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Review Article

Current status, challenges and future potential of implementing occupational telehealth services in Indian industries

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ABSTRACT

India is undergoing rapid industrial expansion, resulting in a growing workforce exposed to diverse occupational hazards, including musculoskeletal disorders, lung diseases, accidents, and high levels of work-related stress. Telehealth has emerged as a promising strategy to improve access to specialist care; however, its role in occupational health within Indian industries remains poorly understood. A narrative review was conducted to synthesise available evidence on the status, challenges, and future potential of telehealth in occupational health care in India. A comprehensive literature search was performed across PubMed, Scopus, Web of Science, and Google Scholar for English-language publications from 2000 to 2025. Peer-reviewed articles and grey literature, including government reports and policy documents, were included. The review identified a marked paucity of India-specific evidence on tele-occupational health implementation. While national platforms such as e-Sanjeevani demonstrate large-scale telemedicine feasibility, occupational health–specific applications are rarely documented or evaluated. Major barriers include digital infrastructure gaps, low digital literacy, data privacy concerns, medico-legal uncertainties, and a shortage of trained occupational health professionals, with training largely limited to short-term programs such as the AFIH course. Provider-level resistance and inadequate ICT training further impede adoption. Nevertheless, opportunities exist through integration with national digital health systems (ABDM), hybrid service delivery models, workforce capacity building, and assisted telemedicine facilitation at workplaces. Tele-occupational health holds significant potential to improve access, continuity of care, and productivity for India's industrial workforce. Strengthening occupational health training, improving digital readiness, and generating India-specific implementation research are critical to realising scalable and effective tele-occupational health services.

Keywords: Occupational health, Telehealth, Teleconsultation, Occupational injuries

INTRODUCTION

India is one of the world's fastest-growing major economies and an aspiring global leader in industrial development.[1] With a rapidly growing population and rising demand for goods and services, India's manufacturing industries surged from 93,166 units in 1983 to a record high of 253,000 units by 2022. This dramatic growth reflects the scale of industrial expansion in recent decades.[2] Industrialisation is expected to create significant employment opportunities in both the organised and informal sectors. With a growing workforce comes increased exposure to occupational hazards, demanding greater attention to workplace safety and health interventions.[3] Many occupational risks are accidents(8%), musculoskeletal injuries(37%), lung diseases(13%), and workplace-related stress(80%).[4,5] Occupational health physicians hold a vital responsibility

in promoting safe working conditions and equitable access to health services for every worker.[6] Similar to other countries in the WHO South-East Asia Region, India continues to struggle with low government investment in health, insufficient healthcare workforce density, gaps in physical infrastructure, and limited access to quality care for vast sections of the population.[7] The availability of consultants trained in occupational health and safety is limited compared to other medical disciplines, mainly because occupational health receives minimal emphasis in the medical curriculum, and advanced training opportunities are largely restricted to short-term certification programs like the Associate Fellow of Industrial Health (AFIH) course.[8]

Telehealth, a transformative dimension of healthcare delivery, has emerged as a key driver of innovation, overcoming geographical barriers and redefining access to healthcare services.[9] Telehealth is defined as the utilization of electronic information and telecommunication technologies to support long-distance clinical care, patient and professional health education, public health activities, and healthcare administration.[10] Telemedicine can greatly improve access to occupational health specialists for workers with job-related injuries or illnesses. It enables timely expert consultation, helping bridge knowledge gaps among healthcare providers. Strategic use of telehealth supports accurate diagnosis and better decision-making in occupational health care.[11]

Telemedicine helps reduce delays in care, transportation burdens, and unnecessary acute healthcare utilization. It has been widely recognized as an effective mode of service delivery. Its success has been demonstrated across multiple medical disciplines, including dermatology, radiology, and psychiatry.[12-14]

India's vast industrial workforce faces limited access to occupational health services, especially in remote and informal-sector settings.[6] Telehealth offers a scalable solution to improve prevention, diagnosis, monitoring, and rehabilitation related to work-related health issues. However, the current adoption, challenges, and opportunities for telehealth in occupational health across Indian industries remain unclear. This narrative review focuses on synthesising existing evidence to understand the present status of implementation, barriers, and the future potential of occupational telehealth services in India.

A narrative review methodology was adopted to summarize and synthesize current evidence on the status, challenges, and future potential of implementing occupational telehealth services in Indian industries. A comprehensive literature search was conducted across PubMed, Scopus, Web of Science, and Google Scholar databases. The search strategy included combinations of relevant keywords and Boolean operators such as "telehealth", "telemedicine", "occupational health", "industrial workers", "India", "workplace health services", and "remote healthcare". Articles published in English from 2000 to 2025 were considered to capture the most recent and relevant advancements.

Both peer-reviewed journal articles and grey literature sources (e.g., government reports, policy documents, and industry-based telehealth initiatives) were included due to limited formal research in this specific area. Studies focusing exclusively on general public telehealth services without relevance to occupational health were excluded.

CURRENT STATUS OF TELEHEALTH IN INDIA

Despite the growing prominence of telemedicine across India and increasing documentation of telehealth for general clinical care and population health, there remains a striking paucity of data specifically on occupational telehealth services within Indian industries. Broad telemedicine-use studies and surveys (e.g. post-2020 guidelines) rarely disaggregate data by workplace or industrial-worker status, instead focusing on general patient populations or public health outreach. Thus, there is no robust public-domain evidence quantifying how many Indian industries have implemented tele-occupational-health programs, how many workers have accessed them, or what outcomes have been achieved.

The e-Sanjeevani India's national telemedicine platform has provided over 276 million teleconsultations as of November 2024, becoming the largest government-led telehealth service in the country. bridging rural-urban healthcare gaps and demonstrating the scalability of telehealth services.[15] Recent research among rural populations (general, not necessarily employed) shows the factors that influence acceptance/use of telehealth: digital divide, technology literacy, privacy concerns, perceived risk, and resistance to technology e-Sanjeevani provides a strong example of telemedicine infrastructure in India, but because it is oriented toward general population health, it does not substitute for dedicated occupational telehealth services.[16,17] This reinforces the lack of evidence/data specifically on occupational-health telemedicine in Indian industry settings

MAJOR CHALLENGES

Infrastructure limitations and legal concerns significantly hinder the universal adoption of telemedicine in occupational health settings. Reliable high-speed internet, digital devices, and uninterrupted power supply are often lacking in many workplaces, particularly for older or digitally inexperienced workers, contributing to digital inequality and reduced accessibility.[18,19] Additionally, telemedicine involves handling sensitive employee health data, requiring strict compliance with privacy and data protection regulations. Legal liability related to remote clinical decision-making and varying national regulatory frameworks further creates uncertainty for healthcare providers and developers, collectively constraining the

expansion and effective implementation of telemedicine services in occupational health.[20,21]

A recent Indian study found that privacy concerns and perceived risks are major inhibitors of telehealth adoption among rural users. Many fear misuse of personal health information and doubt the quality of remote consultations. Low digital literacy also limits their confidence in using telehealth platforms. Additionally, challenges like poor internet access and high device or data costs widen the digital divide. These factors collectively reduce rural users' intention to adopt telehealth services. The study highlights the need for better digital literacy, stronger privacy protections, and improved connectivity to increase telehealth acceptance.[16]

A 2024 scoping review on telemedicine in India reported major barriers to its implementation. Limited digital literacy, especially among older adults and rural populations, reduces confidence in using digital health platforms. Unreliable internet connectivity further disrupts consultations and discourages adoption. Inadequate infrastructure and the availability of devices also pose significant challenges. The review noted that insufficient training of both patients and healthcare providers limits effective usage. Overall, these issues hinder the widespread uptake of telemedicine services in India.[22] A 2025 report on Indian telemedicine platforms highlighted major data-security risks. Researchers identified significant vulnerabilities that could allow unauthorized access and data leaks. Such concerns create fear and distrust among users when sharing personal health information online. The report emphasised that privacy and security issues remain key barriers to the wider acceptance of telemedicine. Strengthening cybersecurity measures is essential to building user confidence. Ensuring robust data protection will support safer and more trusted telehealth adoption in India.[21]

There is a shortage of trained occupational health professionals, which continues to limit the effective prevention and control of occupational diseases, with existing capacity largely dependent on short-term training programs such as the Associate Fellow of Industrial Health (AFIH) course. Inadequate awareness and training among general physicians further contribute to underdiagnosis and missed opportunities for early intervention. Many clinicians lack sufficient exposure to occupational history-taking and risk assessment in routine practice. Strengthening postgraduate training and capacity building in occupational and environmental medicine is therefore essential to improve recognition, prevention, and management of work-related illnesses.[1]

A recent survey among Indian doctors after the national telemedicine guidelines revealed notable provider-level resistance. Many healthcare professionals expressed concerns about maintaining the quality of care through remote consultations. Medico-legal uncertainties were also seen as a major barrier to telemedicine involvement. Additionally, poor infrastructure and workflow challenges reduced provider confidence. The survey indicated significant gaps in Information and Communication Technology (ICT) training and digital readiness among doctors. These issues slow down the effective adoption and integration of telemedicine into the healthcare system.[23]

OPPORTUNITIES AND FUTURE STRATEGIES

Telehealth in occupational health can be scaled in India by embedding it into national digital health infrastructure (ABDM/eSanjeevani), using hybrid hub-and-spoke models for large and remote worksites, and aligning employer, insurer and regulator incentives to fund and standardize workplace telehealth services.[24-26]

The rapid growth of the telehealth market and digital infrastructure enables real-time consultations and remote monitoring.[24] Linking occupational telehealth encounters with ABDM-compliant longitudinal health records can ensure continuity of care for workers across workplace and community health systems, addressing employees' inability to forgo daily wages and employers' concerns regarding time away from work and productivity losses. Such integration would enable seamless monitoring and management of chronic Non-Communicable Disease (NCDs) such as hypertension, diabetes, and Chronic Obstructive Pulmonary disease (COPD). This approach can reduce fragmentation of care and improve clinical decision-making across providers. Strengthening data interoperability is, therefore, a key future direction for tele-occupational health services.[27]

ESIC is Screening all the Insured persons in the outreach camps and as well as the daily Inhouse camps by Annual preventive Health checkups for the routine health checkups for the individuals above 30 years like all the basic investigations and any other required investigations as per the norms for the early identification of any morbidity and taking preventive measures (Lifestyle and behavioural changes) and treatment if required to prevent form the complications and to overcome the lead time. Occupational health offers expanding career opportunities across corporate, government, healthcare, academic, and consultancy sectors in India.

With growing industrialization and regulatory emphasis, demand for occupational health professionals is expected to rise further. The emergence of tele-occupational health presents new avenues for remote consultations, workplace risk assessments, health surveillance, and employee wellness programs. Digital platforms enable professionals to deliver training, monitoring, and advisory services across multiple industries efficiently. Opportunities also exist in research, policy advocacy, and collaboration with NGOs and international organizations. Together, these developments indicate a promising future for health professionals in occupational and environmental medicine.[28]

Table 1: Study characteristics of tele-occupational health.

Publication year	Author	Study design	Country	Key findings of the study
2025	Mirjam M et al	Systematic review	Finland	The potential positive impact of digital interventions on mental health, especially online training, should be leveraged by health care professionals and providers. In order to provide more specific recommendations for health care professionals, occupational health care researchers should strive for consensus on outcome measures
2024	Medeni et al	Review	Turkey	Barriers to its adoption include technological limitations, data security concerns, and legal complexities. To realise the full potential of telemedicine in occupational health, it is essential to address these challenges and ensure universal access, data protection, and compliance with legal regulations. Ultimately, telemedicine holds promise as a transformative tool for safeguarding employee health and enhancing workplace safety
2024	Arora et al	Scoping review	India	Strengthening digital infrastructure, enhancing digital literacy, standardizing protocols, and developing clear regulatory frameworks are essential. Collaborative efforts and tailored approaches that respect local cultures can further facilitate telemedicine adoption. Continuous research and public awareness campaigns are necessary to ensure telemedicine's sustainable and effective use in India
2023	Nissinen et al	Cross-sectional study	Finland	Occupational health professionals regarding the perceived usefulness and ease of use of telehealth services. However, the study results suggest that occupational telehealth services are most likely to be useful and easy to use when professionals' information and communication technology skills are at a good level.
2012	Pingle S	Country report	India	To extend osh coverage to all sectors of working life in unorganized sectors, spreading awareness about OSH among stakeholders, developing infrastructure and OSH professionals
2024	Huda et al	Qualitative study	India	Telemedicine can potentially transform healthcare access in remote regions of India, reducing healthcare inequities and improving health outcomes. However, addressing technical, infrastructural, and literacy challenges is essential for its successful implementation
2021	Westwood A	Review	India	The challenges to this revolve around digital education for patients and providers, integration of technology into existing care pathways, infrastructural investment and in creating seamless systems. It is a scalable and profitable model that must be seriously considered in the post-pandemic world
2015	Eaten et al	Cross-sectional study	US	The program has created a new system management solution to deliver expert, in-depth consultation and real-time provider education in OEM.
2024	Dastidar et al		India	We propose measures to reimagine e-sanjeevani as a more effective tool for improving public health outcomes and achieving universal health coverage in India.
2024	Mhalshekar et al	Editorial	India	Occupational health emerges not merely as a sector of employment but as a linchpin in the nation's journey toward sustainable growth and inclusive development. By harnessing the potential of its workforce and fostering a culture of health and safety, India paves the way for a future where prosperity is measured not only in economic terms but also in the well-being and resilience of its people

Future directions in tele-occupational health include providing specialist support to primary care physicians and enabling remote evaluation of workers with complex occupational and environmental exposures. Teleconsultation can facilitate assessment of chronic multisystem illnesses, exposure to airborne hazards, and other work-related health risks. Expanding tele-occupational services may improve access to expert care, particularly in underserved and remote settings. Further research is needed to evaluate the quality of care, patient acceptability, and the comparative effectiveness of tele-occupational health models.[29] Train non-physician health workers (ANMs, industrial health officers, first-aiders) as "assisted telemedicine facilitators" within plants, following models like DigiSetu to support low-literacy workers and older employees.[30]

STRENGTHS AND LIMITATIONS

This narrative review comprehensively synthesized the available literature on tele-occupational health, an emerging and underexplored area within occupational and environmental medicine. This review highlights evolving opportunities, particularly relevant to low- and middle-income settings, and provides practical insights for clinicians, policymakers, and educators. Given India's high burden of occupational injuries and diseases in manufacturing, agriculture, and the informal sector, tele-occupational health has significant potential to improve access, continuity of care, and workplace productivity. However, the available evidence from India remains sparse, necessitating reliance on studies and experiences from other countries, which may limit contextual generalizability and underscore the urgent need for India-specific research and pilot implementation studies.

CONCLUSION

Strengthening medical education and training in occupational health is essential to enhance clinical competence and the effective utilization of tele-occupational services, particularly as this field is still emerging in India. Although technological and policy advancements offer substantial potential to transform occupational health service delivery, structured and coordinated efforts are required to overcome existing implementation barriers. Further context-specific research is needed to assess the effectiveness, acceptability, and scalability of tele-occupational health models across diverse Indian industrial settings.

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