

ABSTRACT

Tuberculosis (TB) remains one of the most deadly infectious diseases globally. According to the World Health Organization (WHO) 2023 report, Indonesia ranks second in the world for TB cases. WHO recommends a minimum treatment adherence rate of 90% to ensure therapeutic success and prevent drug resistance. However, Indonesia's nonadherence rate of 27.24% highlights a significant barrier to effective TB control. This study presents the design of an Internet of Things (IoT)-based automatic medication dispenser integrated with a web application to improve patient adherence. The system uses an ESP32 microcontroller, stepper motor, and DHT22 sensor to dispense daily doses on time, monitor storage temperature and humidity, and schedule clinic visits within a 30-day cycle.

The web interface facilitates patient data input and system control, while the modular hardware is developed using 3D printing technology. Test results demonstrate a time deviation of 1 seconds, temperature accuracy of $\pm 0.5^{\circ}\text{C}$, humidity accuracy of $\pm 8\%$, and a 100% success rate across five core scenarios, including data transmission and device activation via API.

The system addresses the limitations of conventional methods such as SMS reminders, VOT, and MEMS, which lack automated dispensing and visit scheduling. Compared to solutions like I-CARES, this system offers lower costs, easier maintenance, and greater durability than the Servo Guerrero-Ulloa system. With physical dosage control, real-time consumption logging, and efficient cost and power usage, the system provides a promising alternative to improve TB treatment adherence, especially in resource-limited healthcare settings.

Keywords: Tuberculosis, Non-adherence, Stepper Motor, Website