INTERVENTIONS BASED ON AI AND ML TO IMPROVE MATERNAL HEALTH IN LOW-RESOURCE SETTINGS

Abstract

Maternal mortality remains a major public health concern in India, particularly in Uttarakhand, where the Maternal Mortality Ratio (MMR) increased from 89 to 103 per 100,000 live births between 2015–17 and 2018–20, contrary to the national declining trend. This thesis investigates the factors contributing to maternal mortality in Uttarakhand and explores the role of Information and Communication Technologies (ICT), particularly Artificial Intelligence (AI) and Machine Learning (ML), in improving maternal healthcare in low-resource settings.

A comprehensive literature review was conducted to identify research gaps and understand the determinants of maternal mortality. Primary data were collected through field surveys in 15 villages of the Udham Singh Nagar district, Uttarakhand. The study analyzed socioeconomic, cultural, infrastructural, and healthcare-related factors influencing maternal healthcare utilization using statistical and correlation analyses.

The findings reveal that maternal healthcare utilization is affected by multiple interrelated factors, including inadequate healthcare infrastructure, shortage of female healthcare providers, limited ambulance services, long waiting times, poor awareness of government welfare schemes, financial constraints, cultural beliefs, and inadequate family support. Health conditions such as anemia, poor nutrition, and inadequate hygiene further increase the likelihood of pregnancy-related complications. The study also observed that districts with relatively better socioeconomic conditions and healthcare infrastructure exhibited higher maternal mortality, highlighting the influence of complex contextual factors beyond healthcare availability alone.

Based on these findings, this research proposes an AI/ML-enabled maternal health intervention framework for the early identification of high-risk pregnancies using routinely collected maternal health parameters. The proposed framework supports risk prediction, timely referral, personalized recommendations, and continuous maternal health monitoring, thereby strengthening frontline healthcare delivery.

The study concludes that reducing maternal mortality requires an integrated approach combining community awareness, improved healthcare infrastructure, effective implementation of government policies, and AI-driven digital health technologies. The proposed framework provides practical insights for policymakers and healthcare practitioners to design context-specific interventions for improving maternal health outcomes, particularly in resource-constrained settings.