# Chandigarh University, Mohali

## Report on

## The Clinic OPD Management System

**Submitted to:**

**University Institute of Computing**

**Submitted by:**

**Krishkumar (25MCD10007)**

# ACKNOWLEDGEMENT

We deem it a pleasure to acknowledge our sense of gratitude to our project guide, Er. Harmanjot Kaur (Assistant Professor, UIC) under whom we have carried out the project work. Her incisive and objective guidance and timely advice encouraged us with constant flow of energy to continue the work.

We wish to reciprocate in full measure the kindness shown by Dr. Abdullah (H.O.D, University Institute of Computing) who inspired us with his valuable suggestions in successfully completing the project work.

We shall remain grateful to Dr. Manisha Malhotra, Additional Director, University Institute of Computing, for providing us a strong academic atmosphere by enforcing strict discipline to do the project work with utmost concentration and dedication.

Finally, we must say that no height is ever achieved without some sacrifices made at some end and it is here where we owe our special debt to our parents and our friends for showing their generous love and care throughout the entire period of time.

Date: 12.11.2025

Place: Chandigarh University, Mohali, Punjab.

By: Krishkumar, UID- 25MCD10007.

# Table Of Content

# ABSTRACT

The Clinic OPD Management System is designed to simplify and digitize the daily operations of outpatient departments (OPD) in clinics and small healthcare facilities. Traditionally, patient registration, appointment handling, billing, and prescription management are performed manually, which is time-consuming and prone to errors. This system provides an efficient, user-friendly interface to manage patient records, doctor consultations, prescriptions, and billing operations.

The system ensures accurate record-keeping, quick access to patient history, structured prescription creation, and automatic invoice generation. Developed using Python Tkinter for the GUI, MySQL for data storage, and ReportLab for PDF generation, the project integrates essential clinic workflow modules in a cohesive manner. The result is a system that improves clinic productivity, reduces manual paperwork, and enhances patient service quality.

It provides a user-friendly interface to store and retrieve patient records efficiently, generate digital prescriptions, and produce automated invoices. The implementation helps reduce paperwork, improve accuracy and patient service quality, and support data-driven decisions through structured reporting.

The system is tested and validated for real-world workflow, demonstrating efficiency, reliability, and ease of use.

## GRAPHICAL ABSTRACT


*Fig 1*

# CHAPTER 1 INTRODUCTION

## 1.1.Need Identification

The necessity for digitizing OPD workflow arises from real operational challenges observed in clinics. The following needs were identified:

1. **Efficient Information Storage & Retrieval:**
   Patient history, past prescriptions, and visit logs should be easily accessible.
2. **Organized Appointment Scheduling:**
   To prevent overlapping bookings and reduce patient waiting time.
3. **Professional & Readable Prescriptions:**
   To avoid confusion caused by handwritten prescriptions.
4. **Accurate Billing & Expense Records:**
   Digital billing reduces calculation errors and financial mismanagement.
5. **Data Security and Long-Term Access:**
   Digital records remain preserved and can be backed up securely.

Thus, a clinic-specific management software is required to **replace manual and paper-based processes with a reliable computerized system.**

## 1.2.Identification of Problem

The observed issues in current manual operation are summarized below:

| Area | Existing Problem | Impact |
|---|---|---|
| Patient Registration | Data stored manually in registers | Hard to search and reference |
| Appointment Handling | First-come entry without time allocation | Long queues & overcrowding |
| Prescription Writing | Handwritten notes | Misinterpretation & errors |
| Billing | Manual calculations | Higher chances of errors |
| Data Tracking | No centralized database | Clinic cannot analyze performance |

These limitations affect the overall productivity of clinic staff and patient comfort. Therefore, digitization is necessary.

### 1.3.Identification of Tasks

To develop the *Clinic OPD Management System* for City Care Clinic, several tasks were identified during the planning and analysis phase. Each task represents a key activity required for smooth OPD workflow. These tasks were recognized based on how the clinic currently operates and what improvements were needed to make their daily work faster and more organized.

The major tasks identified are as follows:

1. Patient Registration
   The system must allow the clinic staff to record patient details such as name, age, gender, contact number, and address. This information must be stored permanently so that patients do not have to provide their details again during future visits.
2. Appointment Scheduling
   The clinic receives many patients every day. Therefore, the system needs to ensure that appointments are scheduled properly without time conflicts. It should also allow staff to view, modify, or update appointments for any selected date.
3. Doctor Consultation and Patient History Access
   During the consultation, the doctor should be able to view the patient's old records and medical history when required. This helps in making proper diagnosis and prescribing correct treatment.
4. Prescription Entry and Follow-Up Management
   The doctor should be able to enter the diagnosis and medicines digitally. The system should generate a standard formatted PDF prescription and also record the follow-up date so that the clinic can keep track of returning patients.
5. Billing and Payment Calculation
   After the consultation, the clinic charges fees based on services and medicines provided. The system should automatically calculate the total bill including quantity, price, and amount for each service and generate a professional invoice in PDF form.
6. Data Storage and Retrieval
   All information must be stored in a database so that records can be viewed at any time. The system should also support quick searching of patients, appointments, and billing history.
7. Dashboard and Reporting
   The clinic management should be able to view daily statistics such as total patients visited, completed appointments, total revenue, and common diseases diagnosed. Graphical charts help in understanding clinic performance clearly.
8. User-Friendly Interface and Reliability
   The system must be simple enough for staff members with basic computer knowledge. It should be error-free, stable, and able to run smoothly on normal computer hardware available in the clinic.

# CHAPTER 2 BACKGROUND STUDY

## 2.1. Proposed Solution

The proposed Clinic OPD Management System digitizes all core activities:

- Patient information is stored permanently in a database.
- Appointments can be scheduled without time conflicts.
- Doctors can input diagnosis and prescribed medicines directly.
- Prescriptions are exported to **PDF format**, ensuring professional and consistent formatting.
- Billing calculations become **automatic**, reducing financial errors.
- A dashboard provides **real-time insights** such as:
    - Daily patient count
    - Top common diseases
    - Revenue summaries
    - Appointment status patterns

This solution ensures:

- Faster patient processing
- Zero data loss
- Increased accuracy and reliability
- Improved clinic reputation through professional documentation

## 2.2. Bibliometric Analysis

Multiple organizations have implemented OPD management systems; however, most are either:

1. **Hospital Management Systems (HMS)**
    - Feature-rich but **expensive** and **complex**
    - Requires trained operators
    - Not suitable for clinics with a single doctor
2. **Web Appointment Portals**
    - Handle scheduling only
    - Do not provide billing or prescription support
3. **Mobile Apps**
    - Useful but rely on internet connectivity
    - Limited control over data privacy.

### 2.3 Review Summary

The system must:

- Save time
- Reduce operational errors
- Be easy for staff to use
- Store data securely for future reference

Hence, development of a **Clinic OPD Management System** is justified.

### 2.4 Problem Definition

To design and implement a reliable and user-friendly OPD Management System for City Care Clinic to digitalize patient data, appointments, prescriptions, billing, and clinic reporting, ensuring reduced waiting time and improved decision-making.

### 2.5 Goals/Objectives

With the increasing digitization in healthcare services, clinics today require efficient systems that ensure quick service delivery, secure patient data handling, and smooth workflow management. Traditionally, clinics maintain patient records, appointments, billing, and prescriptions manually in registers. However, as the number of patients grows, this method becomes slow, repetitive, and prone to errors.

To overcome these issues, the **primary goal** of the Clinic OPD Management System is to **replace manual record-keeping with an organized digital solution** that allows the clinic to function more smoothly and efficiently.

**Key Objectives**

2.5.1 **To Reduce Manual Workload**

The system is designed to minimize paperwork by storing all data in digital form, making tasks faster and more manageable.

2.5.2 **To Improve Patient Handling and Service Speed**

By maintaining a structured appointment schedule, the clinic can reduce waiting time and maintain better patient flow.

2.5.3 **To Maintain Accurate Patient Medical History**

The system stores patient details, previous visit data, and past prescriptions, which helps the doctor to review and treat patients more effectively in future visits.

2.5.4 **To Generate Clear and Professional Prescriptions**

Handwritten prescriptions can sometimes be unclear. This system automatically generates **PDF prescriptions**, ensuring clarity and professionalism.

2.5.5 **To Ensure Error-Free Billing and Payment Processing**

The system includes itemized billing and automatic total calculations which reduces financial errors and improves transparency.

2.5.6 **To Provide Analytical Insights for Decision-Making**

Dashboard charts displaying daily patients, most common diseases, and revenue trends help the clinic evaluate performance and plan improvements.

## 2.6. Why Use These Technologies Over Other Technologies

Selecting the right technologies is important for building a reliable and easy-to-maintain clinic management system. The technologies chosen were based on **usability, performance, availability, and simplicity of implementation**.

### 2.6.1 Developer Efficiency & Simplicity

Python provides easy syntax and readability, which makes development faster. CustomTkinter allows the creation of a **modern graphical interface** without complications, making it ideal for clinic staff with basic computer knowledge.

### 2.6.2 MySQL for Secure and Structured Records

MySQL is a well-known database system that stores patient information, appointments, prescriptions, and billing data in a structured and organized format. It also supports fast data searching and ensures that medical records remain safe for many years.

### 2.6.3 ReportLab for Prescription and Invoice PDF

Healthcare documents must look **professional and easy to understand**. ReportLab allows automatic creation of clearly formatted **prescriptions and invoices**, eliminating handwriting confusion and saving time.

### 2.6.4 Matplotlib for Visual Dashboard Analytics

Matplotlib helps generate charts that show:

- Daily patient flow
- Top diseases treated
- Revenue trends

  This helps the doctor understand clinic performance in one glance.

### 2.6.5 Budget and Practical Use

- All selected technologies are **free and open-source**.
- No paid license or subscription is needed.

- System works completely **offline**, meaning **no internet is required** to manage the clinic.

### 2.6.6 Easy Deployment & Maintenance

The system can run on a standard Windows laptop. No special server, cloud setup, or complex installation is required. This makes it **cost-effective and easy to maintain** in small and medium-sized clinics.

# CHAPTER 3 DESIGN AND PROCESS

## 3.1. Evaluation And Selection of specifications / features

The design of the Clinic OPD Management System began with understanding the practical day-to-day functioning of a clinic. After interacting with clinic workflow patterns and identifying pain points, the core features were finalized based on necessity, usability, and time efficiency. The selected features aim to cover all essential clinic operations while ensuring simplicity for the end-user (doctor and staff). The final selected features are:

1. **Patient Registration**
   Enables the clinic to store patient personal and contact details. Helps avoid repeated data entry during future visits.

2. **Appointment Booking**
   Provides a structured time-slot based appointment system which avoids overcrowding and reduces waiting time.

3. **Prescription Entry and Saving**
   Stores patient diagnosis, medications, dosage, and follow-up details which can be retrieved when needed.

4. **Billing and Invoice Generation (PDF)**
   Generates automated itemized medical bills reducing calculation errors and improving transparency.

5. **Dashboard with Analytical Charts**
   Displays trends such as daily revenue, number of patients, and common diseases to support better decision-making.

These features were selected because they reflect the primary activities performed in a clinic every day and directly improve efficiency, accuracy, and service quality.

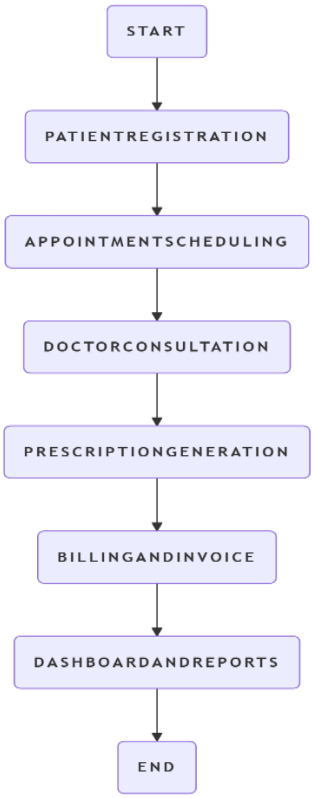
### 3.2. Design constraints

During the planning and development of the system, certain constraints and requirements were considered:

| Constraint | Description |
|---|---|
| **Offline Functionality** | The system must work without internet as many clinics prefer standalone offline systems. |
| **Low Hardware Requirement** | Should run smoothly on basic Windows laptops or desktop systems. |
| **User-Friendly Interface** | The clinic staff may not be highly technical, so the interface must be simple and intuitive. |
| **Data Security and Reliability** | Patient history, medical records and billing data must be stored safely and must be retrievable anytime. |

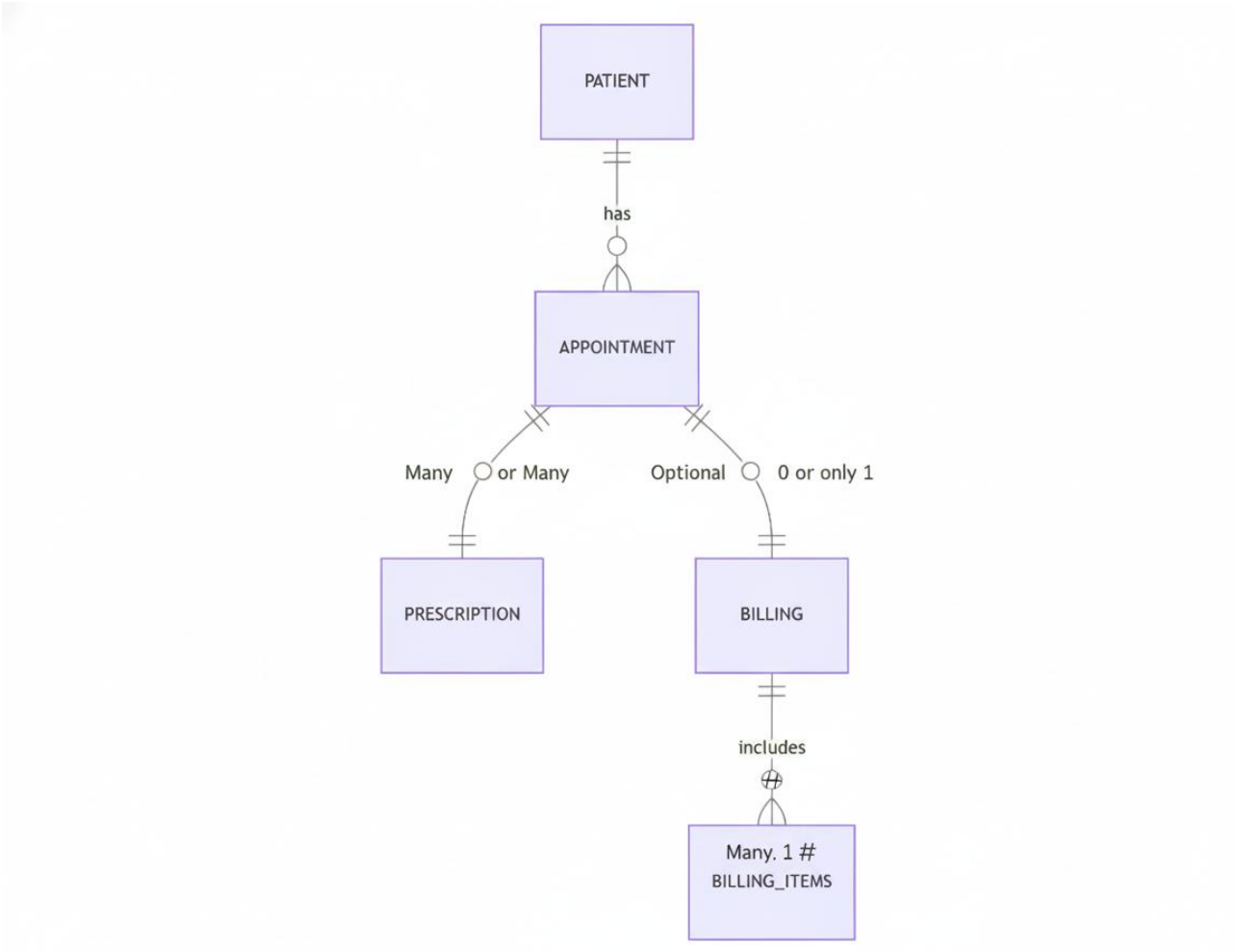
These constraints guided the choice of technology and system design.

### 3.3. Design flow:




This flowchart represents the complete functioning of the OPD System from patient arrival to report generation.

### 3.4 ER Diagram:




*ER DIAGRAM*

### 3.5.User Interface Screens:

The following are the primary user interface screens developed:

- **Patient Registration Screen** – Allows adding and updating patient records.

- **Appointment Screen** – Displays today's appointments and helps schedule new ones.
- **Doctor Prescription Screen** – Used by the doctor to enter diagnosis and treatment details.
- **Billing Screen** – Generates and prints patient invoices.
- **Dashboard Screen** – Shows graphs and clinic statistics.

# CHAPTER 4 RESULTS ANALYSIS AND VALIDATION

## 4.1. Result analysis

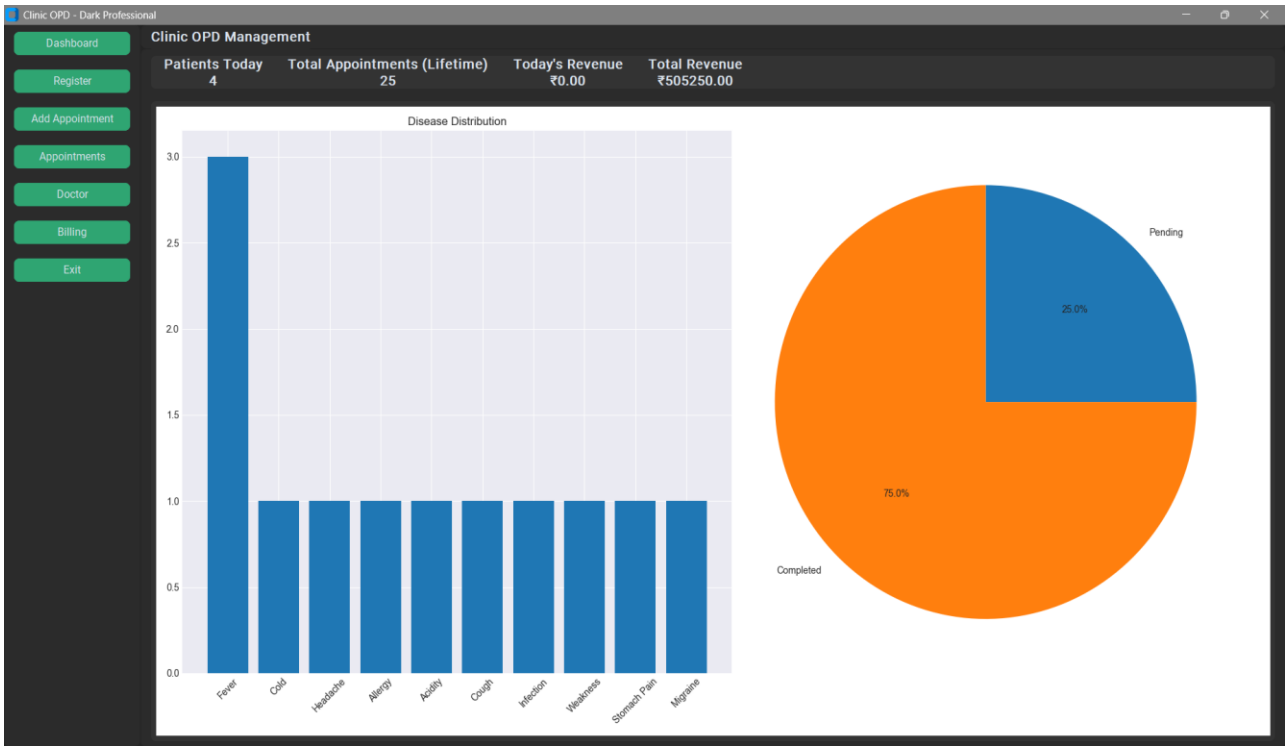
The Clinic OPD Management System was evaluated to check how effectively it performs in comparison to traditional manual clinic processes. The main goal of this system was to simplify daily OPD activities such as patient registration, appointment scheduling, prescription handling, and billing. The analysis focused on performance, usability, data correctness, and workflow improvement.

**Key Evaluation Points**

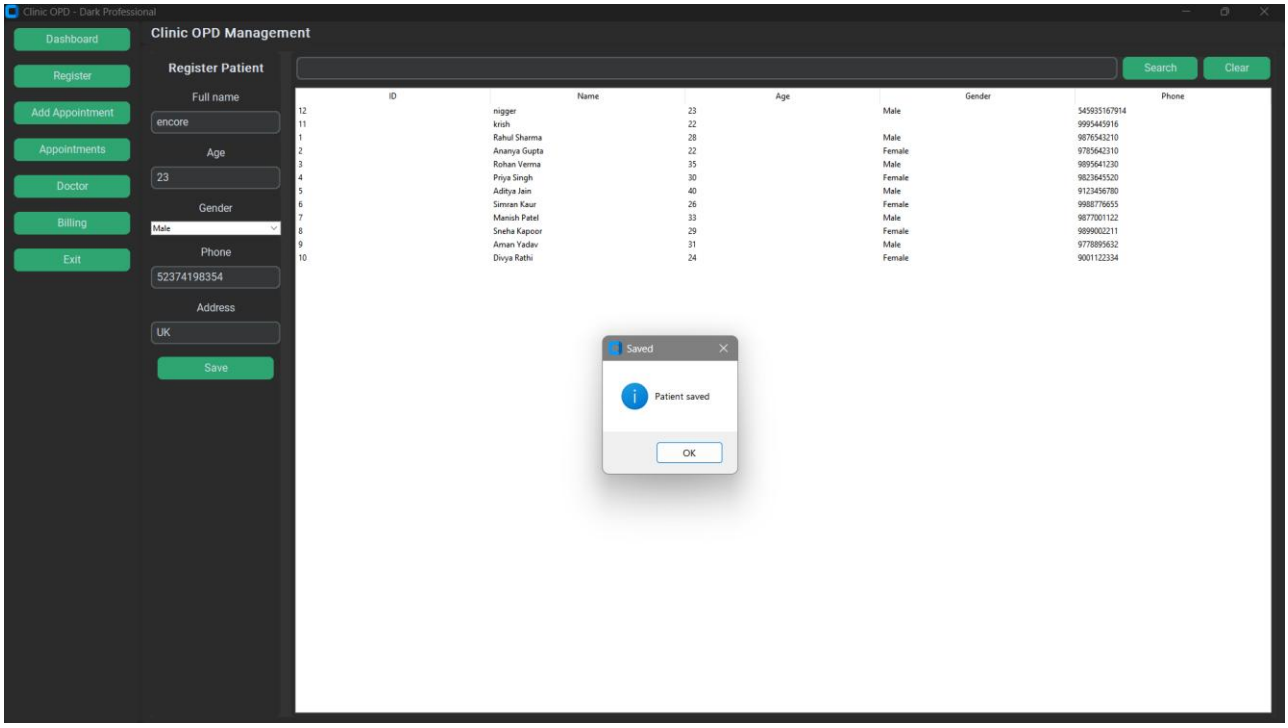
| Aspect Evaluated | Manual Process (Before System) | Result After Implementation |
|---|---|---|
| Patient Records | Paper-based, difficult to retrieve | Easily retrievable, well-organized digital database |
| Appointment Scheduling | Overlapping or forgotten schedule entries | Clear time-slot-based scheduling with conflict-free structure |
| Prescription Writing | Handwritten, sometimes unclear or misplaced | Neat, printable prescriptions stored securely in database |
| Billing & Payments | Manual calculation errors common | Automated billing, accurate totals, PDF invoice generation |
| Report & Analytics | Not available | Dashboard with patient count and revenue statistics |

## 4.2Screenshots:

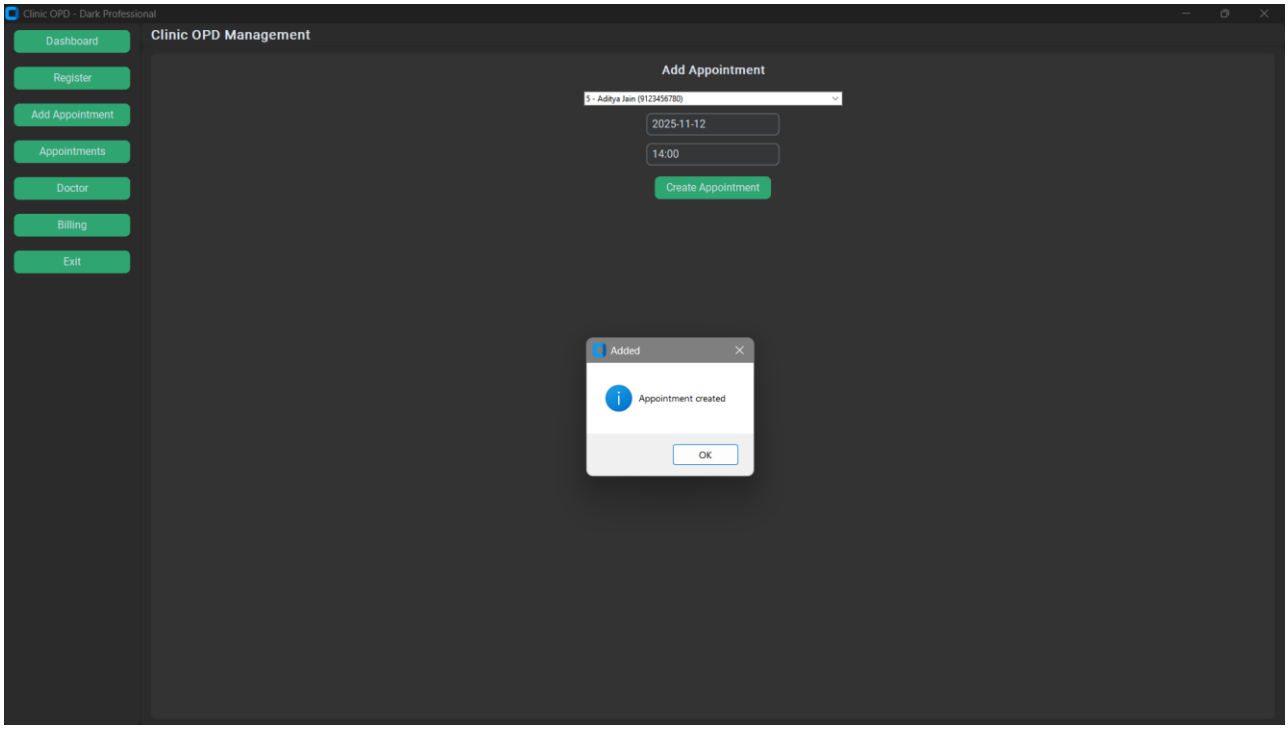
**Dashboard:**



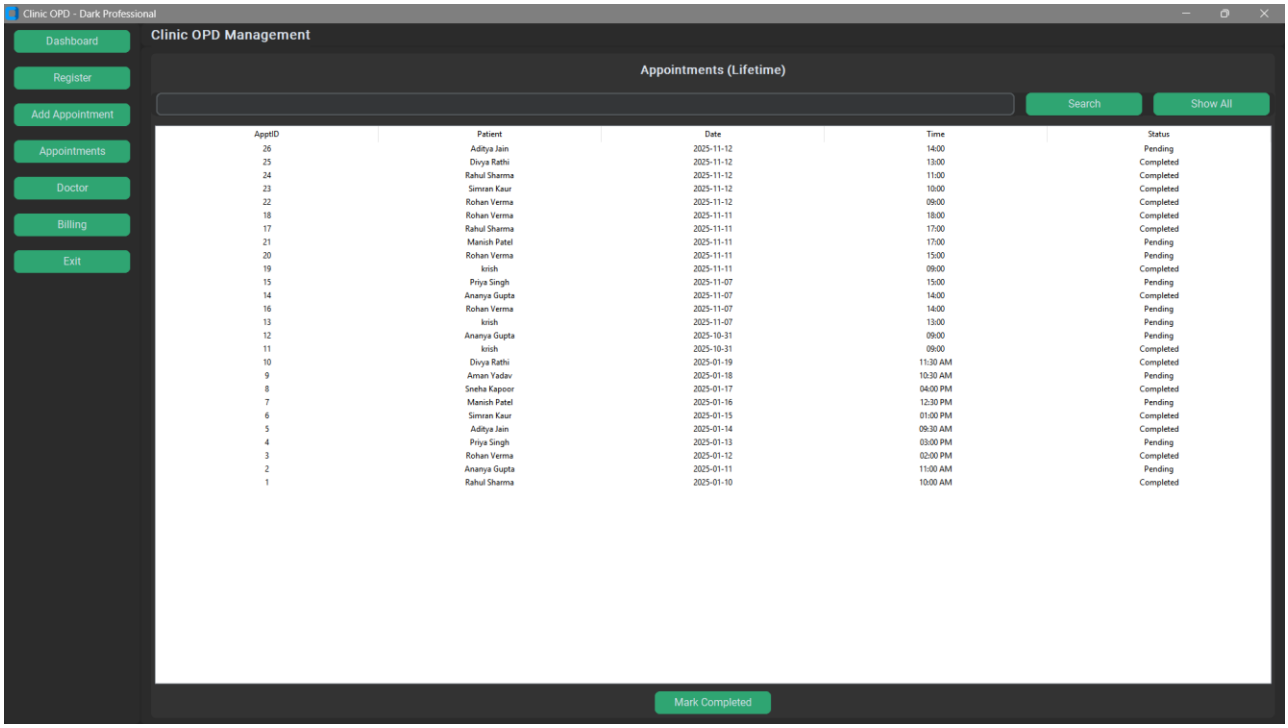
## Resgister:



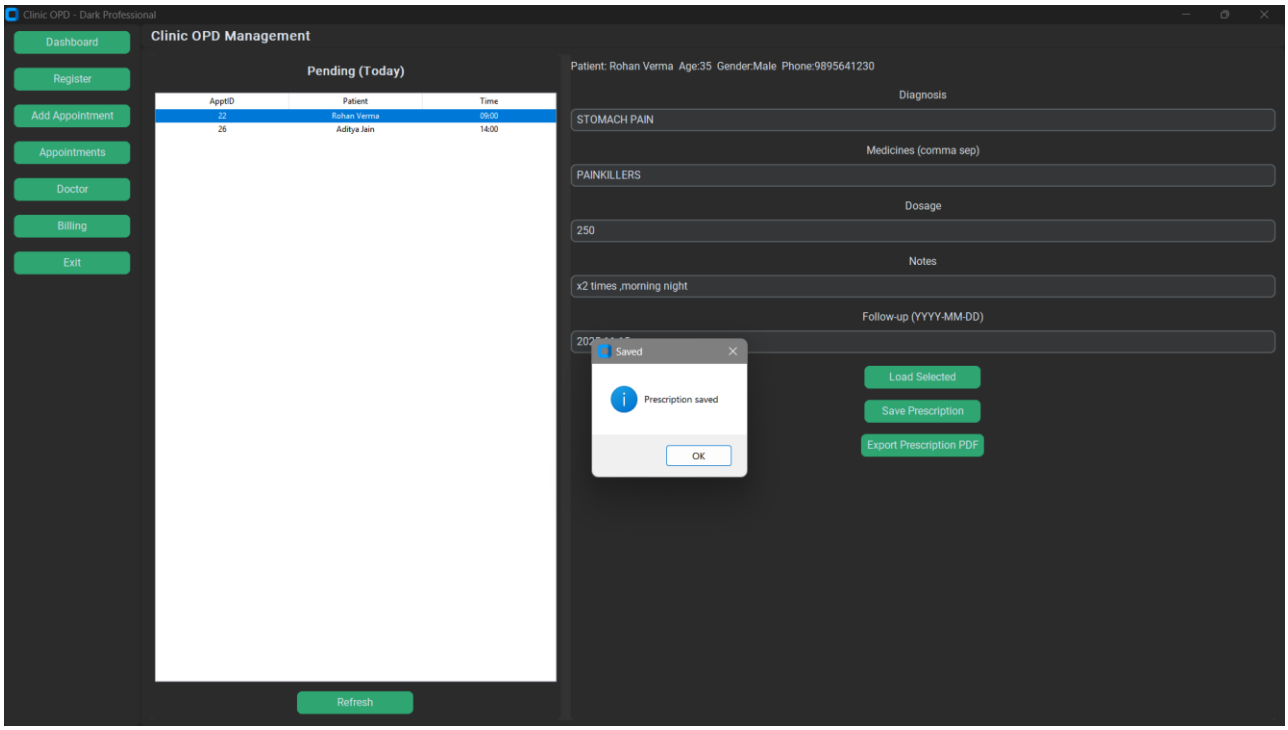

## Add Appointment:



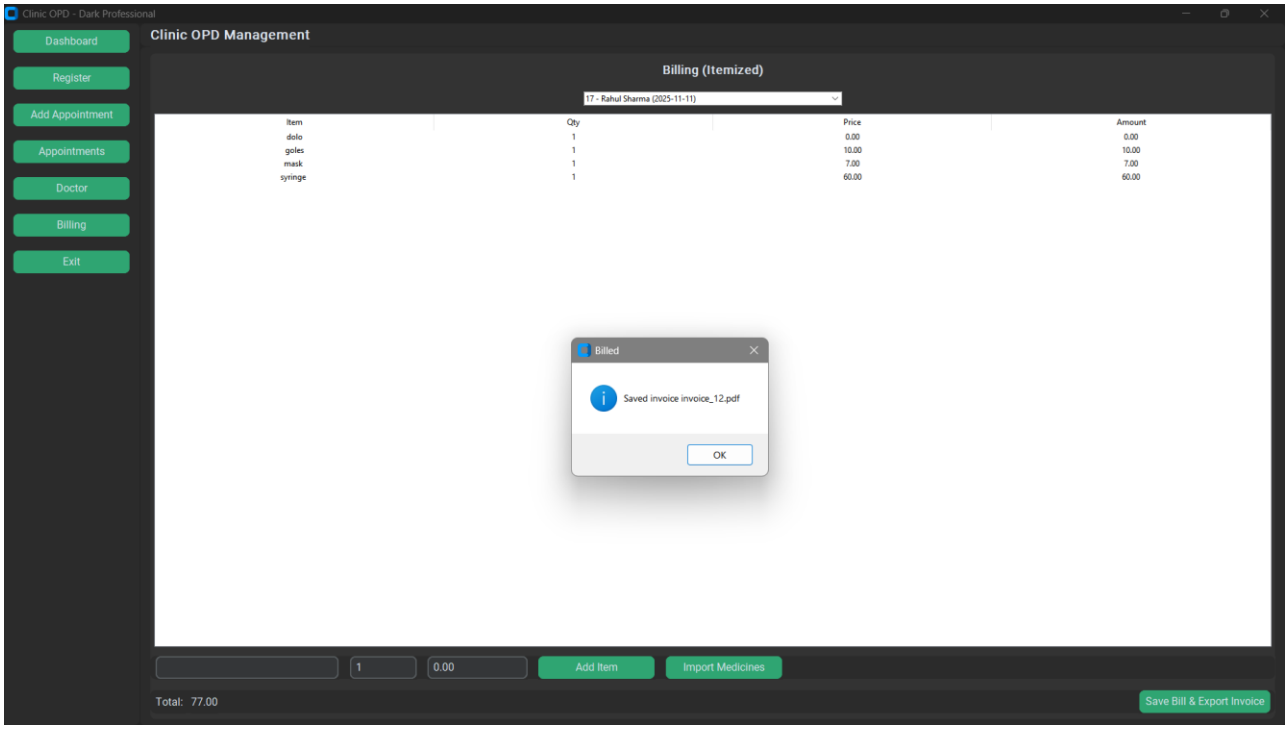
## Appintments:




## Doctor:



**Billing:**




### 4.3 Summary of Validation

| Test Type | Result |
|---|---|
| Functional Testing | All features working correctly |
| Database Validation | Data stored accurately with no loss or mismatch |
| User Acceptance Testing | System found easy, practical, and helpful |
| Performance Testing | System remains efficient even with large data |

# CHAPTER 5 CONCLUSION AND FUTURE WORK

## 5.1. Conclusion:

The **Clinic OPD Management System** was developed to streamline daily clinic operations and replace traditional manual workflows. Before implementation, clinics often faced issues such as disorganized patient records, unclear handwritten prescriptions, errors in billing, and difficulty in managing appointments. These inefficiencies could lead to delays and affect the quality of patient care.

The developed system resolves these issues by integrating **patient registration, appointment booking, prescription generation, billing, and dashboard analytics** into a single user-friendly software interface. Patient and appointment data are stored systematically, prescriptions are printed clearly, and billing is calculated automatically, reducing human error. The dashboard also provides quick insights into daily patient flow and clinic revenue.

Key improvements observed:

- **Faster and simplified patient registration**
- **Clear and standardized digital prescriptions**
- **Accurate itemized billing without calculation mistakes**
- **Easy retrieval of past patient and medical records**
- **More professional and organized clinic workflow**

This project also enhanced technical skills such as database design, GUI development, and modular programming. Overall, the system successfully meets its objective of **digitizing and improving OPD management**, making clinic operations more efficient and reliable.

## 5.2. Future work:

Although the system is functional, it can be enhanced further. Future improvements may include:

### 5.2.1 Multi-Doctor & Multi-Clinic Support

Ability to manage multiple doctors, schedules, and branches through the same system.

### 5.2.2 Patient Online Portal

Patients can book appointments, view prescriptions, and track follow-ups online.

### 5.2.3 SMS / WhatsApp Alerts

Automatic reminders for appointments, follow-up visits, or medication schedules.

### 5.2.4 QR / Barcode Patient ID

Quick patient identification to speed up OPD processing and record retrieval.

### 5.2.5 Cloud Data Backup

Automatic syncing and secure cloud-based record storage accessible from anywhere.

### 5.2.6 Advanced Analytics

Disease trend visualization, seasonal illness reports, and revenue forecasting.

**Final Statement**

The Clinic OPD Management System enhances clinic workflow, reduces manual effort, and improves patient care quality. With continued enhancements, it has the potential to evolve into a **complete hospital management platform** capable of supporting larger healthcare setups in the future.

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