AutoMedico – An Intelligent Pharmacy Automation System

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***Abstract*—**AutoMedico is a web-based intelligent pharmacy management system designed to automate and digitalize pharmacy operations for small and medium-scale stores. It integrates AI-powered medicine search using the Google Gemini API, digital prescription scanning through the OCR.space API, automated GST billing, with both cash and Razorpay-based digital payment support, and efficient inventory management using a PHP–MySQL backend. The system provides real-time stock tracking, expiry and low-stock alerts, and maintains detailed records of customers and prescriptions for better accuracy. With a responsive Bootstrap-based interface, AutoMedico minimizes human errors, enhances speed and accuracy in dispensing medicines, and improves overall operational efficiency in modern pharmacy management.

Keywords*—Pharmacy Automation, Artificial Intelligence, Digital Prescription Scanning, Inventory Management, Sales Analytics, GST Billing, AI Recommendations, Cash and Digital Payments.*

I. INTRODUCTION

Pharmacies play a vital role in the healthcare sector by providing patients with essential medicines and healthcare products. In India, most pharmacies still rely on traditional manual systems for operations such as billing, stock tracking, and expiry management. These manual practices often lead to human errors, stock mismanagement, and delays in customer service. To overcome these limitations, AutoMedico is developed as a web-based intelligent pharmacy management system that automates and simplifies all major pharmacy operations. Built using PHP, MySQL, HTML5, CSS, JavaScript, and Bootstrap, the system ensures smooth performance, scalability, and a user-friendly experience.

Through AI integration using the Google Gemini API, AutoMedico intelligently suggests generic alternatives, verifies possible drug interactions, and even recommends medicines based on symptoms, enhancing prescription safety. The OCR.space API enables automatic extraction of medicine names from uploaded prescriptions, reducing manual effort and improving accuracy.

The system also supports both cash and Razorpay-based digital payments, ensuring flexible, secure, and transparent transactions. AutoMedico generates real-time alerts for low stock or expiry and provides analytical dashboards with multiple downloadable reports, including sales reports, weekly sales summaries, stock details, and customer records, helping pharmacists make data-driven decisions.

With integrated GST billing, AI assistance, and secure authentication, AutoMedico empowers pharmacies to operate efficiently while maintaining compliance, accuracy, and transparency.

II. LITERATURE SURVEY

Chathuranga et al. (2014).

Presented a web-based pharmacy automation system using ASP.NET and C#, designed to automate ordering and supplier management with the goal of reducing manual record handling. The system consisted of modules for order placement, supplier tracking, and report generation. It allowed real-time access to inventory details and order status, which reduced paper-based work and human error. The study also highlighted how the system helped in decision-making by maintaining accurate inventory data. Overall, it demonstrated that digital pharmacy systems can save time, improve efficiency, and make business operations smoother.

Anupama et al. (2020).

Discussed the growing role of Artificial Intelligence (AI) in pharmacy systems, explaining how AI can predict patient needs, manage stock levels, and verify prescriptions automatically. The researchers used

various algorithms to analyze patient purchasing history and identify trends for future demand. Their study proved that AI-based automation improves accuracy in medicine dispensing, enhances user satisfaction, and builds customer trust. They also emphasized that AI can support pharmacists by reducing repetitive manual work and improving focus on clinical responsibilities.

Sudipta Das et al. (2021).
Developed a computerized pharmacy inventory system to improve efficiency and reduce operational errors. The system was created using database management and user-friendly interface design to record sales, purchases, and medicine details. It provided real-time stock updates and automatic alerts when medicines reached a minimum quantity. Their findings showed that computerized systems reduce record-keeping errors, save time in billing, and maintain accurate financial and stock data. This research demonstrated the importance of shifting from manual record systems to fully automated setups for better performance.

Muhammad Ahmer Raza et al. (2022).
Explored how Artificial Intelligence (AI) and Machine Learning (ML) can be used in pharmaceutical management for predictive stock forecasting, data management, and intelligent medicine recommendations. Their study focused on the use of ML algorithms for analyzing sales data to predict which medicines would be in demand. They also proposed intelligent recommendation systems that could suggest generic or alternative medicines. The results showed that AI integration could help pharmacies prevent overstocking or stockouts and offer smarter, data-driven insights.

Shivaprakash et al. (2022).
Proposed a desktop-based pharmacy management system using Python and SQLite for local data handling. The project automated everyday pharmacy operations such as billing, expiry-date alerts, and report generation. It simplified processes for small-scale pharmacies with limited budgets by providing an easy-to-use software solution. The research proved that automation helps pharmacies save time, reduce dependency on manual entries, and minimize the chances of human mistakes in medicine sales and record maintenance.

Amber Zerafa (2023).
Focused on the importance of Pharmacy Management Information Systems (PMIS) for ensuring safe and accurate medicine dispensing. The study emphasized modules for prescription validation, data protection, and pharmacist-patient communication. The system was designed to avoid incorrect dispensing through built-in verification and secure access. Amber Zerafa concluded that information systems not only improve accuracy but also promote accountability and transparency in pharmacy operations. This research also highlighted the importance of maintaining data privacy and audit trails in digital healthcare environments.

Chalasani et al. (2023).
Explored the use of AI in clinical decision-making and pharmacy practice. The research mainly dealt with drug interaction prevention and remote telemedicine consultations. By integrating AI models, the system could analyze prescriptions, identify harmful combinations, and alert the pharmacist before dispensing. The authors also showed how AI supports telepharmacy allowing patients to get remote assistance and guidance. Their study demonstrated that AI can enhance safety and reliability in digital healthcare practices.

Jarab et al. (2023).
Highlighted the transformative role of AI in drug safety monitoring and pharmaceutical supply chains. The paper discussed how intelligent systems can detect errors in drug packaging, track medicine movement, and manage large-scale supply networks. AI-powered platforms improved collaboration between manufacturers, distributors, and pharmacies, ensuring that medicines were authentic and delivered on time. The authors concluded that integrating AI with supply chain systems reduces wastage, prevents counterfeit drugs, and promotes patient safety.

Almeman et al. (2024).
Analyzed how traditional pharmacies are evolving into digital and telepharmacy platforms. Their study examined how online consultation, cloud-based systems, and AI chatbots are transforming pharmacy services. The research also discussed how patients are

increasingly relying on digital tools for ordering medicines and consulting pharmacists remotely. They concluded that the future of pharmacy depends on integrating AI, cloud computing, and telecommunication tools to offer convenient and accessible healthcare. The study supports the concept of connected and intelligent pharmacy systems like AutoMedico.

Dundi et al. (2024).
Discussed the digital transformation of Indian pharmacies and the gradual shift toward automation. The authors studied how digital billing, GST integration, and online records have improved accuracy and transparency. They also noted that automated systems help maintain proper medicine stock, handle customer data securely, and speed up operations. The paper showed that the Indian pharmacy industry is moving toward hybrid digital models where both physical and online pharmacy features are combined to provide better service to customers.

Ramamoorthy et al. (2024).
Examined the application of robotics and AI in the pharmaceutical industry. Their study explained how robots are being used in manufacturing, packaging, and large-scale dispensing units to improve precision and speed. They also highlighted how AI systems guide robotic arms for labeling and quality control. The research concluded that automation significantly reduces human errors and operational costs. However, the authors noted that such advanced technologies may not yet be feasible for small pharmacies due to high costs, which makes software-based automation a more practical solution for them.

III. RESEARCH GAP

The increasing adoption of digital tools in pharmacies has enhanced efficiency; however, several critical challenges remain unaddressed in daily operations. Existing pharmacy management systems typically support basic features, yet many essential functions required for seamless, accurate, and real-time workflow management are either missing or insufficiently implemented. Through a review of current systems, the following key research gaps were identified:

1. Prescription Handling Issues
Existing platforms rely heavily on manual verification and often fail to extract or organize essential prescription details, leading to slower workflows.
2. Lack of Real-Time Stock Updates
Most systems update inventory only after manual entry or billing. Continuous, real-time tracking of stock, low-stock alerts, and fast-moving medicines is still limited, causing stock mismatches.
3. Poor Expiry Tracking
Current solutions lack automated expiry alerts and reminder mechanisms, which are essential for minimizing wastage and ensuring safe dispensing.
4. Fragmented Workflow
Features such as billing, stock management, and prescription handling are frequently separated across different screens, resulting in discontinuity and time-consuming processes.
5. Complex Interfaces for Non-Technical Users
Many systems require technical skills, highlighting the need for a simple, intuitive, web-based interface that can be used easily by pharmacists without technical expertise.
These gaps demonstrate the need for a unified and user-friendly pharmacy system that supports prescriptions, stock management, expiry alerts, and workflow automation in an integrated manner. AutoMedico aims to meet this need by providing an all-in-one digital platform designed for simpler and more efficient pharmacy management.

IV. SYSTEM ARCHITECTURE

The proposed system, AutoMedico, follows a four-layer architecture that ensures smooth communication, efficient processing, and clear separation of
concerns. Each layer in this architecture performs a specific function that contributes to the overall performance, scalability, and reliability of the application. The modular design allows easy maintenance and future expansion without
disturbing other components. This layered design promotes clear organization and enhances both the usability and functionality of the system.
1. Presentation Layer
The Presentation Layer forms the topmost layer and serves as the user interface of AutoMedico. It is developed using HTML5, CSS, JavaScript, and Bootstrap (UI) to ensure a modern, responsive, and attractive layout. This layer acts as the point of interaction between the system and the end users—mainly the staff and administrators.

It includes key modules such as the Admin Dashboard, Staff Dashboard, and Billing Interface, which are designed for easy navigation and fast accessibility. Users can quickly access medicine information, generate invoices, track sales, and manage stock with minimal training. The responsive Bootstrap framework ensures the system runs smoothly across devices such as desktops, tablets, and mobile phones.
The intuitive interface significantly reduces manual effort and errors by allowing pharmacists to view stock status, generate GST bills, and monitor low-stock medicines in real-time.
The Presentation Layer is not only visually appealing but also optimized for speed and simplicity, improving the overall user experience. It directly communicates with the Application Logic Layer, sending and receiving data securely through HTTP requests.

2. Application Logic Layer
The Application Logic Layer serves as the core functional layer of AutoMedico. It acts as the bridge between the user interface and the database. This layer is developed using PHP and runs on the Apache Server, which ensures stability, platform independence, and scalability.
The layer handles all the essential business logic of the system, including:

- Authentication and Authorization – Ensures only verified users can access the system. Admins have full control, while staff members have restricted access to modules.
- Inventory Management – Automatically updates stock after each sale and tracks expiry dates.
- Billing and Sales Processing – Generates automated invoices with GST calculation and records transaction details in the database.
- Alert System – Provides alerts for low stock, near-expiry medicines, and delayed restocking, helping the pharmacy maintain optimal inventory levels.

All major operations, such as medicine search, stock updates, and billing, are processed in this layer. It ensures that even if multiple users are active simultaneously, data integrity is maintained. The modular design makes it easy to extend the system by adding new modules in the future, such as online ordering or supplier integration.

3. Database Layer
The Database Layer is the backbone of AutoMedico, responsible for storing, retrieving, and managing all the data efficiently. It uses the MySQL Server as the database management system. This layer is carefully structured with multiple interrelated tables such as:

- Medicines Table – Stores medicine details like name, expiry date, stock quantity, and price.
- Customers Table – Maintains customer information, purchase history, and contact details for future references.
- Sales Table – Keeps a record of all sales transactions with GST, total cost, and the responsible staff member.

The relational database design ensures data consistency and integrity by linking these tables through primary and foreign keys. It enables fast query execution and provides reports such as daily sales summaries, stock updates, and profit analytics. Data security is also a key focus—sensitive information is protected through authentication mechanisms and limited user privileges.
In case of system expansion, the MySQL database can easily support a larger dataset or even integrate with cloud-based services, making AutoMedico suitable for long-term scalability.

4. AI & Integration Layer
The AI & Integration Layer adds intelligence and automation to the system, transforming AutoMedico from a simple management tool into a smart digital pharmacy assistant. This layer utilizes advanced AI models and external APIs to improve accuracy, minimize manual effort, and support intelligent decision-making in the pharmacy workflow.
• OCR.space API – Used for digital prescription scanning. Pharmacists can upload an image of a prescription, and the OCR engine automatically extracts medicine names and other key details. This feature helps reduce manual typing errors, ensures accurate medicine entry, and speeds up the overall dispensing process.
• Google Gemini API – Integrates AI-powered recommendations that help pharmacists and users by suggesting suitable generic or substitute medicines, verifying potential drug interactions.
By combining AI intelligence and automation, AutoMedico ensures greater efficiency, accuracy, and reliability. This integration helps create a more

intelligent, responsive, and user-friendly system that enhances both pharmacist productivity and customer satisfaction.

Furthermore, this layer demonstrates how emerging AI technologies can be effectively applied in pharmacy management systems to modernize traditional workflows.

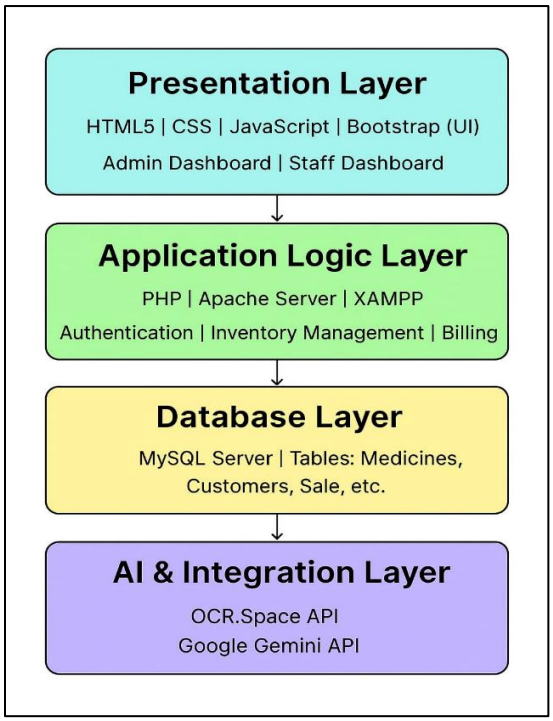


Figure 1 – AutoMedico System Architecture

V. WORKING OF THE SYSTEM

The AutoMedico system operates through an intelligent and modular architecture designed to automate, manage, and streamline every pharmacy operation efficiently. It integrates various technologies such as Artificial Intelligence, Optical Character Recognition (OCR), and automated billing into a unified web platform. Each module of the system works in coordination to ensure accuracy, speed, and ease of use for both administrators and staff members. The functioning of AutoMedico begins with user registration and authentication, continues through inventory and billing management, and extends to AI-driven medicine recommendations and analytics. This systematic workflow ensures that daily pharmacy operations are carried out digitally with minimum human effort and maximum efficiency.

1. User Registration and Authentication

The first step in the system workflow begins when the admin registers the pharmacy on the platform. The admin acts as the primary authority and has complete control over user and data management. The admin can create multiple staff profiles, each with unique login credentials such as username and password.

Unlike the Admin, staff members cannot register themselves; they can only log in using the credentials provided by the Admin. The authentication process is handled securely through PHP and MySQL, where every login attempt is verified to ensure that only authorized users access the system.

Once logged in, users are redirected based on their roles:

- The Admin Dashboard provides access to all modules, including staff management.
- The Staff Dashboard includes all features except for staff management, maintaining security and role-based restrictions.

This role-based access control enhances system safety, prevents unauthorized access, and ensures accountability for each operation performed within the system.

2. Medicine Entry and Inventory Initialization

After successful registration, the admin begins by entering details of all available medicines into the system database. Each medicine entry contains essential attributes such as: Medicine name, Expiry date, Quantity in stock, GST percentage

This structured data is stored in the MySQL database, and every medicine is assigned a unique ID for identification and tracking.

Once the initial stock is entered, the system automatically generates an inventory report, allowing the admin to view details such as total stock, soon-to-expire medicines, and reorder levels. This digital management eliminates the need for manual registers, ensures real-time accuracy, and provides a complete overview of the pharmacy's inventory at any time.

3. AI-Based Medicine Search and Recommendations

One of the most intelligent features of AutoMedico is the AI-powered search and suggestion module, which integrates the Google Gemini API.

When the Admin or Staff searches for a medicine, the system instantly provides predictive results, even if the full name is not entered. The AI also recommends:

- Generic substitutes for unavailable medicines
- Alternatives based on salt composition
- Symptom-based suggestions— for example, typing "fever" instantly lists the top 3 recommended medicines for fever

This intelligent search system helps pharmacists find the required medicines quickly, reduces human searching errors, and assists in making safe, data-driven dispensing decisions. It not only saves time but also enhances the quality and reliability of pharmacy operations.

4. Digital Prescription Scanning

To reduce manual effort, AutoMedico includes a digital prescription scanning feature using the OCR.space API. Pharmacists can upload a scanned image or photo of a doctor's prescription directly into the system.

The OCR engine automatically reads the image and extracts important details such as medicine names, dosage, and quantity. These extracted details are cross-referenced with the medicine database to ensure accuracy. The system then automatically fills in the required fields for billing or stock checking.

This feature significantly minimizes human errors, prevents incorrect data entry, and accelerates the overall dispensing process. Moreover, the scanned prescriptions are stored in the database for future reference and compliance tracking.

5. Customer and Staff Management

The admin can add, view, or update customer details such as name, contact information, and address. Staff members can also access these records for billing and prescription tracking purposes.

In addition, AutoMedico includes a Staff Management Module, which is accessible only by the Admin. Through this, the admin can create, edit, or remove staff members and assign specific roles or permissions. Staff cannot modify or access the management section, maintaining data security and operational control.

This distinction between Admin and Staff roles ensures that the system operates in a controlled environment with clear accountability.

6. Billing and Payment Management

One of the most crucial aspects of the AutoMedico system is its intuitive, responsive, and interactive billing interface, designed to simplify and streamline bill generation.

When a customer purchases medicines, the system automatically retrieves the selected medicine details—such as price, GST rate, and available quantity—from the database. It then calculates the total cost, applies GST, and generates the final payable amount.

AutoMedico supports both cash and digital payments through Razorpay integration, allowing flexible and secure transactions. Once a payment (cash or online) is completed, the corresponding transaction is saved in the database for record-keeping and future audits.

After billing, the system automatically updates the inventory in real time, deducting the sold quantities and reflecting accurate stock levels. The interface also supports adding multiple medicines to a single bill, applying discounts, and printing GST-compliant receipts for customers.

This automated and integrated billing mechanism ensures accuracy, transparency, and efficiency in every transaction while significantly reducing manual effort and human errors.

7. Inventory Updates and Alert System

After every billing transaction, the system updates the stock levels in the database. If the stock of any medicine drops below the minimum threshold, the system triggers a low-stock alert. Similarly, it generates expiry alerts when any batch approaches its expiration date.

These real-time alerts help pharmacists take preventive actions, such as restocking popular medicines or removing expired ones. The admin can also generate reports showing current stock levels, expired medicines, and pending reorders. This ensures that the pharmacy always maintains an up-to-date and compliant inventory.

8. Analytics and Reporting

AutoMedico features an advanced Analytics Dashboard for the Admin, providing detailed statistics about pharmacy operations. It visually represents:

- Sales reports (daily and weekly)
- Stock details and movement
- Customer details and transactions

The system supports exporting reports in PDF, Excel, or CSV format, making it easy to maintain records for business reviews or compliance purposes. These analytical tools allow pharmacies to make data-driven decisions, track performance, and forecast future stock requirements effectively.

In summary, the AutoMedico system operates in a continuous and organized loop that covers every aspect of pharmacy management. The admin begins by registering the pharmacy, adding medicines, and managing staff. Staff members can then perform daily operations such as searching for medicines, scanning prescriptions, billing customers, and updating inventory.

The integration of AI and OCR technologies ensures that all tasks from prescription reading to billing—are executed with precision and efficiency. The system's automation features eliminate manual record-keeping, reduce human errors, and improve the overall speed of service.

Through its modular design, responsive interface, and intelligent processing capabilities, AutoMedico successfully transforms traditional pharmacies into fully digital, efficient, and data-driven healthcare service centers.

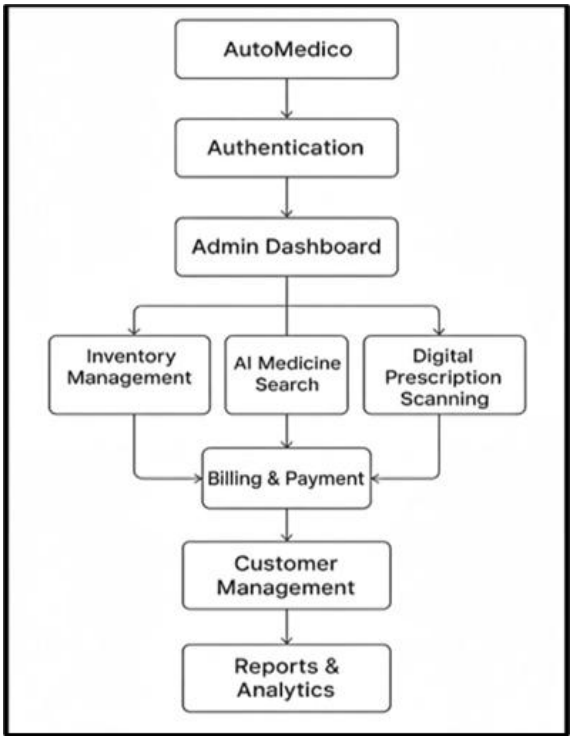


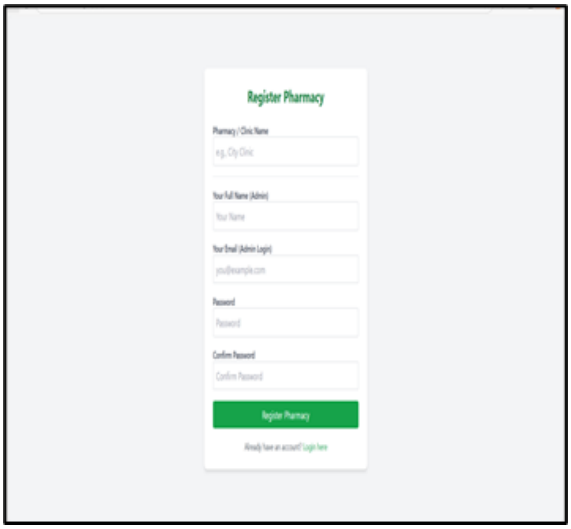
Figure 2 – Flow of AutoMedico System

VI. SYSTEM SCREENS

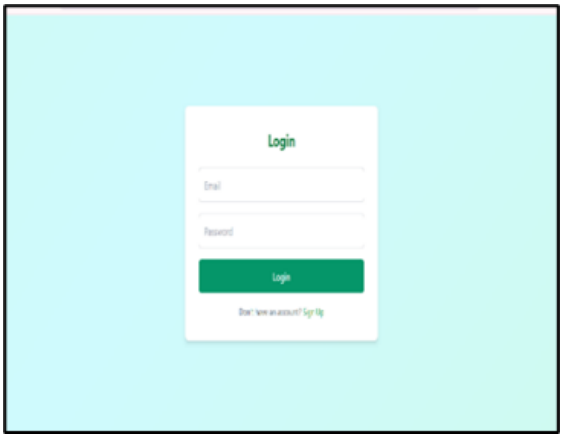
AutoMedico features an intuitive web interface with clearly structured screens for easy navigation and usability.

1. Registration and Login Screen:
   The system begins with Admin registration. Once registered, the admin can create staff profiles. Staff can only log in using credentials generated by the Admin. A secure authentication system ensures only authorized users gain access.

Registration Screen

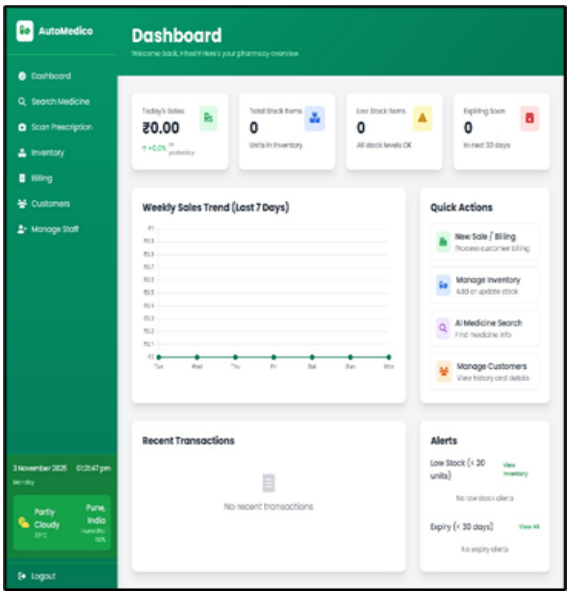


Login Screen



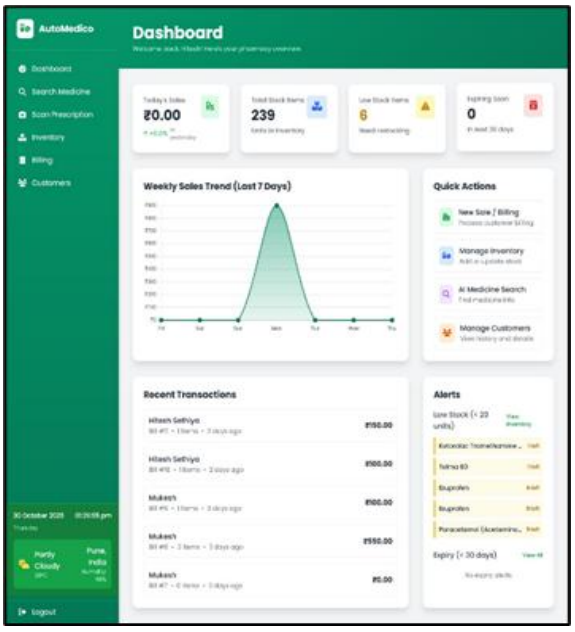
2. Admin Dashboard:

After login, the admin is redirected to the main dashboard. Displays cards for total stock, daily sales, expiring items, and low-stock alerts. A graph summarizes weekly sales data, while side navigation provides quick access to all modules.



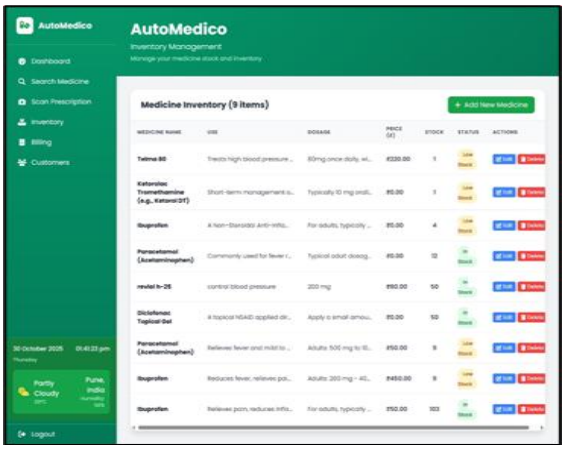
3. Staff Dashboard:

The Staff dashboard has similar modules to the admin dashboard but excludes the "Manage Staff" option. It allows staff to handle billing, prescriptions, and inventory updates within assigned limits.



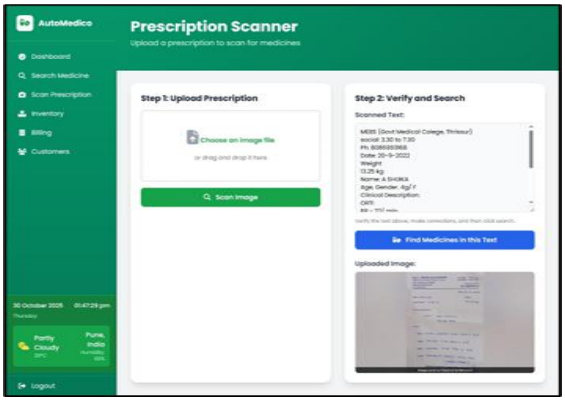
4. Inventory Management Screen:

Shows a searchable, filterable table of all medicines. Admin can add, edit, delete, or export data. Expiring medicines are highlighted automatically.



5. Prescription Management:

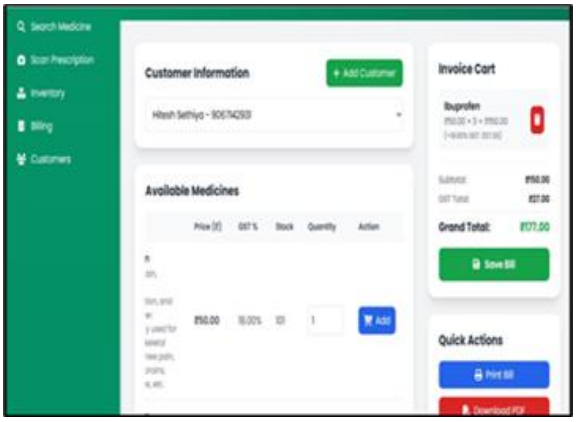
Screen: Allows uploading prescriptions via file upload or camera capture. Extracted medicines are displayed with an editable interface.



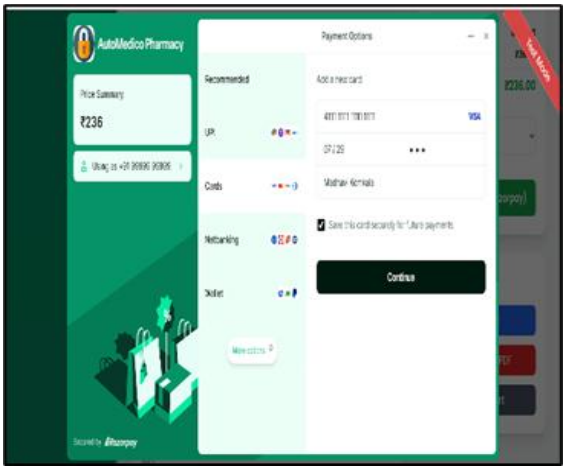
6. Billing & Payment Screens:

The system generates bills by adding items and calculating GST, processes secure payments, confirms transactions, prints GST-compliant receipts, and updates inventory instantly.

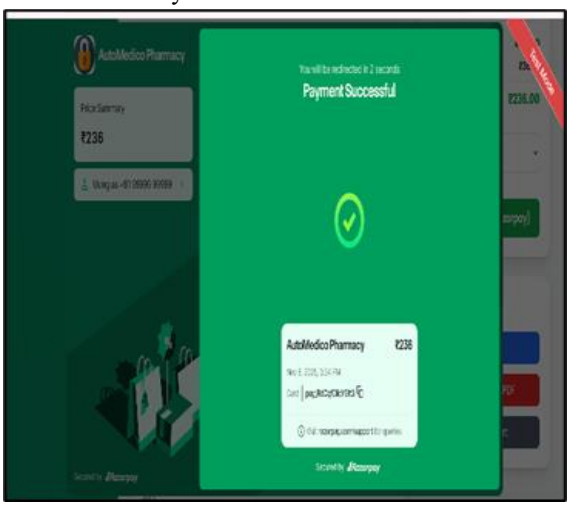
Billing Screen



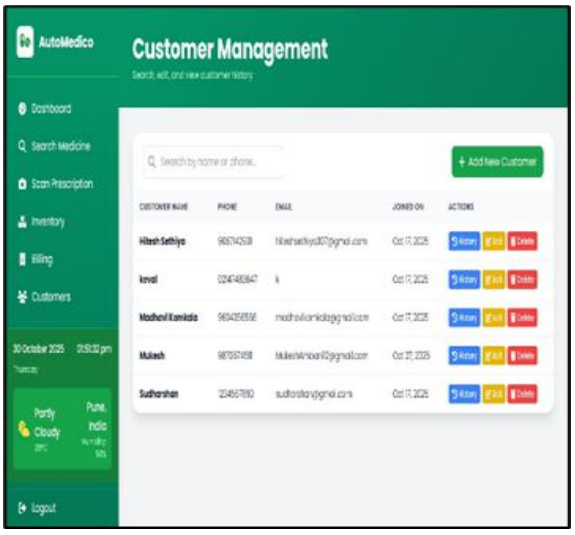
Payment Gateway



Payment Successful Screen

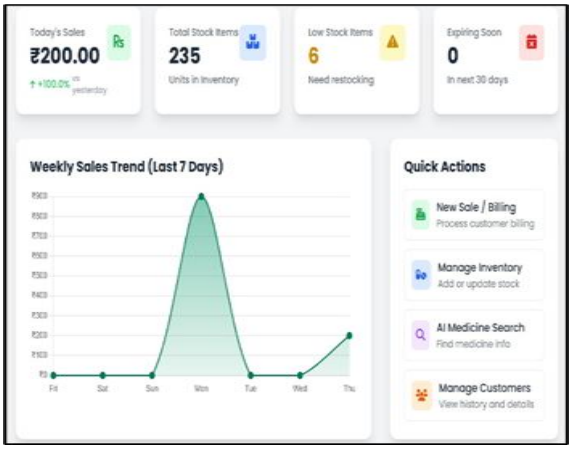


7. Customer Management Screen:
Displays customer details and purchase history.

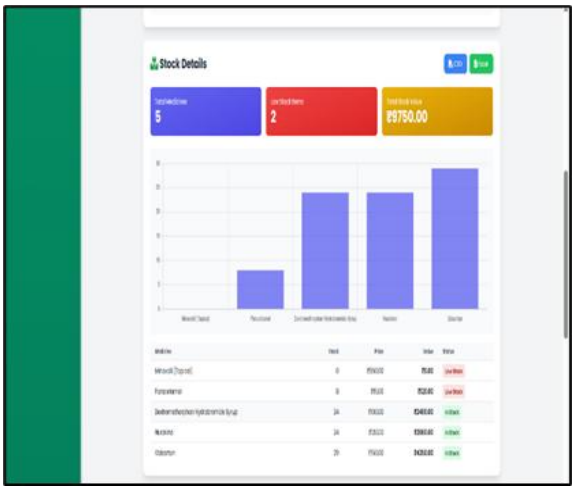


8. Reports Screens:
The system generates comprehensive reports on sales, inventory, and customer data, with options to export them in PDF or Excel format for business and accounting purposes.

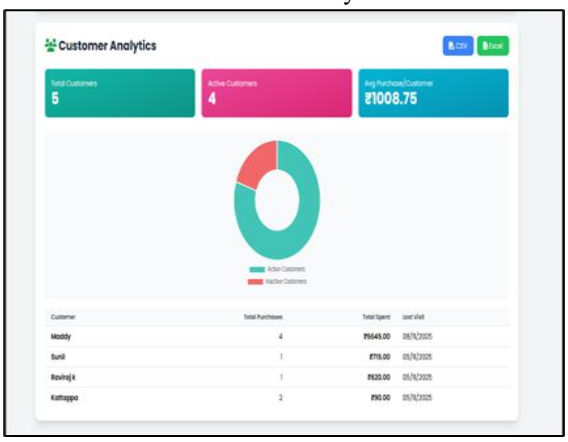
Weekly Sales Report



Stock details



Customer analytics



VII. APPLICATIONS

1. Retail Pharmacies:
AutoMedico provides complete automation for retail pharmacies to manage billing, inventory, and prescriptions efficiently.
2. Hospital Pharmacies:
Supports in-house patient prescription handling and controlled medicine distribution.
3. Medical Wholesalers:
Enables tracking of bulk orders, supplier coordination, and automated returns of expired medicines.
4. E-Pharmacy Platforms:
Can be integrated into online medicine delivery services for automated processing and digital payment management.
5. Healthcare Clinics:
Facilitates digital record-keeping for doctors and patients, simplifying follow-up and prescription refills.
6. Diagnostic Centres:
AutoMedico can be used in diagnostic and pathology centres to manage prescribed test records, generate billing with GST, and maintain a digital inventory of medical supplies such as reagents and testing kits.

VIII. ADVANTAGES

1. Automation and Accuracy:
AutoMedico automates repetitive tasks like billing, stock updates, and report generation, reducing manual errors and improving operational accuracy.
2. AI-Powered Assistance:
The system leverages AI through the Google Gemini API to provide intelligent medicine suggestions, detect drug interactions, and recommend cost-effective generic alternatives.
3. Regulatory Compliance:
AutoMedico ensures full compliance with GST and pharmaceutical regulations, simplifying financial and legal documentation for pharmacies.
4. Data Analytics and Insights:
The system provides real-time sales, profit, and stock analytics through graphical dashboards, helping in data-driven business decisions.
5. Supplier and Customer Coordination:
Maintains smooth communication between pharmacies, suppliers, and customers through timely restock alerts and accurate order tracking.
6. Secure Digital Record Management:
All transaction and inventory data are stored securely, enabling easy retrieval, backup, and long-term record maintenance.
7. User-Friendly Interface:
Designed with simplicity and clarity, the interface allows even non-technical users to operate efficiently with minimal training.

IX. LIMITATIONS

1. Internet Dependency:
The system requires a stable internet connection for real-time updates, cloud synchronization, and API-based AI features to function effectively.
2. OCR Sensitivity:
The accuracy of prescription scanning through the OCR.space API depends on the clarity, handwriting, and quality of the uploaded image.
3. AI Recommendation Limitations:
The suggestions provided by the Google Gemini API may vary depending on the dataset and available medical information, which could affect recommendation accuracy.
4. Initial Setup and Training:
The system requires initial investment for setup and basic user training to ensure staff can operate the platform efficiently.
5. Hardware and Browser Compatibility:
The system performs best on updated browsers and devices; outdated systems may experience slower performance or limited functionality.
6. Data Privacy Concerns:
Since AutoMedico stores sensitive pharmacy and patient information, proper security configurations and regular updates are essential to prevent unauthorized access or data breaches.

X. CONCLUSION

AutoMedico successfully bridges the gap between traditional pharmacy management and modern digital automation. By integrating AI-driven recommendations, OCR-based prescription reading, and real-time analytics, the system enhances efficiency, reduces human dependency, and ensures greater accuracy in pharmacy operations. The use of web technologies like PHP, MySQL, and Bootstrap provides a seamless, responsive, and user-friendly experience for both administrators and staff.

The platform simplifies daily activities like billing, inventory management, and reporting, while empowering pharmacies to make informed, data-driven decisions. AutoMedico supports healthcare professionals in maintaining compliance with drug regulations while improving customer satisfaction through faster service and intelligent suggestions.

In the future, AutoMedico can be expanded with features like voice-based assistance, mobile app integration, and cloud-based synchronization to further strengthen accessibility and scalability. Overall, AutoMedico represents a significant step toward building a smarter, automated, and future-ready pharmacy management ecosystem.

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