of the participants belonged to middle and lower middle class according

to B.G.Prasad socioeconomic scale, contrary findings were reported by Shalini et al,<sup>[3]</sup> Das et al.<sup>[16]</sup> Chaurasiya et al,<sup>[6]</sup> Majid et al<sup>[7]</sup> and Nagar et al<sup>[8]</sup> where the majority belonged to lower socio-economic class. In study by Aparemaya et al<sup>[19]</sup> 56% were from upper lower and 37.4% from lower middle class. Malnutrition tends to be more common among people belonging to lower and lower middle class as observed in the present study as well as by other authors.

In the present study majority lived in a semi pukka house, in the study by Prashanth MR et al<sup>[19]</sup> majority lived in a pakka house, while in study by Shukla Y et al<sup>[15]</sup> the major housing seen was kuccha house. Overcrowding was seen in homes of 56.2% this was lower than that reported by Shukla Y et al<sup>[15]</sup> who observed it to be present in 72.9% households. Majority participants had piped water supply (43.8%), although this was lower than that observed by Musa et al<sup>[22]</sup> who observed 76.04% having piper water supply.

#### Birth profile and feeding practices

Majority of the children had institutional delivery (94.5%), and majority had normal birth weight (75.4%), Shukla Y et al<sup>[15]</sup> in their study observed similar trend but proportion of low birth weight children was higher than the present study (39.1%), whereas Aprameya et al<sup>[18]</sup> observed majority (68.1%) to be having low birth weight, Purohit el al<sup>[20]</sup> in their study observed low birth weight in 7.98% participants which was lower than the present study, Shalini H et al.<sup>[3]</sup> in their study observed low birth weight among 44.5% children admitted to NRC. The difference can be attributed to different study settings and different socioeconomic conditions among the study participants. Majority children were birth order <3, with 39.7% being  $1^{st}$ birth order followed by 37% being 2<sup>nd</sup> birth order, similar findings were reported by Syed Tariq A et al.<sup>[21]</sup> and Shalini H et al.<sup>[3]</sup> Prashanth MR et al<sup>[19]</sup> in their study observed more prevalence of children with

birth order  $2^{nd}$  than  $1^{st}$  similar to that observed by Khargekar et al.<sup>[22]</sup>

In the present study majority of the children were started breastfeeding between 1-6 hours of birth, whereas only 24.7% were started breastfeeding within the 1<sup>st</sup> hour, similar results were observed by Wadde S K et al,<sup>[23]</sup> Aprameya et al<sup>[18]</sup> in their study however observed that higher proportion of children were started breastfeeding within 1<sup>st</sup> hour after birth (31.9%). Colostrum was given to 56.1% children in the present study which was lower than that observed by Shalini et al<sup>[3]</sup> (92.9%) but higher than that by Das et al<sup>[16]</sup> (39%). Also 15.1% children were given some form of prelacteal feed, which was higher than that observed by Shalini et al  $^{[3]}(10.4\%)$ , but lower than that observed by Das et al (32%).<sup>[16]</sup> The differences in feeding patterns can be due to cultural differences in the study areas, and also local customs and routines followed. Difference in awareness about the correct feeding practices can also be one of the factors which can cause such differences in reporting. Similarly the post-delivery status of the child and mother also has a bearing on the initiation of breastfeeding. In the present study only 34.2% children were exclusively breast fed for 6 months, this was higher than that observed by Das et  $al^{[16]}$  (10%) but lower than that observed by Shalini H et  $al^{[3]}$  (80.6%), Prashanth MR et  $al^{[19]}$  observed a higher proportion than the present study (57.3%) while Shukla Y et  $al^{[15]}$  (19.2%) and Aprameya et  $al^{[18]}$ (20.9%) observed lower proportion of 6 months exclusive breast feeding than the present study. The difference in local customs and culture, condition of the mother and baby and socio-economic differences between the populations can be some of the factors attributing to such difference in findings.

In the present study 74% of the admitted children with SAM were immunised as per age while the rest were partially immunised, similar findings were reported by Majid et al <sup>[7]</sup> (73.8%), while Das et al<sup>[16]</sup> reported a higher proportion of partially

immunised children (85%) and Shalini et al<sup>[3]</sup> observed a higher proportion(85%) as compared to the present study.(1,5,14) In the present study no child was unimmunised while Shalini et al,<sup>[3]</sup> Das et al<sup>[16]</sup> and Majid et al<sup>[7]</sup> had children who were not given any vaccination (1.2%, 4.3% & 3.9%). Mishra et al,<sup>[24]</sup> Shukla Y et al<sup>[15]</sup> reported a higher proportion of partially immunised children (42%, 31.7%).

#### **Conclusion:**

Severe acute malnutrition seems to be more prevalent in the younger age group of children, these children often have associated comorbidities like acute respiratory illness, acute gastroenteritis and acute febrile illness. The average duration of stay required in between 7 to 15 days and most children admitted to the NRC show moderate rate of weight gain. Socioeconomically, severe acute malnutrition appears to be more prevalent among households belonging to middle and lower middle class, and where educational status of parents both mother and father is low. Poor housing condition, presence of overcrowding and nuclear family structure were also seen among these children.

Poor feeding practices like delay in initiating breast feeding, low proportion of children getting the colostrum, and lesser proportion being given exclusive breast feeding also seem to be more among these children suffering from severe acute malnutrition. Immunization although seen in fair number of children is still not universal and can be one of the contributing factors for malnutrition.

#### **Recommendations:**

Severe acute malnutrition continues to be a public health problem in India. Age group of 1-2 years is mostly affected so timely follow-ups are recommended to be done by grass root health care workers. Educating the parents about infant feeding practices and importance of immunization also needs to be done. More penetration on government housing schemes like Indira Awas Yojana should be encouraged as better living conditions along with supply of clean and treated piped water for drinking purposed reduces the chances of children falling ill and getting trapped in the vicious cycle of poverty and malnutrition. At the institutional level parents should be encouraged to follow-up the children at the healthcare facility for proper management.

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# Determinants of Tuberculosis Treatment Outcome among Patients Belonging to the Tea Tribe Community in Dibrugarh District of Assam

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#### Abstract:

Introduction: Certain social determinants like poverty, malnutrition, indoor air pollution, male gender, diabetes, and cancer are some identified risk factors of TB. The tea garden population as it is socioeconomically backward are more vulnerable to get infected. Objective: To estimate the determinants of tuberculosis treatment outcomes among patients belonging to the tea tribe community in Dibrugarh District of Assam and to assess the quality of life using WHO-QoL (BREF) instrument. Method: A Community-based cross-sectional study was conducted in Dibrugarh District of Assam. A sample size of 930 was calculated using nMaster2.0 software, CMC, Vellore, India. From the list of registered TB cases whose treatment was assigned hailing from tea estates, a required sample was selected using a computerized random number. Predesigned, pretested questionnaire was used to assess the demographic, socio-economic, environmental and healthseeking behaviour of the participants. Univariate and bivariate analysis was done. Results: Total participation was 785. Regarding environmental determinants, ventilation was very poor and 98.5% used firewood as fuel for cooking. The risk of passive smoking was present in 7.6% of households. Respondents who had a history of family members with chronic cough were present in 5.9%. Loss to follow up rate was 2.9% (23/786). Lack of energy and fatigue was experienced by 83.6%. Marital status, occupation, monthly income, type of family and ventilation were associated with treatment outcome. Gender and socio-economic status of the respondents were associated with knowledge attitude and practice on Hepatitis B among participants which was found to be statistically significant (p-value < 0.0001). Conclusion: Certain social and environmental determinants like monthly income, type of family, and inadequate ventilation influence the treatment outcome in the tea garden population. Knowledge and practice pattern for tuberculosis needs to be improved to prevent transmission and alteration in quality of life.

Keywords: Determinants, Environment, Tea tribe, Tuberculosis, WHOQOL - BREF

#### Introduction:

Tuberculosis is a preventable and curable disease yet has been known as the most infectious killer disease of the world after COVID-19, with 10.6 million people falling ill to it globally in 2022 with a mortality of 1.3 million.<sup>[1]</sup> Sharing 27% of this global

burden, India presently has a point prevalence of 312 per lakh population.<sup>[2,3]</sup> Among the states in Northeast India, Assam has a total notification rate of 90% both from the public and private sectors in the period January to April 2024.<sup>[4]</sup> Certain social and environmental risk factors like poor housing,

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malnutrition, and poor ventilation are some identified determinants.<sup>[5]</sup> Though not all infected will develop the disease, people from socioeconomically disadvantaged sections are affected more which may dampen the effort to eliminate TB.<sup>[5]</sup> Persons suffering from TB face social and economic barriers and stigmatization once diagnosis is made, making them reluctant to seek care.<sup>[5]</sup>

The present study was carried out in tea city Dibrugarh of Assam, considering the high prevalence among the tea garden plantation workers and families<sup>[6]</sup> and also inclusion of them in the 100 days TB elimination campaign as one of the vulnerable group<sup>[7]</sup> with the objectives, to estimate the determinants of tuberculosis treatment outcome among patients belonging to tea tribe community in Dibrugarh District of Assam and to assess the quality of life using WHO-QoL (BREF) instrument.

#### Method:

A community-based cross-sectional study was conducted in 2021-22 among registered (Nikshay portal) TB cases who already had a treatment assigned, hailing from tea garden community residing in different tea estates of Dibrugarh. Data collection was done by house-to-house visits. Predesigned formats were used after field testing. All patients willing to participate were included. Severely ill patients, unwilling to give consent, were excluded.

**Sample size**: Taking prevalence as 312 per lakh population with 10% relative precision and 95% confidence interval the required sample size was 845. Considering the 10% non-response rate sample size becomes 930. From the list of all registered cases as available in the Nikshay portal, undergoing treatment, 930 cases belonging to the tea garden community were selected by computerized random number. Demographic, socio-economic, environmental, knowledge and practice pattern

among tuberculosis patients was assessed. Quality of life among those who have completed their treatment without evidence of failure was assessed using WHO-QoL (BREF) instrument.<sup>[8]</sup> Statistical analysis was done by univariate and bivariate analysis.

#### **Operational definition:**

Treatment completed: A person affected by TB who has completed treatment without evidence of failure or clinical deterioration BUT with no record to show that the smear or culture results of biological specimen in the last month of treatment was negative, either because the test was not done or because the result is unavailable.<sup>[9]</sup>

Cured: A person affected by TB who was microbiologically confirmed for TB at the beginning of treatment but is smear or culture negative at the end of complete treatment.<sup>[9]</sup>

Loss to follow up: A TB patient previously treated for TB for one month or more and was declared a loss to follow up in the most recent course of treatment.<sup>[9]</sup>

**Ethical consideration**: IEC(H) was obtained from the Institutional Ethics Committee (Human) (No.AMC/EC/2563) subject recruitment was done following ethical approval. Written informed consent was sought from each selected participant and those consenting was only included in the study.

#### **Results**:

A total of 785 participants were enrolled, with a response rate of 84.4%. Marital status, occupation of the respondents and per capita income according to BG Prasad classification is associated with treatment outcome. (Table 1)

**Environmental determinants of the households of study participants**: Separate kitchen area and presence of exhaust fan ventilation in the household are significantly associated with the completion of treatment. (Table 2)

	Variable	Loss to follow-up	Cured/ Treatment	Overall	p-value
		(n=23)	completed (n=762)	(n=785)	-
Gender					
	Male	13 (56.5%)	436 (57.2%)	449 (57.2%)	0.947
	Female	10 (43.5%)	326 (42.8%)	336 (42.8%)	
Marital	Status				
	Married	11 (47.8%)	509 (66.8%)	520 (66.2%)	0.002
	Widow	7 (30.4%)	59 (7.7%)	66 (8.4%)	
	Unmarried	0 (0.0%)	2 (0.3%)	2 (0.3%)	
	Single	5 (21.7%)	192 (25.2%)	197 (25.1%)	
Religion	n				
	Hindu	23 (100.0%)	734 (96.3%)	757 (96.4%)	0.645
	Muslim	0 (0.0%)	7 (0.9%)	7 (0.9%)	
	Christian	0 (0.0%)	21 (2.8%)	21 (2.7%)	
Caste					
	General	0 (0.0%)	10 (1.3%)	10 (1.3%)	0.58
	OBC	23 (100.0%)	752 (98.7%)	775 (98.7%)	
Type of	family				
	Joint	5 (21.7%)	196 (25.7%)	201 (25.6%)	0.666
	Nuclear	18 (78.3%)	566 (74.3%)	584 (74.4%)	
Mobile	phone at home				
	None	4 (17.4%)	218 (28.6%)	222 (28.3%)	0.23
	One	12 (52.2%)	408 (53.5%)	420 (53.5%)	
	Two or more	7 (30.4%)	136 (17.8%)	143 (18.2%)	
Educati	ion of the responden	its			
	Illiterate	10 (43.5%)	256 (30.1%)	239 (30.4%)	0.06
	Primary level	10 (43.5%)	194 (25.5%)	204 (26.0%)	
	Middle level	3 (13.0%)	133 (17.5%)	136 (17.3%)	
	High school	0 (0.0%)	174 (22.8%)	174 (22.2%)	
	Graduate and abov	e 0 (0.0%)	5 (0.7%)	5 (0.6%)	
Occupa	tion				
	Unskilled	11 (47.8%)	296 (38.8%)	307 (39.1%)	0.035
	Skilled labour	2 (8.7%)	280 (36.7%)	282 (35.9%)	
	Business	0 (0.0%)	10 (1.3%)	10 (1.3%)	
	Housewife	5 (21.7%)	51 (6.7%)	56 (7.1%)	
	Cultivator	0 (0.0%)	2 (0.3%)	2 (0.3%)	
	Retired	2 (8.7%)	40 (5.2%)	42 5.4%)	
	Student	3 (13.0%)	56 (7.3%)	59 (7.5%)	
	Unemployed	0 (0.0%)	27 (3.5%)	27 (3.5%)	
Socio-E	conomic Status				
	Class II	0 (0.0%)	9 (1.18%)	9 (1.2%)	0.000
	Class III	0 (0.0%)	146 (19.16%)	146 (18.6%)	
	Class IV	19 (82%)	439 (57.61%)	458 (58.4%)	
	Class V	4 (18%)	166 (21.78%)	170 (21.7%)	

Table 1: Socio-demographic details of the patients and their association with tuberculosis treatment outcome (N=785)

Table 2: Distribution of study participants according to environmental profile and TB treatment	outcome
(N=785)	

Variable	Defaulter (n=23)	Cured/ Treatment completed (n=762)	Overall (n=785)	p-value
Cross ventilation present at home				
Yes	0 (0.0%)	15 (2.0%)	15 (1.9%)	0.497
No	23 (100.0%)	747 (98.0%)	770 (98.1%)	
Kitchen area separate				
Yes	22 (95.7%)	555 (72.8%)	577 (73.5%)	0.015
No	1 (4.3%)	207 (27.2%)	208 (26.5%)	
Exhaust fan/ ventilation present in t	he kitchen			
Yes	0 (0.0%)	17 (2.2%)	17 (2.2%)	0.032
No	22 (95.7%)	538 (70.6%)	560 (71.3%)	
Any sputum-positive patients under	going treatment pre	esent in the family		
Yes	0 (0.0%)	31 (4.1%)	31 (3.9%)	0.324
No	100 (100.0%)	731 (95.9%)	754 (96.1%)	
Any family member with chronic cou	igh or h/o respirato	ory ailment		
Yes	3 (13.0%)	43 (94.4%)	46 (5.9%)	0.137
No	20 (87.0%)	719 (94.4%)	739 (94.1%)	

## Table 3: Distribution of the study participants according to health seeking behaviour and its outcome (N=785)

Variable	Loss to follow-up	Cured/ Treatment	Overall
	(n=23)	completed (n=762)	(n=785)
How cough and cold with fever managed in the family			
Only Home treatment	3 (13.0%)	55 (7.2%)	58 (7.4%)
Consulted health worker	0 (0.0%)	5 (0.7%)	5 (0.6%)
Visited Health Centre	0 (0.0%)	16 (2.1%)	16 (2.0%)
Hospital	7 (30.4%)	193 (25.3%)	200 (25.5%)
Private practice	0 (0.0%)	2 (0.3%)	2 (0.3%)
Others (specify)	0 (0.0%)	2 (0.3%)	2 0.3%)
Home treatment, Hospital	13 (56.5%)	423 (55.5%)	436 (55.5%)
Different methods along with Home Treatment	0 (0.0%)	66 (8.7%)	66 (8.4%)
Availability of govt. health facility in the area			
Yes	15 (65.2%)	672 (88.2%)	687 (87.5%)
No	8 (34.8%)	90 (11.8%)	98 (12.5%)
Approached Government facility			
Yes	15 (65.2%)	659 (86.5%)	674 (85.9%)
No	8 (34.8%)	103 (13.5%)	111 (14.1%)
Satisfied with health care service provided at Governme	nt Facility		
Yes	15 (65.2%)	652 (85.6%)	667 (85.0%)
No	8 (34.8%)	110 (14.4%)	118 (15.0%)
What measures adopted to prevent tuberculosis transm	ission in the commun	ity	
Vaccination	0 (0.0%)	76 (16.0%)	76 (15.4%)
Tonics	0 (0.0%)	115 (24.2%)	115 (23.2%)
Home-based measures	0 (0.0%)	8 (1.8%)	8 (1.8%)
(honey, tulsi, amla/lemon juice etc)			
Preventing from cold	2 (10.5%)	92 (19.3%)	94 (19.0%)
Safe disposal of sputum	15 (78.9%)	184 (38.7%)	199 (40.2%)
Hand Washing	4 (21.1%)	95 (20.0%)	99 (20.0%)
Social Distancing	13 (68.4%)	141 (29.6%)	154 (31.1%)
Cough Etiquette	0 (0.0%)	100 (21.1%)	100 (20.3%)

## Knowledge about tuberculosis, its causation and management

Common ailments occurring in their area was cough (76.7%) followed by fever (60.8%). Regarding smoking as risk factor, 55.8% was said by, while 25.5% said it negatively and 18.7% had no idea about this.

#### Health care seeking behaviour of the respondent

Loss to follow up was 2.9% (23/785). Availing Govt hospital facility was found in 39.5% if suffered from cough and cold while 35.0% tried to manage it by giving only home treatment. Majority(85.9%) were satisfied with the health care service provided. Statistically significant difference was seen between "Availability of govt. Health facility in the area" amongst loss to follow up and those who completed treatment or cured (p=0.001). Regarding the different measures to prevent tuberculosis transmission in the community in cured/treatment completed group 24.2% believed tonics, 21.1% Cough etiquette can prevent tuberculosis transmission in the community while nobody in the loss to follow up groups believed this (p=0.014; p=0.025. While in loss to follow up group, 78.9% believed that safe disposal of sputum, 68.4% social distancing can prevent tuberculosis transmission in the community as compared to 38.7% and 29.6% respectively in the other group (p<0.05). (Table 3)

#### Health worker and continuity of treatment:

The majority (92.1%) of respondents were familiar with the health worker/ DOT provider in their area and 69.2% of participants replied positively when asked "Whether health workers contacted them during their illness". In the loss to follow-up group, majority discontinued DOTS after 4 months of treatment and informed (47.8%) that they stopped it because they felt better than earlier.

#### Quality of life of tuberculosis cases as per WHOQOL BREF questionnaire

Only 3.8% respondents were ill at the time of interview and 75.2% respondents thought that if something was wrong with their health it was due to their illness. Regarding physical health lack of energy and fatigue (83.6%) was common followed by less sleep and rest (20.3%) and pain and discomfort in 4.8%.

**Regarding Psychological health:** Negative feeling for bodily image and appearance was seen in (5.0%), while positive feeling was present in 86.6%, low selfesteem was informed by (67.0%), lower thinking, learning, memory and concentration was found in (69.0%).

**Level of independence:** Mobility was less in (61.0%), lower activities of daily living was seen in (92.0%), Dependence on medicinal substances & medical aids was seen in (5.1%), reduced work capacity found in (69.7%).

**Social relationship:** Mobility for attending different social activity was seen less in (61.7%).

Activities of daily living was (89.6%) while 7.5% showed dependence on medicinal substances & medical aids, Work capacity was reduced to (69.9%).

**Social relationship**: Personal relationship reduced in (70.1%) participants, while 72.4% require social support and 40% had reduced sexual activity.

**Environment**: Financial resources were less amongst 63.1% participants, freedom, physical safety and security was lower in 76.6% participants.

**Health and social care**: Accessibility and quality home environment was not found in 73.4% participants, opportunities for acquiring new information and skills was also found low in 64.2%, participation in and opportunities for recreation/ leisure was found less amongst 60.5%.

**Physical environment** (pollution/ noise/ traffic/ climate) was found compromised in (62.5%), transport facility was found low in (54.6%).

**Spirituality/ Religion/ personal beliefs**: Less faith in Religion was evident in 36.6% participants.

#### Discussion:

Since ancient times human civilization has been undergoing the scourge of tuberculosis as an incurable disease. However, with the introduction of effective drugs it changed from incurable to a much curable disease. But with the spread of drug resistance form and co-infection with HIV, the scenario has worsened leading to declaration by WHO as a global emergency.<sup>[10]</sup>

Certain social determinants like poor ventilation, overcrowding in homes and workplaces, malnutrition, hunger and poverty are identified risk factors which may not only enhance infection but also increase the severity of the disease.<sup>[5]</sup> The pool of study participants in the conducted study were males in majority, married, illiterate, unskilled labourers, lived in homes without cross ventilation or exhaust fans, mostly using firewood for cooking. There was a positive association between marital status and status of treatment.

Economic hardship is one of the major reasons for people to discontinue treatment in between as has been cited by other studies.<sup>[11]</sup> Stigma associated with the disease, lack of social support from family, friends, doubt about recovery after treatment, difficulty from the side effects, feeling of wellness after initiation of treatment and ignorance of consequences of non-adherence may be some reasons of incomplete treatment.<sup>[12]</sup> Present study showed that occupation of the respondents was associated with treatment status and loss to follow up was more in the unskilled labourer group who were engaged in informal sector owing to loss of wage for repeated visits to health facilities, less literacy and therefore less information, there was a greater probability of discontinuation of treatment.<sup>[13]</sup> It was noticed that the tea garden management authority took the responsibility of collecting the drugs from district store for their permanent workers and so treatment adherence and completion were more in such workers in comparison to temporary workers who worked as daily wage earners and were unwilling to lose a days wage to visit district store for next doses of medicines and since there was relief of symptoms after initiation of treatment discontinuation was more in the later group. Either because of a secured source of finance or responsibility was also taken by Tea garden management, treatment completion and recovery were noticed more in the permanent worker group. Moreover monthly income in joint families, availability of housing amenities like exhaust ventilation, separate kitchen area were associated with uptake of treatment in present study and these factors are considered as indicators of improved socio economic condition<sup>[14]</sup> While previous study have measured that poverty, poor socio economic condition hinder treatment adherence and successful outcome.<sup>[11]</sup>

Treatment adherence may also be affected by misconceptions and lack of information on transmission of disease, necessity of early diagnosis and treatment, as delayed or irregular treatment may facilitate relapse, resistance or death.<sup>[15]</sup> Knowledge on tuberculosis reduces the barriers by enhancing access to treatment.<sup>[16]</sup> Such knowledge can be regarding following cough hygiene, avoiding unnecessary spitting for TB prevention.<sup>[15]</sup> Knowledge on safe disposal of sputum, distancing

and maintaining adequate cough etiquette was associated with intake of treatment in present study as a measure for prevention of indiscriminate transmission of disease in the community. Approach of the health care providers, willingness to serve and address the spread of misinformation, satisfaction with care provided and availability of government health facilities in the area for free medications service is another facilitator for treatment adherence, as travel cost may be a reason for noncompliance.<sup>[15,17]</sup> Nestled in some isolated community within the tea gardens, the workers remain separated from the general population and may be ignorant of the disease and services. Hence health care providers can bring a difference in this regard.

Diagnosis of TB may cause psychological disturbance in the patient which may accentuate physical illness and there may be sleeplessness, anxiety, tiredness, anorexia, weight loss, mood disorder etc which may reduce the quality of life (QoL).<sup>[18]</sup> This study reported negative feelings with low self-esteem and thinking, lack of memory and concentration as dimension of psychological health and lack of energy and fatigue, low sleep as the dimension of physical health among the affected. Besides these, reduced work capacity with less mobility, dependence on medicines and other aids, less personal relationships and social activity, less involvement in recreational activity with depletion on financial resources and less freedom and sense of security were other parameters experienced by the affected individuals. So, perceived perceptions implies that along with physical health, there is deterioration of quality of life (QOL) of TB patients. However, with integrated TB treatment strategies, QoL may improve as was reported from a number of studies and the scores may even help to identify the patients who have discontinued treatment.<sup>[19]</sup> So, a hand holding approach will reduce the loss to follow up with a rise in QoL.

The strength of present study is that it can be the beginning to study the barriers to treatment adherence. Since it was a cross-sectional study, it can be considered as a limitation as treatment outcome of all subjects remained unknown and addition of a qualitative component may further improve understanding the barriers better.

#### **Conclusion:**

Different determinants working in different setting may influence the profile of TB patients and their uptake of treatment and also quality of life of the patients. Hence, efforts should be to address the determinants by shared approach among various stakeholders both within and outside the health sector.

#### **Declaration:**

Funding: Study funded by ICMR

Conflicts of interest: Nil

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## 'Medical Minds and Machine Learning': Awareness and Opinions on Artificial Intelligence in Healthcare among Undergraduate Medical Students of a Tertiary Care Institute of Kolkata, India

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#### Abstract:

**Introduction:** There is a need to incorporate Artificial Intelligence (AI) in medical education which may help in expanding awareness on role of AI in healthcare among the students. **Objectives:** To assess the awareness and opinions on role of AI in healthcare among undergraduate medical students of a Tertiary Care Institute of Kolkata and to identify any associated sociodemographic factors with their awareness on AI. **Method:** Descriptive study was conducted using consecutive sampling among 288 undergraduate medical students using a pretested questionnaire, from August - October (2023). Participants with an 'overall awareness score on AI' equal to or above median were categorized as having 'high awareness'. Association of sociodemographic profile with awareness was assessed using binary logistic regression. **Results:** Almost half (51%) of the students belonged to Phase III of MBBS. Around 70.8% believed AI will reduce medication errors, while 83.3% opined AI will aid in healthcare-oriented research. 53.5% had low awareness on role of AI. Higher odds of low awareness were found among students whose parents were involved in healthcare. **Conclusion:** Almost half of the students had high awareness and orientation among the undergraduate medical students for appropriate use of AI applications in future.

Keywords: Artificial Intelligence, Awareness, Machine Learning, Medical education

#### Introduction:

Artificial Intelligence (AI) means making machines capable of simulating intelligence by giving the computer human-like capabilities, such as understanding, reasoning and problem-solving. AI interprets external data, learns from it, and uses this learning to achieve specific goals and tasks.<sup>[1]</sup> AI systems can perform numerous functions to provide support to clinicians in various medical fields, such as drug development, disease diagnostics; health monitoring, medical data management, personalized medicine; and in the analysis of health plans, surgical treatments, and medical treatments.<sup>[1,2]</sup> They may detect things that are comparable to what they know and label them accordingly.<sup>[2]</sup> This provides a humanlike experience, yet it is only a simulation. The AI may not understand commands, but it will respond to them using algorithms.<sup>[3]</sup> When a powerful AI is

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confronted with a problem, it proceeds to solve it without the need for human participation.<sup>[4]</sup>

AI, which is also referred to as machine intelligence, is commonly used when a machine mimics cognitive behaviour associated with the human brain during learning and problem solving.<sup>[4]</sup> Nowadays, biological and chemical scientists extensively incorporate AI algorithms in drug designing and discovery process. Computational modelling based on AI and Machine Learning (ML) principles provides a great avenue for identification and validation of chemical compounds, target identification, peptide synthesis, evaluation of drug toxicity and physiochemical properties, drug monitoring, drug efficacy and effectiveness, and drug repositioning.<sup>[5]</sup> Artificial Neural Networks (ANN) and Deep Learning (DL) algorithms have modernized the area.<sup>[5,6]</sup>

With the development of neural networks, machines could classify and organize inputted data that mimics like a human brain, which further shows advancement in AI.<sup>[6]</sup> Deep Learning (DL) is a subset of ML, which itself is a subset of AI, and thus, the evolution goes like AI>ML>DL. ML either uses supervised learning, where the model is trained to use labelled data, which means that the input has been tagged with corresponding preferred output labels or uses unsupervised learning.<sup>[7]</sup>

AI subsets of machine learning and deep learning also plays an important role in the medical education of undergraduate medical students and trainees in post-graduate programs.<sup>[8]</sup> AI program has multiple challenges for the implementation in the health sector including provider's inertia, financial restrictions, limitation of trained health professionals for setting up diagnostic protocols on which algorithms are based, lack of data on public perception and implications of AI, and fear of replacement of physician, social barriers, confidentiality, and medicolegal implications.<sup>[8,9]</sup> Developing countries like India are lagging in the implementation of AI-based solutions in healthcare.<sup>[10]</sup> It is hypothesized that the undergraduate medical students are not fully aware of the AI implications in medicine and other sectors of healthcare and research. Therefore, with this background in mind, the current study was undertaken among the undergraduate medical students of a Tertiary Care Teaching Institute of Kolkata, India.

#### Method:

*Study design, and study setting:* The study had a cross-sectional design, and was conducted among undergraduate medical students of Institute of Post Graduate Medical Education and Research (IPGME&R) and Seth Sukhlal Karnani Memorial (SSKM) Hospital, Kolkata.

*Study duration and study participants:* The study was conducted for a period of 3 months (August 2023 to October 2023). The study participants included all the undergraduate medical students from Phase I to Phase III (Part I and Part II) of the MBBS curriculum.

**Inclusion and Exclusion criteria:** The study included all undergraduate medical students from Phase I to Phase III (Part I and Part II) who were present during their lecture classes and/or clinical postings during the data collection period. The study excluded all those medical students who were pursuing their compulsory rotatory internship during the phase of the study and those who did not give informed written consent for participation in the study were excluded.

*Sample size and sampling technique:* The total number of undergraduate medical students (Phase I to Phase III of MBBS) in IPGME&R and SSKM Hospital are 750. Hence, the expected sample size at the beginning of conduction of the study was estimated to be 750. However, after applying the selection criteria, the final sample size at the end of the data collection period turned out to be 288. Consecutive sampling technique was employed to achieve the desired sample size.

Study tools and study technique: An anonymous, predesigned, pretested and structured questionnaire was employed to obtain data from the eligible study participants. It contained a mixture of open-ended and semi-open, single and multiple-response questions and was developed in English language, since the medical students were well-versed in English. The questionnaire collected data across the domains of sociodemographic characteristics of the study participants, their awareness and opinions regarding the role of AI in healthcare. The awareness domain included 11 items, e.g.- AI devalues the medical profession, AI reduces errors in medical practice, AI facilitates patients access to the service, AI facilitates healthcare professionals access to information, AI enables healthcare professionals to make more accurate decisions, AI increases patients confidence in medicine, etc. The opinion domain included total 7 items, like- Knowledge and skill development in AI should be included in the undergraduate medical curriculum, Proper training should be required to prevent and solve ethical issues that may arise with AI tools and applications, A simplified lecture on AI, Computer use, Coding, Python language should be included in the undergraduate medical curriculum should be included, AI applications is needed to aid in scientific research in future. This self-administered questionnaire was validated using content validity and face validity by three respected faculties from the Medical Education Unit (MEU) of the institution and necessary changes were incorporated before pretesting it. Pretesting of the questionnaire was done on 28 undergraduate medical students belonging to the institution, who were later excluded from the final sample. The students who attended their clinical postings/lecture classes during the data collection period and fulfilled the eligibility criteria, were consecutively administered the questionnaire at the end of their classes or postings, while those who were absent at the time of data collection, were

called over the telephone and told to come the next day. Four phone calls were made individually for those who were absent during data collection. Those who did not reply or were absent during their lecture classes/clinical postings throughout the data collection period were excluded from the study. Data were collected for three randomly selected days in a week. Thus, at the end of the data collection period, which continued for 1.5 months, the final sample size turned out to be 288.

*Study variables:* Independent variables in the study were the sociodemographic characteristics of the study participants. Dependent variables included the awareness and opinions of the eligible participants on the role of AI in healthcare.

Statistical analysis: Data were tabulated in Microsoft Office Excel 2021 and analysed using the Statistical Package for the Social Sciences (SPSS) version 25.0. (Armonk, NY: IBM Corp. 2017). Descriptive analyses were represented using Mean (± SD), frequency and percentage and with the help of appropriate diagrams. Awareness on role of AI in healthcare was assessed using 11 items on a 5-point Likert Scale, ranging from Strongly agree (score of 4) to Strongly disagree (score of 0). Thus, the total possible score ranged from 0-44. The item 1 and items from 8-11 in the awareness domain were reversely scored. An overall scoring of awareness was done, followed by categorization of awareness based on the median of the overall awareness score. Those who scored more than and equal to the median of the overall awareness score were categorized as having high awareness while score less than the overall median score was categorized as having low awareness. Median of the overall awareness score was employed for categorization as the data distribution was not normal (skewed distribution). There was a total of 7 items which assessed the opinions of the students on the role of AI in healthcare. Results for the opinion domain was based on descriptive statistics. Multivariable Binary

Logistic Regression analyses was performed to identify any associations between the sociodemographic characteristics of the study subjects with their awareness on AI. All the variables having a p-value less than 0.2 in the univariate logistic regression analyses were considered biologically plausible and included in the multivariable model to check for model fitness, after checking for multi-co-linearity (variance inflation factor more than 10 and tolerance less than 0.1). A pvalue of less than 0.05 at 95% Confidence Interval (CI) was considered as statistically significant.

*Ethical considerations:* Proposal of the study was submitted, and ethical clearance was obtained from the Institutional Ethics Committee (IEC) of IPGME&R and SSKM Hospital, Kolkata (*IPGME&R/IEC/2023/976*). Informed written consent were taken from the study participants. Anonymity and confidentiality of data were maintained throughout the study.

#### **Results:**

The mean age of the study participants was 21.2 (± 3.7) years. Majority of them belonged to the agegroup of 21-24 years (73.6%). Out of the total participants, 214 (74.3%) were males, nearly half [149 (51.7%)] of the students belonged to Phase III of MBBS, 178 (61.8%) were currently residing in the institutional hostel, 100 (34.7%) of the students passed XIIth standard under the CBSE Board (Central Board of Secondary Education), while the remaining under the WBCHSE (West Bengal Council of Higher Secondary Education) or ISC (Indian School Certificate) Board. Regarding the occupational status of the participants parents, the mothers of 196 (68.1%) participants and fathers of 200 (69.5%) participants were employed. Among the participants, 35 (12.2%) of them had their parents involved in healthcare profession (doctors, nurses, paramedics, etc.). (Table 1).

Nearly 76% of the students have not received

study participants (N=288)Socio-Demographic Characteristicsn (%)Age (in completed years) $7 (2.4)$ $17-20$ $7 (2.4)$ $21-24$ $69 (24.0)$ $\geq 25$ $212 (73.6)$ Gender $74 (25.7)$ Male $214 (74.3)$ Phase of MBBS $90 (31.2)$ Phase II $49 (17.1)$ Phase III (Part I) $111 (38.5)$ Phase III (Part II) $38 (13.2)$
Socio-Demographic Characteristics         n (%)           Age (in completed years)         7 (2.4) $17-20$ 7 (2.4) $21-24$ 69 (24.0) $\geq 25$ 212 (73.6)           Gender         74 (25.7)           Male         214 (74.3)           Phase of MBBS         90 (31.2)           Phase II         90 (31.2)           Phase III (Part I)         111 (38.5)           Phase III (Part II)         38 (13.2)
Age (in completed years) $17-20$ 7 (2.4) $21-24$ 69 (24.0) $\geq 25$ 212 (73.6)Gender74 (25.7)Male214 (74.3)Phase of MBBS90 (31.2)Phase II90 (31.2)Phase III (Part I)111 (38.5)Phase III (Part II)38 (13.2)
17-207 (2.4) $21-24$ $69$ (24.0)≥ 25 $212$ (73.6)Gender74 (25.7)Male $214$ (74.3)Phase of MBBS $214$ (74.3)Phase I90 (31.2)Phase II49 (17.1)Phase III (Part I)111 (38.5)Phase III (Part II)38 (13.2)
$\begin{array}{ccc} 21-24 & 69 (24.0) \\ ≥ 25 & 212 (73.6) \\ \hline \\ Gender & & \\ \hline \\ Female & 74 (25.7) \\ Male & 214 (74.3) \\ \hline \\ Phase of MBBS & & \\ \hline \\ Phase I & 90 (31.2) \\ \hline \\ Phase II & 90 (31.2) \\ \hline \\ Phase II & 49 (17.1) \\ \hline \\ Phase III (Part I) & 111 (38.5) \\ \hline \\ Phase III (Part II) & 38 (13.2) \\ \hline \end{array}$
≥ 25 212 (73.6) Gender 212 (73.6) Gender 74 (25.7) Male 214 (74.3) Phase of MBBS 214 (74.3) Phase II 90 (31.2) Phase II 90 (31.2) Phase II 49 (17.1) Phase III (Part I) 111 (38.5) Phase III (Part II) 38 (13.2) Phase III (Part II) 212 (73.6) Phase II (Part II) 212 (73.6) Phase II (Part II) 212 (73.6) Phase II (Part II) 212 (73.6) Phase III (Part II) 212 (73.6) Phase I
Gender         Female       74 (25.7)         Male       214 (74.3)         Phase of MBBS       90 (31.2)         Phase I       90 (31.2)         Phase II       49 (17.1)         Phase III (Part I)       111 (38.5)         Phase III (Part II)       38 (13.2)
Female       74 (25.7)         Male       214 (74.3)         Phase of MBBS       90 (31.2)         Phase I       90 (31.2)         Phase II       49 (17.1)         Phase III (Part I)       111 (38.5)         Phase III (Part II)       38 (13.2)
Male       214 (74.3)         Phase of MBBS       90 (31.2)         Phase I       90 (31.2)         Phase II       49 (17.1)         Phase III (Part I)       111 (38.5)         Phase III (Part II)       38 (13.2)
Phase of MBBS       90 (31.2)         Phase I       90 (17.1)         Phase III (Part I)       111 (38.5)         Phase III (Part II)       38 (13.2)
Phase I       90 (31.2)         Phase II       49 (17.1)         Phase III (Part I)       111 (38.5)         Phase III (Part II)       38 (13.2)
Phase II       49 (17.1)         Phase III (Part I)       111 (38.5)         Phase III (Part II)       38 (13.2)
Phase III (Part I)         111 (38.5)           Phase III (Part II)         38 (13.2)
Phase III (Part II) 38 (13.2)
Current residential status
Hosteler 178 (61.8)
Day scholar 90 (31.2)
Rented house/Paying guest 20 (7.0)
Board in which passed XIIth standard
WBCHSE 154 (53.5)
CBSE 100 (34.7)
ISCE 23 (8.0)
Other state boards 11 (3.8)
Education of mother
Illiterate 4 (1.4)
Primary 13 (4.5)
Middle school 26 (9.0)
Secondary 34 (11.8)
Higher secondary 48 (16.7)
Graduate and above 163 (56.6)
Occupation of mother
Employed 196 (68.1)
Unemployed 38 (13.2)
Others (housewives and retirees) 54 (18.7)
Education of father
Primary 9 (3.1)
Middle school 10 (3.5)
Secondary 21 (7.3)
Higher secondary 36 (12.5)
Graduates and above 212 (73.6)
Occupation of father
Employed 200 (69.5)
Unemployed 30 (10.4)
Retirees 58 (20.1)
Any parent involved in healthcare
Yes 35 (12.2)
No 253 (87.8)





## Table 2: Distribution of study participants according to their responses (awareness) on role of AI in healthcare (N= 288)

Questions	Strongly	Agree	Neutral	Disagree	Strongly
	agree	n (%)	n (%)	n (%)	disagree
	n (%)				n (%)
"AI devalues the medical profession."	19 (6.6)	54 (18.7)	90 (31.2)	101 (35.1)	24 (8.4)
"AI reduces errors in medical practice."	28 (9.7)	184 (63.8)	57 (19.8)	15 (5.2)	4 (1.4)
"AI facilitates patients access to the service."	32 (11.2)	158 (54.8)	71 (24.6)	24 (8.4)	3 (1.0)
"AI facilitates healthcare professionals	41 (14.2)	177 (61.4)	46 (15.9)	12 (4.1)	12 (4.1)
access to information."					
"AI enables healthcare professionals	30 (10.4)	159 (55.2)	62 (21.5)	24 (8.4)	13 (4.5)
to make more accurate decisions."					
"AI increases patients confidence	18 (6.2)	91 (31.6)	98 (34.1)	71 (24.6)	10 (3.5)
in medicine."					
"AI facilitates patient education."	18 (6.2)	126 (43.7)	91 (31.6)	46 (15.9)	7 (2.4)
"AI negatively affects the relationship between	22 (7.6)	112 (38.9)	82 (28.5)	61 (21.2)	11 (3.8)
healthcare professionals and the patient."					
"AI damages the trust of the patient on the	26 (9.1)	115 (39.9)	89 (30.9)	50 (17.4)	8 (2.7)
healthcare professional."					
"AI reduces the humanistic aspect of	51 (17.7)	123 (42.7)	54 (18.7)	53 (18.4)	7 (2.4)
the medical profession."					
"Use of AI may result in violations of	19 (6.6)	139 (48.2)	97 (33.7)	29 (10.1)	4 (1.4)
professional confidentiality."					

any formal education on AI. Almost 35% of the students disagreed to the fact that AI devalues medical profession, while 63.9% agreed that AI reduces errors in medical practice. Around 54% patients agreed that AI facilitates patients access to healthcare services. Nearly 55% agreed that AI enables healthcare professionals to make more accurate decisions, 38.9% believed that AI negatively affects the doctor-patient relationship. Nearly 40% of the participants also agreed that AI destroys the trust built upon the healthcare professionals by the patients. (Table 2) Among the study subjects, 154 (53.5%) had low awareness whereas 134 (46.5%) had high awareness on the role of AI in healthcare.

The study participants were of the opinion that knowledge and skills in AI is required for better implementation of treatment strategies (76.7%), while 70.8% opined AI will reduce errors in medical practice. Nearly 77% opined that a simplified lecture on AI and its tools, coding, cloud computing, application of Python software, etc. should be executed in medical colleges and 83.3% opined that AI will also aid in scientific research. Almost 62% were of the opinion that AI will assist in dealing with emergency responses in the upcoming times. (Table 3). 73% of the study subjects opined that healthcare professionals will be better equipped if AI applications become more widespread in India. (Figure 1)

Multivariable Binary Logistic Regression analyses of awareness of study participants on the role of AI in healthcare were performed with their sociodemographic characteristics. The results revealed statistically significant higher odds of low awareness among the students whose parents were involved in healthcare (aOR= 2.50, 95% CI 1.38-5.07; p 0.005) as compared to students whose parents were not involved in healthcare, while lower odds of low awareness (aOR= 0.31, 95% CI 0.15-0.65; p 0.002) on AI were observed among the students belonging to the Phase III of MBBS (Part I) as compared to other undergraduate students belonging to others phases of MBBS. The model fitness information was given by the Omnibus Test of Model Coefficients, which was statistically significant, (p=0.01) and by the Hosmer-Lemeshow Goodness of Fit Test which was not statistically significant (p = 0.97). These findings suggested a good fit of the model. (Table 4)

Table 3: Students'	opinions o	n role of AI in	healthcare	(N=28)	38)
				<b>(</b>	· - J

Questions	Yes	No	Not sure
	n (%)	n (%)	n (%)
Knowledge and skill development in AI should be included in the	221 (76.7)	25 (8.7)	42 (14.5)
undergraduate medical curriculum			
AI should be used as an application for reducing medication errors	204 (70.8)	13 (4.5)	71 (24.7)
Proper training should be required to prevent and solve ethical	212 (73.6)	19 (6.6)	57 (19.8)
issues that may arise with AI tools and applications			
A simplified lecture on AI, Computer use, Coding, Python language	222 (77.1)	24 (8.3)	42 (14.6)
should be included in the undergraduate medical curriculum			
should be included			
Knowledge and skill development on AI applications should be	171 (59.4)	27 (9.4)	90 (31.2)
included to increase patients control over their health			
AI applications is needed to aid in scientific research in future	240 (83.4)	14 (4.8)	34 (11.8)
Knowledge and skills on AI are needed to help assist in	177 (61.4)	26 (9.1)	85 (29.5)
emergency responses			

Socio-demographic characteristics	Low awareness on role of AI (n1= 154)				
	n (%)	aOR (95% CI)	p-value		
Age of study participants (in completed years)					
17-20	47 (30.5)	0.58 (0.25-1.02)	0.051		
21-24	103 (66.9)	0.73 (0.14-4.16)	0.777		
<u>&gt;</u> 25	4 (2.6 %)	Ref.	-		
Gender of participants					
Females	117 (76.0)	1.86 (0.48-2.53)	0.621		
Males	37 (24.0)	Ref.	-		
Phase of MBBS					
Phase I	54 (35.1)	0.57 (0.25-1.29)	0.962		
Phase II	28 (18.2)	0.87 (0.44-1.77)	0.918		
Phase III (Part I)	72 (46.7)	0.31 (0.15-0.65)	0.002		
Phase III (Part II)	0 (0)	Ref.	-		
Involvement of parents in healthcare					
Yes	18 (11.7)	2.50 (1.38-5.07)	0.005		
No	136 (88.3)	Ref.	-		

 Table 4: Multivariable Binary Logistic Regression showing the association of socio-demographic

 characteristics of study participants with their awareness on the role of AI in healthcare (N=288)

(Ref. Cat= 'High awareness' on role of AI in healthcare)

**Model fitness:** Cox and Snell R-square=0.07, Nagelkerke R-square=0.10, Omnibus Test was significant (p=0.01) but Hosmer-Lemeshow Test was not significant (p=0.97) (Statistically significant values highlighted in bold text)

#### Discussion:

In a study conducted by Syed W et al.<sup>[11]</sup> most of the students (73.9%) knew about AI. In addition, 69.4% of the students thought that AI is a tool that helps healthcare professionals (HCP). 57.3% of the students were aware that AI would assist healthcare professionals in becoming better with the widespread use of AI. The mean score was significantly associated with age (p = 0.030), year of study (p = 0.040), and nationality (p = 0.013). The gender of the participants was found to have no significant association with the mean positive perception score (p = 0.916). On the contrary, the results from the current study revealed that 53.5% had high awareness on the role of AI. 76.7% of the students opined knowledge and skills in AI is the need of the hour, 70.8% believed AI will reduce medication, while 83.3% opined AI will aid in healthcare-oriented research. Higher odds of high

awareness were found among the students whose parents were involved in healthcare (aOR= 2.50, 95% CI 1.38-5.07; p 0.005).

A study conducted by Park SH et al.<sup>[12]</sup> in 2024, examined the effectiveness of a pilot Digital Health Scholars (DHS) non-credit enrichment elective that paralleled the Dartmouth Geisel School of Medicine's first-year preclinical curriculum with a focus on introducing AI algorithms. Ten self-selected firstyear students enrolled in the elective curriculum. The study demonstrates that a digital health enrichment elective that runs in parallel to an institution's preclinical curriculum and embeds AI concepts into relevant clinical topics can enhance students' confidence in describing the content objectives that pertain to high-level algorithmic understanding. This is in contrast to the current study, which was conducted on undergraduate medical students of a Tertiary Care Institute in Eastern India, where it was found that 51% belonged to Phase III of MBBS and

74.3% were males. 53.5% had high awareness on the role of AI. 76.7% of the students opined knowledge and skills in AI is the need of the hour, 70.8% believed AI will reduce medication, while 83.3% opined AI will aid in healthcare-oriented research. Higher odds of high awareness were found among the students whose parents were involved in healthcare (aOR= 2.50, 95% CI 1.38-5.07; p 0.005). This study mainly focused on the students awareness on AI and their opinions on the role of AI in healthcare. Also, nearly 15% believed that AI will replace the healthcare professionals in near future.

Another study done by Maine B et al.<sup>[13]</sup> in India in 2021, medical curriculum should be focussed on AI literacy rather than expertise. AI researchers/data scientists may act as resource persons to conduct faculty development programs in AI for medical faculty. For the medical students, emphasis should be laid on population health and evidence-based medicine. The present study too, emphasized on the fact that medical students from the grassroot level should have a formal training of using AI tools to spot anomalies, forecast patterns from medical data and make decisions.

In a study conducted by Randhawa GK et al.<sup>[14]</sup> in Canada, despite the rich and early history of AI in medical education, its application in the education of healthcare professionals in Canada has generally been limited. The current study also focussed on the issue that a developing country like India still needs to expand the domain of AI in healthcare and for that purpose, AI awareness and its judicious application should be included in the undergraduate medical education curriculum, clubbed with workshops and seminars on the importance of AI in healthcare. In general, there is a paucity of literature on the knowledge and attitudes of the medical students regarding AI, especially interprofessional education and the continuing professional development of healthcare professionals.

According to Narayana S et al.<sup>[15]</sup> in a study done in 2023, AI tools can aid the researcher in collecting relevant research articles, identifying the knowledge gaps in the literature, formulating research questions, recommending appropriate statistical methods for the available data, creating a graphical representation of the data, and manuscript writing. In contrast to this study, the current study explored the awareness and opinions on AI in healthcare among undergraduate medical students, to identify the lacunae in their understanding and awareness of the same and implement corrective measures so that the future doctors of our country can be better equipped with AI technology and tools.

A study conducted by Daher OA et al.<sup>[16]</sup> in Lebanon, there is a notable awareness of AI among students who are eager to learn about it. Despite this interest, there exists a gap in knowledge regarding DL, alongside a positive attitude towards it. Additionally, a higher percentage of students from Mount Lebanon (71.6%) showed an inclination towards using AI compared to Beirut (63.2%) (p=0.03). Noteworthy are the Lebanese University and Saint Joseph University, where the highest proportions of students are willing to integrate AI into the medical field (79.4% and 76.7%, respectively; p=0.001). The present study revealed that 51% of undergraduate medical students belonged to Phase III of MBBS and 53.5% had high awareness on the role of AI. 76.7% of the students opined knowledge and skills in AI is the need of the hour, 70.8% believed AI will reduce medication, while 83.3% opined AI will aid in healthcareoriented research in upcoming times, but nearly 15% believed that AI will replace the healthcare professionals in the near future.

A review article done by Mir MM et al.<sup>[17]</sup> highquality data that met the study objectives were included. The goal of this review article was to present the implications of AI in medical education, now and in the coming years. On the contrary, the results from the current study revealed that 53.5% had high awareness on the role of AI. 76.7% of the students opined knowledge and skills in AI is the need of the hour, 70.8% believed AI will reduce medication, while 83.3% opined AI will aid in healthcare-oriented research. Higher odds of high awareness were found among the students whose parents were involved in healthcare (aOR= 2.50, 95% CI 1.38-5.07; p 0.005). The aim of the present study was to assessing the awareness and opinions on role of AI in healthcare among undergraduate medical students of a Tertiary Care Institute of Kolkata and to identify any associated sociodemographic factors with their awareness on AI.

#### Limitations of the study:

The current study was conducted in one tertiary care institute; hence it may not represent the overall awareness and opinions of undergraduate students, particularly of those belonging to other peripheral medical colleges of the state. Also, the study relied upon self-reported data, which may be subjected to social desirability bias.

#### **Conclusion:**

The results from this study revealed that more than half of the students had low awareness on role of AI in healthcare, majority of students recognized the potential of AI in reducing medication errors and advancing healthcare-oriented research. Workshops and seminars on various AI tools and applications of AI in healthcare and research should be conducted in the medical colleges all over the country, for generating more awareness and creating an insight into the role of AI among the medical students, so that ethical and judicious use of AI applications can be implemented by the future doctors of our country.

#### **Declaration**:

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#### Conflicts of interest: Nil

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## Determinants of Chronic Kidney Disease among Young Adults attending a Tertiary Care Hospital in Madurai- A Case-Control Study.

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#### Abstract:

Introduction: As with other non-communicable diseases, chronic kidney disease (CKD) also is in a way at the top among the younger population. Apart from diabetes, hypertension, old age, family history of CKD other risk factors like smoking, alcohol, pesticide exposure, heavy metals also made them vulnerable to CKD. The focus on CKD in younger age groups is often overlooked; therefore, this study has been planned to address this gap. Objective: To determine the risk factors for chronic kidney disease among young adult patients <40 years of age. Method: An unmatched case control study was conducted in district hospital in Madurai. The study compared patients with chronic kidney disease aged under 40 (cases) from the Nephrology ward and outpatient with similar-aged controls without CKD from the Medicine ward, using routine eGFR calculations for diagnosis. The calculated sample size was 76, which was rounded up to 100 participants in both the case and control groups. Data collection was done by using semi-structured questionnaire. Univariate and multivariate analysis were used to predict the risk factors for young CKD patients. Results: The study predicted that rural population (OR-5.236, 95% CI-2.489-11.014), family history of CKD (OR-29.590, 95% CI-3.351-261.243), hypertension (OR-5.005, 95% CI-2.014-12.437), history of taking alternative medicine (OR-5.136, 95% CI-1.745-15.117), and recurrent urinary tract infection (OR-11.460, 95% CI-2.288-57.444) were significantly associated risk factors for CKD. Conclusion: This study predicted hypertension, rural population, family history of CKD, history of recurrent urinary tract infection, alcohol consumption as significant risk factors for CKD. Hypertension, history of recurrent urinary tract infection, alcohol consumption were modifiable risk factors. By controlling these modifiable risk factors, the burden of CKD can be reduced. In addition this study predicted that, rural population was more vulnerable to CKD, so the screening service to these populations through primary health care approach is essential.

Keywords: Case control study, Chronic kidney disease, Risk factors, Young adults

#### Introduction:

Chronic Kidney Disease (CKD) is an emerging non-communicable disease that contributes significant burden in both developed and developing countries. As per the Kidney Disease Outcome Quality Initiative, CKD is defined as kidney damage or glomerular filtration rate (GFR) < 60 ml/min/1.73 m<sup>2</sup> for three months or more, irrespective of the cause.<sup>[1]</sup>

The CKD prevalence has shifted over time due to changes in demographic trends and in part with an increase in hypertension and diabetes mellitus.<sup>[2]</sup> The global prevalence of CKD as per the Global Burden of

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Determinants of CKD among Young adults

Disease (GBD) study in 2017 was 9.1% (8.5% - 9.8%) and resulted in 35.8 million Disability-Adjusted Life Years (DALYs), whereas 25.3 million of the Cardio Vascular Disease (CVD) DALYs could be attributed to impaired kidney function and mortality increased by 41.5%.<sup>[3]</sup> In 2020, a report from the International Society of Nephrology stated that CKD prevalence in men and in women was 10.4% and 11.8%, respectively.<sup>[4]</sup>

In India, there is no national data of the magnitude of CKD until 2005. This led to the formulation of the Indian CKD registry by the Indian Society of Nephrology to enroll all CKD patients. The prevalence of CKD in India is about 800 per million populations (pmp), while the incidence of End Stage Renal Disease (ESRD) is 150-200 pmp.<sup>[5]</sup> Screening and Early Evaluation of Kidney Disease Project (SEEK), an Indian cohort study conducted between 2005-2007, reported a 17.2% prevalence of CKD in the study cohort.<sup>[6]</sup> The prevalence of CKD in young adults varies from 7% - 22.27%.<sup>[7]</sup>

Less than 5% of the CKD patients are adolescents and young adults whose ten-year survival ranges from 70-85%.<sup>[7]</sup> Young adults with CKD leads poor quality of life (QoL) as they tend to face issues like unemployment, sickness absenteeism, discordant relationship, social isolation. This, in turn, leads them to psychological disturbance.<sup>[8]</sup> Their mortality rate is 30 times higher than their healthy peers.<sup>[7]</sup>

CKD is a one of the major causes of out-of-pocket health expenditure. As of 2017, more than 2.5 million people received renal replacement therapy, and this number is expected to double by 2030. Renal replacement therapy remains inaccessible in many developing countries owing to its cost. Approximately 2.37.1 million adults are expected to die prematurely from lack of access to renal replacement therapy.<sup>[9]</sup>

Huge burden of CKD is found to be due to their close association with diabetes and hypertension.<sup>[10]</sup> Apart from modifiable risk factors like diabetes, hypertension, smoking, alcohol, use of analgesic and alternative medicine, exposure to occupational hazards, kidney stones, non-modifiable risk factors like old age, race, gender, family history of CKD also contribute to the development of CKD.<sup>[11-15]</sup> This higher prevalence of CKD risk factors like hypertension and diabetes in the younger population necessitates a screening program for early detection in turn facilitates lifestyle modification and control of disease progression. Delayed diagnosis and treatment increase the risk of End Stage Renal Disease, cardiovascular complications leading to premature death. The screening program and guidelines for early identification of CKD among the younger population are often lacking in India. Hence, this study needed to explore the risk factors for CKD in the younger age group.

#### **Objective:**

To identify the risk factors for chronic kidney disease among young adult patients <40 years of age attending a tertiary care hospital in Madurai.

#### Method:

Study design: An unmatched case-control study

**Study Site:** Tertiary care hospital of Madurai district, Tamil Nadu during the period of October 2020 to December 2021

#### **Study Population:**

#### Inclusion Criteria:

Cases: Newly diagnosed chronic kidney disease patients which was confirmed by nephrologist, aged less than 40 years attending nephrology OP and ward were considered as cases

Controls: Patients without Chronic Kidney Disease and belong to the age same group admitted to the medicine ward on the day of data collection were considered as controls. CKD in controls was diagnosed by calculating estimated GFR from age, height, weight, and serum creatinine (Cockcroft-Gault equation CrCl= 140age\*weight in kg/serum creatinine \* 72) value obtained from the laboratory reports, which is done routinely for all inpatients.

#### **Exclusion Criteria:**

Unstable patients, Conditions causing acute kidney injury and congenital disorder of kidney, not willing to participate in the study were excluded from this study.

#### Sample size:

Sample size was calculated based on Palo SK et al<sup>[16]</sup> study by using following parameters with Confidence interval-95%, Power-80%, Ratio of control to case-1, Exposure among cases P1- 9.9% Exposure among controls P2- 0.01% P = 0.0989. Calculated Sample size was 76 and which was rounded up to 100 participants in both the case and control groups.

#### Sampling method:

 $Consecutive \, sampling \, method.$ 

#### Study tool:

Data was collected by using pre-designed semistructured questionnaire and Measurements like blood pressure, weight, height. The questionnaire of the present study was divided into two parts. Part 1 consists of questionnaires regarding Sociodemographic details like age, sex, occupation, education, income and Part 2 consists of questionnaires to assess the risk factors like Family history of chronic kidney disease, medical history regarding co-morbidities like DM, HTN and frequency of Smoking habit, Alcohol consumption, History of taking native medicines, analgesic drugs, Previous history of treatment for recurrent urinary tract infection and renal stones.

#### Data collection method:

Data collection was done in the study area after

obtaining permission from the Institute Ethics Committee.

- a) Data was collected by the consecutive sampling method.
- b) After obtaining informed consent, relevant information was obtained from the respondent using the semi-structured questionnaire in the local language.
- c) Confidentiality maintained throughout the study period

#### **Operational Definition:**

The socio-economic status of the study participants was calculated by Modified Kuppusamy's socio-economic status scale 2020.

Body Mass Index is defined as the body mass (weight) divided by the square of the body height. It is expressed in units of  $kg/m^2$ .

Patients were interviewed regarding the use of alternative medicine during their lifetime and the preceding one year and duration of use.<sup>[17]</sup>

Regular use of analgesic intake was defined as taking analgesic or antipyretic tablets for fever or pain relief at least once a week over a consecutive period of 3 months.<sup>[17]</sup>

Recurrent urinary tract infection is defined as three or more UTIs within 12 months or two or more occurrences within six months.<sup>[18]</sup>

History of recurrent UTI in study participants was confirmed by taking medical treatment or getting admitted for treatment of UTI.

The previous history of kidney stones in study participants was confirmed by taking medical management or undergoing any surgical procedure for the same.

According to U.S. Food and Nutrition Board and the United Kingdom, the National health service recommends daily water intake for Indian males and females should be 3.150 liters and 2.5 liters, respectively.<sup>[19]</sup> Study participants were interviewed about the amount of water intake (In Cases-before the diagnosis of CKD). Those who consume less than 2.5 liters were considered as inadequate water intake.

As per WHO, the daily recommended salt intake is 5 grams per day. Based on surveys done in various regions of India, salt intake among them varies from >6.5/g/day to 11 g/day.<sup>[19]</sup> Diets with significant contribution to high salt intake in our Indian settings are pickles, pappadams, hot spicy rasam, dry fish. Using food frequency method, the data was collected among the study participants.

#### **Data Entry and Analysis**

Google form was used for Data collection and the data was retrieved in an Excel format. Analysis of the data was carried out using SPSS Software version 20 (licensed). Descriptive statistics were used to find out the frequencies and percentages. Binary logistics and multiple logistic regression analysis were used to find the CKD predictors. p-value < 0.05 was considered as statistically significant.

#### **Results**:

In this study 68% belonged to the age group 30-40 years. Majority (86%) of the cases were in stage 5, followed by stage 4 (9%) and stage 3 (5%). Among the cases, 63% were males, whereas in controls 50% were males, and 50% were females. Based on the Modified Kuppusamy scale for socio-economic status, more than half of the study population belonged to class IV (50.5%), and 32% were unemployed. The majority of the study participants were married (90%) and following Hinduism as religion (89%). 18% of the cases had a family history of CKD, whereas only 1% of the controls had a positive family history. 16% of the cases had diabetes mellitus, and 22% of the controls had diabetes mellitus. The proportion of hypertension was higher among the cases (29%) than controls (9.1%). Among the cases, 20% had a history of taking alternative medicine, and in controls, it was only 7%. 21% of the cases had a history of analgesic abuse, and in controls 13% had history of analgesic abuse. A higher incidence of recurrent urinary tract infection was reported in cases (20%) than controls (2%). The proportion of cases (10%) with a history of treatment for renal stones was nearly similar to that of controls (9%). Among the cases, 35% were smokers, 65% were nonsmokers, whereas in controls, 26% were smokers, and 74% were nonsmokers. 37% of the cases and 20% of the controls were alcoholics. The proportion of cases with a history of salty food intake was slightly higher in controls (26%) than cases (20%). 63% of the cases consumed less than the recommended level of water (< 2.5 liters/day), whereas, in controls, only 58% consumed less than the recommended level of water.

Table 1 shows an association between risk factors and CKD by binary logistic regression by calculating unadjusted odds ratio indicates that family history of chronic kidney disease (OR-21.732, 95% CI, 2.840- 166.268) is the significant nonmodifiable risk factor of chronic kidney disease among the selected patients. The CKD risk among those from rural areas was 4.6 times higher than those from urban areas, and the hypertensive patients had four times higher risk than normotensives. Other risk factors like recurrent urinary tract infection (OR-12.250, 95% CI, 2.780-53.989), history of taking alternative drugs (OR-3.321, 95% CI, 1.335-8.261), consumption of alcohol (OR-2.349, 95% CI, 1.243- 4.439) showed a statistically significant association with CKD. Compared to the younger age group (18-29 years), the older age group 30-40 years had 1.3 times higher risk of developing CKD, but it was not statistically significant. Similarly, male gender (OR-1.703, 95% CI, 0.968- 2.994), use of analgesic medication (OR-1.779, 95% CI, 0.835- 3.788), history of renal stones

Diala Calata a	6	C				
<b>KISK factors</b>	Case (n=100)	Controls (n=100)	Total (n=200)	p-value	Udds ratio	95% CI
Age in Years	(1.100)	(	(			
18-29	29	35	64			Ref.
30-40	71	65	136	0.364	1.318	0.726 - 2.393
Gender	/ 1	00	100	0.001	1.010	
Male	63	50	113	0.065	1.703	0.968-2.994
Female	37	50	87	01000	11/00	Ref.
Marital status	07	50	07			non
Married	88	92	180	0.349	0.638	0.249-1.634
Unmarried	12	8	20	010 17	01000	Ref.
Residence	12	0	20			itel.
Rural	75	39	114	0.000	4.692	2.562-8.595
Urhan	25	61	86	0.000	1.072	Ref
Family H /O CKD	20	01	00			itel.
Yes	18	1	19	0 003	21 732	2,840-166 268
No	82	99	181	0.000	<i>L</i> 1./J <i>L</i>	Ref
Diabetes Mellitus	02	<i>,</i> ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	101			itel.
Yes	16	22	38	0 281	0.675	0.331-1 379
No	84	78	162	0.201	0.075	Ref
Hypertension	01	70	102			itel.
Voc	29	9	38	0.001	4 13	1 838 - 9 281
No	71	91	162	0.001	4.15	1.030-9.201 Pof
H/O Taking alternative	71 medicine	71	102			Kel.
Voc	20	7	27	0.010	3 3 2 1	1 335 -8 261
No	20	03	27 173	0.010	5.521	1.333-0.201 Pof
Analgogicabuco	00	93	175			Kel.
Voc	21	12	24	0 1 2 5	1 770	0 025 2 700
No	21 70	13	166	0.135	1.//9	0.033-3.700 Dof
NU Docurrent urinary tract	/ J	07	100			Kel.
Voc	20	2	22			Pof
No	20	ے 00	22 170	0.001	10 05	12 780 52 000
NU U/o Trootmontfor Dor	ou	70	1/0	0.001	12.23	2.100-33.909
n/o rreatment for Kena		0	10			Dof
ies	10	ን 01	19 101	0.01	1 1 1 2 2	
NU U/o Smolving	90	91	101	0.81	1.123	0.430-2.895
	25	26	61	0.170	1 500	0.025 2.012
res	35 (F	20 74	01 120	0.108	1.533	0.835-2.812
NU U/O Alashalasussus (	65 ion	/4	139			Kei.
n/O Alconol consumpt	10N	20	F 7	0.000	2 2 4 0	1 2 4 2 4 4 2 0
res	3/	20	5/	0.009	2.349	1.243 - 4.439
NO	63	80	143			Kef.
Saity food intake	26	0.0	4.6			
Yes	26	20	46	0.011		Kef.
No	74	80	154	0.314	1.405	0.724-2.728
Daily Water intake			464			
<2.5 L	63	58	121	o :=	4 6 6 6	Ref.
>3 L	37	42	79	0.47	1.233	0.699-2.176

### Table 1 : Association between Risk factors and CKD by Binary Logistic Regression [N=200]

Table 2 : Association between Risk factors and CKD by Multiple Logistic Regression [N=200]							
<b>Risk factors</b>	Case	Control	Total	p-value	Adjusted	95% CI	
	(n=100)	(n=100)	(n=200)		<b>Odds</b> ratio		
Residence							
Rural	75	39	114	0.000	5.236	2.489-11.014	
Urban	25	61	86			Ref.	
Family H/O CKD							
Yes	18	1	19	0.002	29.59	3.351-261.243	
No	82	99	181			Ref.	
Hypertension							
Yes	29	9	38	0.001	5.005	2.014 - 12.437	
No	71	91	162			Ref.	
H/O taking alternative me	edicine						
Yes	20	7	27	0.003	5.136	1.745 - 15.117	
No	80	93	173			Ref.	
Recurrent urinary tract in	fection						
Yes	20	2	22	0.003	11.46	2.286-57.444	
No	80	98	178			Ref.	
H/O Alcohol consumption							
Yes	37	20	57	0.093	1.976	0.894-4.371	
No	63	80	143			Ref.	

(OR-1.123, 95% CI, 0.436-2.895), smoking OR-1.533, 95% CI, 0.835- 2.812), reduced water intake (OR-1.233, 95% CI, 0.699-2.176) posed a higher risk of getting of CKD than their counterpart, but all these were not statistically associated.

Table 2 shows the association between CKD and various risk factors using multiple logistic regression. In binary logistic regression analysis, the following risk factors, family history of CKD, cases from the rural areas, hypertension, history of taking alternative drugs, history of recurrent urinary tract infection, alcohol consumption were significantly associated with CKD. Factors that are statistically significant in binary logistic regression were analysed in multivariate logistic regression, and adjusted odds ratios were calculated. The risk of developing CKD is 5.2 times (OR-5.236, 95% CI, 2.489-11.014) higher in the rural population, 29.6 times (OR-29.590, 95% CI, 3.351-261.243) higher among those with a family history of CKD. Cases with a history of taking alternative medicine had 5.1 times

(OR-5.136, 95% CI, 1.745-15.117) higher risk than those without a history of taking alternative medicine. CKD risk among hypertensive patients is five times (OR-5.005, 95% CI, 2.014-12.437) higher than normotensive patients. Those with a history of recurrent urinary tract infection 11 times (OR-1.460, 95% CI, 2.286-57.444) higher risk of getting CKD than others.

#### **Discussion:**

The Mean age of the study participants was 32.2 + 6.35 years. More than half of the study participants 113 (56.5%) were males. There were a slightly higher percentage of men among the cases in this study (63%). Similar findings were reported in a casecontrol study conducted in India (55.1%), Saudi Arabia (65%) and Egypt (61%).<sup>[6,20,21]</sup> In contrast, Suleymalar G et al<sup>[22]</sup> (18.4% in females, 12.8% in males) study showed a female predominance.

In this study, the rural setting was associated with increased odds (OR- 5.236, 95% CI, 2.489-11.014) of CKD. This is in concordance with the study
done in selected cities in India (Delhi, Haryana, Andra Pradesh, Tamil Nadu).<sup>[23]</sup> This might suggest that exposure to agricultural work and agrochemicals, a potential risk factor for CKD, which may be greater in rural populations.

In this study, CKD risk was higher among those who had a family history of CKD (OR-29.590). Similar to this study, a statistically significant association (5.2%, p-value- 0.001) was found in study conducted in Andra Pradesh.<sup>[24]</sup>

The increasing trend of non-communicable diseases among the general population due to urbanization and lifestyle modification justify the higher prevalence of diabetes (22%) among the controls in the current study. In this study, Diabetes had no significant association with CKD. Many Studies were predicted diabetes was a significant risk factor for CKD.<sup>[14,24]</sup>

Hypertension is considered as a risk factor and complication of CKD. The present study predicted that the odds of developing CKD among the patients with hypertension was approximately five times higher than those without hypertension, and it was statistically significant (p-value 0.001, (OR- 5.005, 95% CI, 2.014-12.437) which is similar to studies in India by Kanyari et al.<sup>[24]</sup> (p-value-<0.001), Kokila et al.<sup>[25]</sup> (OR-1.42) studies from India found a significant association between hypertension and CKD.

In this study, the CKD risk was 5.1 times higher in those who had a previous history of taking alternative medicine which was similar to study done by Akkilagunta et al.<sup>[17]</sup> (OR-5.15, 95% CI-1.27-20.87).

Present study found an increased risk of CKD (odds ratio-1.779) among those who had a history of analgesic intake for a longer period, though it was not statistically significant. A study done in Barcelona by Ibeiez et al.<sup>[26]</sup> showed an approximately similar risk of CKD (odds ratio-1.22) on prolonged use of any analgesic.

A significant association between the history of

recurrent urinary tract infection with CKD was observed in this study [odds ratio -11.460, CI ( 2.286-57.444)]. Sajid et al.<sup>[14]</sup> study in Pakistan showed that urinary tract infection was a significant risk factor for CKD odds ratio-2.213, CI (0.0848 5.778).

In this study, Alcoholics had 1.976 times higher risk than of non- alcoholics which was statistically significant. Similar to this study, Kokila et al.<sup>[25]</sup> (pvalue-0.018) study found a significant association between alcohol consumption and CKD.

An ICMR case-control study by Palo SK in Odisha observed a higher prevalence of CKD among those who consume locally made alcohol (OR-1.091, 95% CI- 1.02 1.17).<sup>[16]</sup>

In this study, smokers posed a 1.5 times higher risk for CKD than nonsmokers, though it was not statistically significant. In contrast to our study, Kokila et al.<sup>[25]</sup> (OR-3.179, 95% CI 1.779-5.678) study found a significant association between smoking and CKD.

This study observed that those who consumed water less than 2.5 Liter per day had a higher risk for CKD (unadjusted OR-1.223) than those who consumed more water. A similar finding was obtained in Sontrop JM et al.<sup>[27]</sup> study [OR-2.52, 95% CI- (0.91 6.96)], the risk of developing CKD was more in low water intake groups

There was no significant association noticed between CKD and renal stones in this current study (p-value-0.810, OR-1.123), even though CKD risk was slightly higher in those who had a history of taking treatment for renal stones.

Nephrolithiasis is documented as a risk factor for CKD in Vupputuri S et al.<sup>[28]</sup> study. The present study was not observed a significant association (pvalue-0.314, OR-1,405) between high salt intake and CKD because both cases and controls desired to eat salty food.

#### **Conclusion:**

This study predicted hypertension, rural population, family history of CKD, history of recurrent urinary tract infection, alcohol consumption as significant risk factors for CKD. Hypertension, history of recurrent urinary tract infection, alcohol consumption were modifiable risk factors. By controlling these modifiable risk factors, the burden of CKD can be reduced. In addition this study predicted that, rural population was more vulnerable to CKD, so the screening service to these populations through primary health care approach is essential.

#### **Recommendations:**

Need of awareness program regarding the CKD and their associated risk factors, health education regarding lifestyle modification including a healthy diet, physical activity and avoidance of alcohol, smoking cessation. Conducting training and education modules for Primary Health Centre physicians regarding screening, management, and timely referral of CKD patients. Mobile health education services like Kilkari for ANC mothers could be initiated for CKD to deliver messages about risk factors, management for minor ailments, conditions requiring admission for CKD. Emergence of CKD of unknown etiology in younger populations needs further research in blind spots like occupational exposure, water quality, and indigenous medicine leading to CKD.

#### Limitations:

This study was conducted in one hospital in Madurai district, and most of them belong to the lower socio-economic class, which limits its generalization to the whole community. It requires a community-based study to find the true prevalence of CKD and its associated risk factor among young adults. Bias could have happened due to inaccurate recall of past events

#### **Declaration:**

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Conflicts of interest: Nil

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# Assessing Knowledge, Attitudes, and Practices of Medication Disposal: A Study on Rural Communities in Sarojini Nagar, Lucknow

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## Abstract:

**Introduction:** The increasing global consumption of medications has led to a significant rise in the improper disposal of unused and expired drugs, posing risks to both human health and the environment. Objective: This study aims to evaluate the understanding, beliefs, and behaviours related to the disposal of such medications within the rural community of Sarojini Nagar, Lucknow. Method: A cross-sectional study was conducted in June 2024 with 317 participants from rural Sarojini Nagar, including patients and attendants visiting the General and NCD OPD of PHC Sarojininagar, chosen purposively. Participants aged 18 years and above who provided consent were included, while those with cognitive or communication issues were excluded. Participants were interviewed by Junior Residents and Data was gathered using a structured questionnaire to evaluate demographic characteristics, knowledge, perceptions, attitudes, and practices related to the disposal of unused and expired medications. Results: The study revealed a lack of awareness about proper disposal methods, with 77.3% of participants reporting no prior information on the subject. Only 14.8% were aware of drug take-back policies. A majority (87.9%) recognized the harmful effects of improper disposal, and 93.7% agreed that such practices negatively impact the environment. Despite this, 69.4% of participants reported keeping unused medications at home, and 78.0% disposed of expired medications by throwing them in household trash. **Conclusion:** The findings highlight a significant gap in knowledge and practices regarding safe drug disposal among rural community of Sarojini Nagar. There is an urgent need for targeted educational programs and the implementation of effective drug take-back systems to mitigate the risks associated with improper disposal. Raising awareness and providing clear guidance on safe disposal methods are crucial steps towards protecting public health and the environment in these communities.

**Keywords:** Environmental Pollution, Pharmaceutical Preparations, Public Health, Rural Health, Waste Disposal-Solid.

## Introduction:

The global rise in medication consumption, driven by increased availability, affordability, and health awareness, has led to challenges like irrational use and improper disposal. According to WHO, 50% of medications are prescribed or used inappropriately, with many remaining unused and expiring.<sup>[1,2]</sup> Expired drugs can lose efficacy, pose health risks, contribute to antibiotic resistance, and lead to accidental poisoning or drug abuse.<sup>[3]</sup> Despite the

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dangers, many consumers lack awareness about proper disposal methods, often storing, sharing, or discarding medications unsafely.<sup>[4]</sup> These practices harm humans, wildlife, and the environment, as improper disposal methods like trashing or flushing are common.<sup>[5,6]</sup>

Studies from Kenya, Nigeria, and Indonesia highlight garbage bins and toilets as primary disposal methods for unused medications.<sup>[7,8]</sup> In India, research has detected pharmaceutical residues in the Ganges River, reflecting a lack of effective disposal systems.<sup>[9]</sup> Unlike developed nations like Canada, Australia, and Sweden, where robust take-back programs exist, India lacks efficient systems and guidelines for over-the-counter medication disposal, exacerbating the problem.<sup>[10]</sup>

Rural areas face unique challenges due to limited healthcare facilities, pharmacies, and awareness about safe disposal practices. Accumulation of expired medications increases risks, especially for children and the elderly. Rural households may also lack access to drug take-back programs, leading to improper disposal behaviours.<sup>[6]</sup>

The WHO and FDA recommend various strategies for safe drug disposal, including incineration, chemical decomposition, landfilling, and take-back programs.<sup>[11,12]</sup> However, implementation in India remains inadequate. Understanding the attitudes and behaviours surrounding drug disposal in rural communities is essential for developing targeted interventions. This study aims to evaluate knowledge, beliefs, and practices regarding unused and expired medications in Sarojini Nagar, Lucknow, to address this critical gap and promote safer disposal practices.

#### Method:

The current descriptive cross-sectional study was conducted among 317 patients, who were

purposively selected in June 2024 from the Outpatient Department (OPD) of Sarojini Nagar Primary Health Centre (PHC), a field practice area of the Department of Community Medicine and Public Health, King George's Medical University, Lucknow. The study included respondents aged 18 years and above who visited the General and Non-Communicable Disease (NCD) OPD of PHC Sarojini Nagar during the study period. Inclusion criteria comprised all individuals aged 18 years and above who visited the PHC and consented to participate. However, respondents with cognitive or communication impairments were excluded from the study.

**Data collection:** The data was collected on a semistructured pretested questionnaire and respondents were interviewed by Junior residents. All the patients who consented to be a part of study were asked about their understanding, beliefs, and behaviours regarding unused or expired household medications.

**Ethical approval** was obtained from the Institutional Ethical Committee of King George's Medical University, Lucknow.

**Data analysis:** Data cleaning was done to ensure data consistency before doing data analysis. Data analysis was done using SPSS version 24 (SPSS-24, IBM, Chicago, USA). Descriptive statistics were presented using frequencies and percentages.

#### **Results:**

Table 1 shows that majority of the study participants were females (53.0%). Of the total study participants 48.3% had their graduate degree and 38.5% were unemployed. Males (25.5%) exhibited greater knowledge of proper drug disposal compared to females (20.2%). The highest awareness was observed in the 26-35 age group (34.7%), while the lowest was among those aged 56-65 years (11.5%). Education level significantly influenced knowledge, with postgraduates showing

Variables	Total n (%)	knowledge regarding proper disposal of drugs	
		Yes n (%)	No n (%)
Gender			
Male	149 (47.0)	38 (25.5)	111 (74.5)
Female	168 (53.0)	34 (20.2)	134 (79.8)
Age in years			
18-25	93 (29.3)	14 (15.1)	79 (84.9)
26-35	101 (31.9)	35 (34.7)	66 (65.3)
36-45	49 (15.5)	14 (28.6)	35 (71.4)
46-55	41 (12.9)	5 (12.2)	36 (87.8)
56-65	26 (8.2)	3 (11.5)	23 (88.5)
>65	7 (2.2)	1 (14.3)	6 (85.7)
Education			
Illiterate	15 (4.7)	1 (16.7)	5 (83.3)
Undergraduate	51 (16.1)	9 (17.6)	42 (82.4)
Graduate	153 (48.3)	26 (17.0)	127 (83.0)
Postgraduate	98 (30.9)	36 (36.7)	62 (63.3)
Occupation Status			
Employed	195 (61.5)	60 (30.7)	135 (59.3)
Unemployed	122 (38.5)	12 (9.8)	110 (90.2)

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the highest awareness (36.7%) and illiterate individuals the lowest (16.7%). Employed individuals (30.7%) were more knowledgeable than their unemployed counterparts (9.8%).

Table 2 shows that majority of the study participants knew that improper disposal of drugs is harmful (88.6%), contaminates the environment (80.1%), may kill wildlife (64.7%), and may lead to accidental ingestion by children (67.2%). But most did not have knowledge regarding proper disposal of drugs (77.3%), take-back policy (84.9%), ways to minimise the harmful effects, and person to contact for proper drug disposal.

Table 3 shows that participants attitude towards drug disposal and most of them were agreeing that unused and expired medicine presents potential risk at home (91.5%), improper disposal of medicines affects the environment and health (93.7%), children are more vulnerable to harm produced by improper disposal of medicines (92.7%), awareness and outreach programs should be initiated (96.8%), Pharmacists, Doctors and other Healthcare Professionals should provide advice on safe disposal of medicines (97.5%), Drug take back policy of unused and expired medicines should be introduced in the community (92.1%).

Table 4 shows the practices followed by the study participants in disposal of unused/ expired drugs. Majority of the study participants kept unused drugs at home (69.4%), did not stored medicines at sites accessible to children (84.5%), separated used and unused medicines (88.0%). Majority of the unused (43.2%) and expired drugs (77.9%) were thrown away.

Figure 1 depicts the varieties of medicines stored at home by the study participants, where analgesics (28.64%) were in the top followed by antibiotics, supplements, and anti-hypertensives, syrups, anti-diabetics, and others.

Table 2:	Knowledge regarding disposal of drugs
	among the study participants (N= 317)

Parameter   n (%)     Received any information about proper     disposal of drugs.     Yes   72 (22.7)     No   245 (77.3)     Knowledge about take back policy   Yes     Yes   48 (15.1)     No   269 (84.9)     Improper disposal of drugs is harmful.   Yes     Yes   281 (88.6)     No   36 (11.4)     Improper disposal of drugs contaminates   48 (15.1)     Improper disposal of drugs contaminates   48 (15.1)     No   36 (11.4)     Improper disposal of drugs contaminates   48 (15.1)     No   36 (11.4)     Improper disposal of drugs may kill wildlife   48 (15.1)     Yes   254 (80.1)     No   63 (19.9)     Improper disposal of drugs may kill wildlife   112 (35.3)     Improper disposal of drugs may lead   12 (35.3)     Improper disposal of drugs may lead   104 (32.8)     Ways to minimize the harmful effects of improper disposal of drugs   173 (54.6)     Mays to minimize the harmful effects of improper disposal of medicines   173 (54.6)
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disposal of drugs.     Yes   72 (22.7)     No   245 (77.3)     Knowledge about take back policy   Yes     Yes   48 (15.1)     No   269 (84.9)     Improper disposal of drugs is harmful.   Yes     Yes   281 (88.6)     No   36 (11.4)     Improper disposal of drugs contaminates   36 (11.4)     Improper disposal of drugs contaminates   48 (15.1)     the environment.   Yes     Yes   254 (80.1)     No   63 (19.9)     Improper disposal of drugs may kill wildlif   Yes     Yes   205 (64.7)     No   63 (19.9)     Improper disposal of drugs may kill wildlif   Yes     Yes   205 (64.7)     No   112 (35.3)     Improper disposal of drugs may lead   Yes     to accidental ingestion by children.   Yes     Yes   213 (67.2)     No   104 (32.8)     Ways to minimize the harmful effects of improper disposal of drugs     Providing proper guidance for the   173 (54.6)     disposal
Yes   72 (22.7)     No   245 (77.3)     Knowledge about take back policy   Yes     Yes   48 (15.1)     No   269 (84.9)     Improper disposal of drugs is harmful.   Yes     Yes   281 (88.6)     No   36 (11.4)     Improper disposal of drugs contaminates   The environment.     Yes   254 (80.1)     No   63 (19.9)     Improper disposal of drugs may kill wildlis.   Yes     Yes   205 (64.7)     No   112 (35.3)     Improper disposal of drugs may lead   to accidental ingestion by children.     Yes   213 (67.2)     No   104 (32.8)     Ways to minimize the harmful effects of improper disposal of drugs     Providing proper guidance for the disposal of medicines   173 (54.6)     Mays to find proper guidance for the disposal of medicines   175 (54.4)
No   245 (77.3)     Knowledge about take back policy   48 (15.1)     Yes   48 (15.1)     No   269 (84.9)     Improper disposal of drugs is harmful.   281 (88.6)     No   36 (11.4)     Improper disposal of drugs contaminates   36 (11.4)     Improper disposal of drugs contaminates   36 (11.4)     Improper disposal of drugs contaminates   254 (80.1)     No   63 (19.9)     Improper disposal of drugs may kill wildlif.   48 (35.3)     No   63 (19.9)     Improper disposal of drugs may kill wildlif.   112 (35.3)     Improper disposal of drugs may lead   112 (35.3)     Improper disposal of drugs may lead   104 (32.8)     Vays to minimize the harmful effects of improper   104 (32.8)     Ways to minimize the harmful effects of improper   173 (54.6)     disposal of medicines   Prescribing medicines in less quantity 17 (5.4)
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Prescribing medicines in less quantity 17 (5.4)
Donating or sharing unused medicine 48 (15.1)
Take back Policy at Govt Health 79 (24.9)
Centres for medicines
Who is the appropriate person to inform
about proper drug disposal
Medicine Company 90 (28.4)
Doctor 87 (27.4)
Pharmacist 102 (32.2)
Others (Nurses, news media, etc) 38 (12.0)

In present study 58.0% of the study subjects dispose of expired medicines by throwing them into the household trash, 9.0% by burying them in the ground, 9.0% by flushing them in the sink/ toilet, and 7.7% by mixing them with water for garden plants. A smaller proportion (4.95%) donate them to hospitals, burns them at home (3.71%), throws into

Table 3: Attitude of the study participants about		
the disposal of the drugs (N= 317)		
Parameter	n (%)	
Unused and expired medicine prese	ents potential risk at	
home.		
Agree	290 (91.5)	
Neutral/Not agree	27 (8.5)	
Improper disposal of medicines affe	ects the environment	
and health		
Agree	297 (93.7)	
Neutral/Not agree	20(6.3)	
Are children more vulnerable	to harm produced	
by improper disposal of medicines?		
Agree	294 (92.7)	
Neutral/Not agree	23(7.3)	
Awareness and Outreach Programs s	hould be initiated	
Agree	307 (96.8)	
Neutral/Not agree	10(3.2)	
Pharmacists, Doctors and other Heal	thcare Professionals	
should provide advice on safe dispos	alofmedicines	
Agree	309 (97.5)	
Neutral/Not agree	8 (2.5)	
Drug take back policy of unused an	d expired medicines	
should be introduced in the commun	ity	
Agree	292 (92.1)	
Neutral/Not agree	25(7.9)	

## Table 4:Practices followed by the study participants in disposal of drugs (N= 317)

Parameter	n(%)
Keep unused medications at home	
Yes	220 (69.4)
No	97 (30.6)
Medicines are stored at sites accessible	e to Children
Yes	49 (15.5)
No	268 (84.5)
Separate unused and expired medicine	S
Yes	279 (88.0)
No	38 (12.0)
Practices with unused medicines*	
Throw away	191 (43.2)
Donate to hospital/NGO	22 (5.0)
Return to Medical store	46 (10.4)
Keep at home until expired	111 (25.1)
Give to Friends/Relatives	45 (10.2)
Others	27 (6.1)
Practices with expired medicines*	
Throw away	268 (77.9)
Donate to hospital/NGO	7 (2.0)
Return to Medical store	27 (7.8)
Keep at home	23 (6.7)
Others	19 (5.5)
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Note. \*Multiple responses have been recorded.



Figure 1: Types of medicines stored at homes by the study participants (N= 317)

river or lake (3.71%), or feeding to domestic animal (3.21%), some 0.74% of the participants uses unspecified methods.

## Discussion:

The current cross-sectional study involving 317 participants revealed several key findings regarding drug disposal practices, attitudes, and knowledge, which can be compared to findings from similar studies in various regions of India, including Singur, Tamil Nadu, Gujarat, Delhi NCR, and Maharashtra. In the current study, 69.4% of participants kept unused medicines at home, a figure comparable to the 67.1% of households in rural Singur<sup>[1]</sup> and more than 50% in Tamil Nadu<sup>[9]</sup> that also stored unused or expired medications. These similarities highlight that the issue of unused medications being retained at home is prevalent in both rural and urban settings across India.

When comparing the types of medications stored, analgesics were the most common in both the current study (28.64%) and the study from Delhi NCR (38.9%)<sup>[3]</sup>, followed by antibiotics, supplements, and anti-hypertensives. In contrast, the study in Singur<sup>[1]</sup> found that antacids (34.4%) and antipyretics (31.25%) were more commonly stored,

reflecting potential regional differences in the types of medications people keep at home. Despite these variations, all studies point to a significant portion of stored medicines being everyday drugs, indicating a need for greater public education about managing common medications safely.

In terms of unsafe storage practices, the Singur study<sup>[1]</sup> reported that all households with unused medications exhibited at least one unsafe storage practice, with 52.1% displaying four or more. Furthermore, 16.7% of households stored medicines within reach of children. In comparison, the current study showed that 84.5% of participants kept medications out of children's reach, highlighting a similarity in storage practices with a subtle margin. However, the current study did not delve as deeply into multiple unsafe storage practices as the Singur study<sup>[1]</sup>did, suggesting the need for more comprehensive safety assessments in future research.

Regarding disposal practices, the current study found that 58.0% of participants disposed of expired medications by throwing them in the household trash, while 9.0% buried them, 9.0% flushed them down in sinks or toilets, and 7.7% mixed them with water for garden plants. Similar trends were seen in the Tamil Nadu<sup>[9]</sup> and Gujarat studies<sup>[2]</sup>, where 53.1% and most participants, respectively, disposed of medications in the trash. The study in Delhi NCR<sup>[3]</sup> further reinforces this pattern, with 73% of participants discarding expired medications in the household trash, followed by 20% who flushed them in the sewer. These findings demonstrate that improper disposal of medications is a widespread practice, regardless of region, emphasizing the urgent need for better education on safe disposal methods across India.

A significant gap in knowledge about proper drug disposal methods and drug take-back policies was noted across all studies. In the current study, 77.3% of participants were unaware of proper disposal methods, and 84.9% lacked knowledge about drug take-back policies. Similarly, the Tamil Nadu study<sup>[9]</sup> reported that 71.2% of participants were unaware of novel disposal practices like takeback systems, and the Gujarat study<sup>[2]</sup> echoed this finding, with few participants returning medicines to pharmacies. Even among pharmacists in Maharashtra<sup>[11]</sup>, 75% were unaware of guidelines for the disposal of expired medications, underscoring the need for widespread awareness programs targeting both the public and healthcare professionals.

Attitudes towards drug disposal were largely positive in all studies. The current study found that most participants recognized the risks of improper drug disposal, with 91.5% agreeing that unused or expired medications pose a potential hazard at home. The Gujarat study<sup>[2]</sup> also noted that participants had a positive attitude, acknowledging that improper disposal affects both the environment and public health. Furthermore, support for awareness and outreach programs was strong in both the current study (96.8%) and the Gujarat study, suggesting that the public is open to learning about safer disposal methods but lacks access to the necessary information and resources.

#### **Conclusion:**

The current study's findings align closely with those from other regions of India, they collectively underscore a nationwide issue regarding the improper storage and disposal of medications. The high prevalence of unsafe practices and the widespread lack of awareness about proper disposal methods and drug take-back policies highlight the critical need for public health interventions, increased education, and the implementation of effective drug take-back systems across both rural and urban areas.

#### **Declaration:**

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# Freedom from Discrimination in Health: Evidence & Pathways

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Discrimination, a negative word signifies a substantial departure from the righteous expected societal norms. The overall scenario being: The one who discriminates- A wrinkled forehead and face with narrowed eyebrows & the one who is discriminated- A tight lipped, saddened questioned face. In earlier times, the slavery remained the highest forms of discrimination. Discrimination in the basic attributes leads to deprived states in all including health. In health sector, discrimination is to be considered as secondary and primarily it occurs because of the universal factors like colour, gender, caste, culture, creed, race, ethnicity, being poverty stricken and in certain occupations. Discrimination in health being a negative determinant, it cunningly pushes the health to negative side of the line. Health when paired with discrimination, the outcome is definitely poor. It leads to poor health on account of the dwindling approachability to health care services.

**The Background:** Preamble of the constitution of the World Health Organization (WHO) states that "The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition."<sup>[1]</sup> The Universal Declaration of Human Rights (1948) mentioned that everyone has the right to a standard of living adequate for the health and well-being of himself and his family (Article 25).<sup>[2]</sup> International Covenant on Economic, Social and Cultural Rights (1966), Article 12 talks of the right of everyone to the enjoyment of the highest attainable standard of physical and mental health.<sup>[3]</sup> The International Convention on the Elimination of All Forms of Racial Discrimination (Article 5) emphasized that states must prohibit and eliminate racial discrimination and should ensure the right of everyone to public health and medical care.<sup>[3]</sup>

**Indian laws:** In the Indian constitution, Article 21 ensures the right to life and personal liberty to every citizen. Right to health confines in the Right to life. The Directive Principles of State Policy in Part IV of the India Constitution provide a basis for the right to health. Specific to be mentioned are Articles 39(e), 39(f) and 47 as a directive principle of State policy under the constitution.<sup>[4,5]</sup> India is a signatory of the Article 25 of the Universal Declaration of Human Rights by UN.<sup>[4]</sup>

## Web of Discrimination:

This can be visualized in manifold like

- 1) The events: The human experimentation, treatment and counselling may be the events where such discrimination in health is evident. The participants/beneficiaries may vary.
- 2) The universal grounds: These can be gender, colour, caste, creed, ethnicity, racial differences.
- **3)** The diseases: Stigmatic diseases, diseases inflicting disability and disfigurement including certain neglected diseases are grounds for discrimination.

Apart from the universal grounds for discrimination, the appearance, clothing, poverty,

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illiteracy also become the basis for initial discrimination. Money is one form of a discriminatory ground. Disability or differently abled being another criterion for discrimination. The hesitation and apprehension to approach health care providers, later on build up owing to displayed discriminatory behaviours. The discrimination is a web which makes a vulnerable person more into vulnerability and into the grip of an imaginary spider.

## Historical events as mirror:

History has in its record some infamous medical experiments citing inhumanness of the researchers. Medical experiments by Japanese scientists (1932-1945) nicknamed as unit 731, medical experimentations by Nazis (1939-1945) which led to the development of "Nuremberg Code-1947" and Tuskegee syphilis study (1932-1972), the revelation of the study led to "The Belmont Report-1979". Discrimination done towards race, ethnicity and country ended up in the highest termination i.e. death of the persons/prisoners/participants. Prisoners of war do see the discrimination at length for myriad reasons leading to ill-health and death as a final consequence in most cases. Ethical principles of "Justice" and "Beneficence" may be at stake while undergoing clinical trials and puts humanity at stake, and its still present.

Unreasonable exclusions from the health policies are discrimination in getting the treatment as a policy beneficiary; seen as violation to article 21, was cited in a court judgement.<sup>[6]</sup> Filed legal cases can be found based on discrimination.

**Being engulfed: (Situation as a whole):** The street dwellers including beggars and persons of hand to mouth living, workers and their entire families in some specific settings of work are not able to avail the health benefits. This specific setting of work includes sewage workers, manhole workers, road makers, construction workers, garbage pickers, people working at garbage disposal sites, home maids, private security guards. This list should also be expanded to commercial sex workers and many more. The needs of such people are not seen as their real needs. The road makers, construction workers

children completely shaded with the dust speaks a lot. Elder siblings caring for younger ones, parents not available at their disposal during illness is itself a natural discrimination towards getting the right type of care from the starting. The apathetic condition of these families including the underprivileged group of beneficiaries in these homes viz children, old age persons and pregnant women are facing the deprived states of wellbeing owing to poverty. Many such incidents in terms of accidents and events leading to death happens at these homes and at places of work. The contractor is least bothered, but the government plans can be there, where such minimum facilities can be ensured. Estimated 18 million children live on streets in India and is home to one of the largest child populations on Earth.<sup>[7]</sup>

Initial works on leprosy by Mahatma Gandhiji and Baba Amte ji, speaks volumes about the discrimination and a negative frowned face of the humanity. The untouchability during the dawn of freedom and India's struggle of being free from it, has seen a great good transition in having a down line of the discrimination cases in general and in health care as well. The sky is much azure now. The appearance including the clothing, the richness are the playing factors at the corporate hospitals and private set ups. The public health system should be in the reach of all the country men. For poor, the only rescue is government hospitals mostly edged on the attitude of the treating doctor and his team. If the doctor is principled, its all good otherwise, nothing can be said. The middle-income persons, depending on the type of illness may go to a private set up or may land up in government. The costly procedures like transplantation involving huge costs may make a person to government hospitals amidst a situational tempest, at the whims of the team of doctors. Priority to certain sets of people in hospitals is discrimination in real sense.

Way out: Pathways: Sensitization in terms of doctor responses towards the community can be ensured by AETCOM (Attitude, Ethics and communication) sessions as a part of CBME (Competency based medical education) curriculum in the MBBS course. More such community orientations where the integration with the real situation of the people can be entrusted may help in better understanding of reality, the helplessness in case of severe forms of diseases, disability and disfigurement. This is ensured in form of "Family Adoption Program" of the CBME curriculum in MBBS.

The discrimination in terms of money is many folds regulated by the Ayushman Bharat scheme of Government of India which by provision of 5 lakhs rupees per family has ensured that the divide in the availability of heath care services by a person is not regulated by just money.

In 2022, the Rajasthan Government has passed the Right to Health Bill, which gives every resident of the state the right to avail free services at all the health facilities. (*which was not easily accepted by medical fraternity in genuine concern to some clauses*.).<sup>[8]</sup>

Incidents of discrimination should be reported with proper resolution to issues. Local team of doctors including supporting staff should be appointed wherever possible, to do away with the discrimination related to caste, state, religion. Certain policies to safeguard the vitality of the young and their "Bachpan" by providing a makeshift shelter with basic education for children of road makers, construction workers and rag pickers must be framed. This is in line with the fact that health is not a discrete entity.

**Summing Up:** The availability of resources, accessibility, past experiences of beneficiaries on one side, the other side being the psyche of the health care providers, the preferences and prejudices, the sensitization towards the needs of the poor and the needy, the readiness to serve, the overall burden and type of diseases remain subject matter of discriminatory grounds.

**Finishing lines:** The eyes of the one who is discriminated has lifelong stories to tell. From framing the policies and solutions apart, the mindset plays a pivotal role reflecting some deep evil rooted misconceptions and beliefs. The health care providers must behold the purpose of this life in serving with equality when one is in such a noble profession and is chosen to serve others.

Discrimination should be avoided at all cost; as it is posing a big question on humanity, "Why this Discrimination?"

#### **Declaration:**

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