Chapter 4
Prenatal Healthcare Framework Using IoMT Data Analytics

Rajiv Pandey
https://orcid.org/0000-0003-3348-9888
Amity University, Lucknow, India

Agnivesh Pandey
D.A-V. College, Chhatrapati Shahu Ji Maharaj University, Kanpur, India

Pratibha Maurya
Amity University, Lucknow, India

Guru Dev Singh
Amity University, Lucknow, India

ABSTRACT

In recent years, as hospitals utilize the internet of medical things (IoMT) for medical applications, edge computing has played an important role in distant healthcare systems. Human life has gotten smarter in the era of pervasive computing, thanks to the newest breakthroughs in IoMT, wearable sensors, and communication technologies to give smart healthcare services. IoMT can completely transform the healthcare business. IoMT uses software and information and communication technology (ICT) to connect wearable sensors, patients, healthcare professionals, and carers. Patients are given extensive supportive information to help them get through their recoveries. In this chapter, the authors aim to propose an IoMT-based healthcare framework called prenatal healthcare system of remote mother and fetal surveillance through IoMT. The data collected through the IoMT devices will be transmitted to server and will be analyzed through AI/ML module. On the signal of any abnormality, the central system will alarm attending doctors about the individual mother and fetus to take necessary action.

DOI: 10.4018/978-1-6684-3533-5.ch004

INTRODUCTION

The Internet of Things (IoT) has gained widespread attention and is being used in a variety of areas of daily life, ranging from smart cities to smart agriculture, as well as healthcare and assisted living applications (Pirbhulal et al., 2016; Sodhro et al., 2018). By establishing smart automation systems, IoT-based frameworks provide a capable and coordinated strategy for health monitoring not just for patients in hospitals but also for persons available anytime and anywhere. When IoT is used for medical purposes, it is referred to as the internet of medical things (IoMT). IoMT has transformed the medical field by introducing the notion of remote healthcare in terms of social benefits and perception, as well as a resource-efficient method of monitoring and diagnosing disorders (Whitmore et al., 2015). Recently, it has served as the foundation for a slew of software aimed at delivering healthcare services to distant clients. Medical information generated by medical nodes connected with the human body is distributed to concerned personnel and family who may access the patient's data at any time and from any location.

Internet of Things (IoT) is substantially altering our lives. Everything in the IoT world is considered as smart objects connected. These objects can connect to information networks such as the Internet and can perform sensing, data processing, networking, and communication (Al-Turjman et al., 2020).

IoT has thrown a challenge in the healthcare domain, which is referred to as the Internet of Medical Things. IoMT provides significant advantages for well-being of people by increasing the quality of life and reducing medical expenses. Major elements are wireless sensors, which will be used to remotely monitor the status of a patient's health, and communication technologies to send the information to health workers. The important step towards a smart healthcare system is to utilize the potential of existing technologies in delivering the best services to users and making their lives better. Artificial Intelligence is the other enabling technology that helps IoMT, which can assist doctors in almost every area of their proficiencies such as clinical decision-making. Through Machine Learning and Deep Learning techniques, the system can learn normal and abnormal decisions using the data generated by the health worker/professionals and the patient feedbacks. With the help of IoMT technologies, self-care and early diagnosis are considered to be an influential service in strengthening the healthcare ecosystem, especially those which utilize remote monitoring systems. The alarms generated by the ML-based analytics system can prompt the healthcare professionals like staff nurses, midwives, doctors, medical students, OBGYNs and required care can be given.

World Health Organization (WHO) recently revealed some startling facts about maternal deaths in India. Their report revealed that every five minutes, at least one Indian woman dies during pregnancy and childbirth. "Of the 529,000 maternal deaths occurring every year, 136,000 or 25.7 percent take place in India. 2/3 of maternal deaths occur after the delivery, postpartum haemorrhage being the most reported complication. The incidence of emergency postpartum hysterectomies is about 83/100,000 with a maternal mortality of 17.7 percent and perinatal mortality of 37.5 percent," said a WHO statement as per EH News Bureau. This is attributed to the absence of focus on regular and emergency obstetric care. This grave situation motivates us to propose a framework and the idea originates to minimize this misfortune.

Quick and cost-effective diagnosis is very essential in such cases so that the doctors can act quickly to reduce the severity of the cause. With this aim, we have proposed a fast and cost-effective diagnosis framework to develop IoMT based healthcare devices. The proposed framework called Prenatal Healthcare System of Remote Mother and Fetal surveillance through IoMT using handheld Ultrasound device and a miniature wearable worn by the mother. The devices will provide surveillance to the fetus and mother by collecting parameters of their health and well-being. The metrics collected will be transmitted to a