Faculty of Engineering & Technology

Electrical & Computer Engineering Department

Linux Laboratory – ENCS3130

Project 1 – Shell Scripting

Medical Test Management System

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Abstract

This project presents the development of a shell scripting-based system designed to efficiently manage and retrieve medical test data for individual patients. The system acts as a basic patient record management tool, focusing on test results, and offers a variety of functionalities including adding new records, updating existing ones, deleting outdated or incorrect entries, and retrieving specific test results based on patient ID or test type. The system also provides the capability to search for abnormal test results, calculate average test values, and validate user inputs to ensure data integrity.

A key feature of the system is its error handling mechanism, which accounts for invalid file names, non-existent tests, and other potential issues. Data validation is meticulously implemented to ensure accurate data entry, including enforcing correct data types for patient IDs and test dates. The system uses a text-based menu interface, allowing users to interact easily and perform operations efficiently. This project demonstrates the practical application of shell scripting in the healthcare domain, offering a streamlined approach to managing patient medical records.

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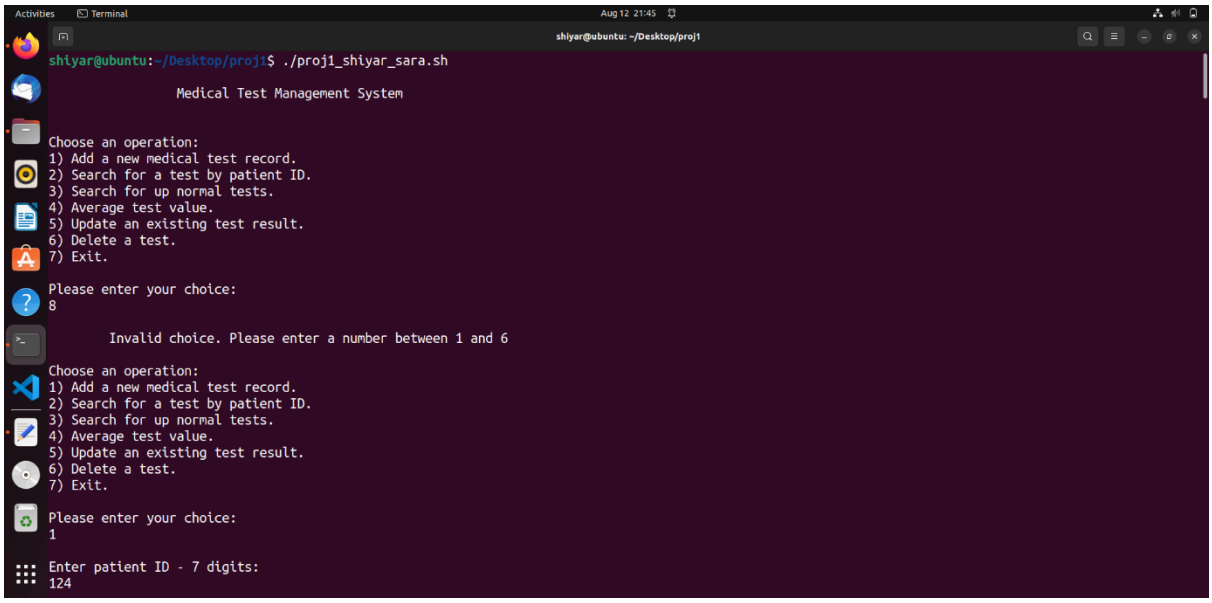
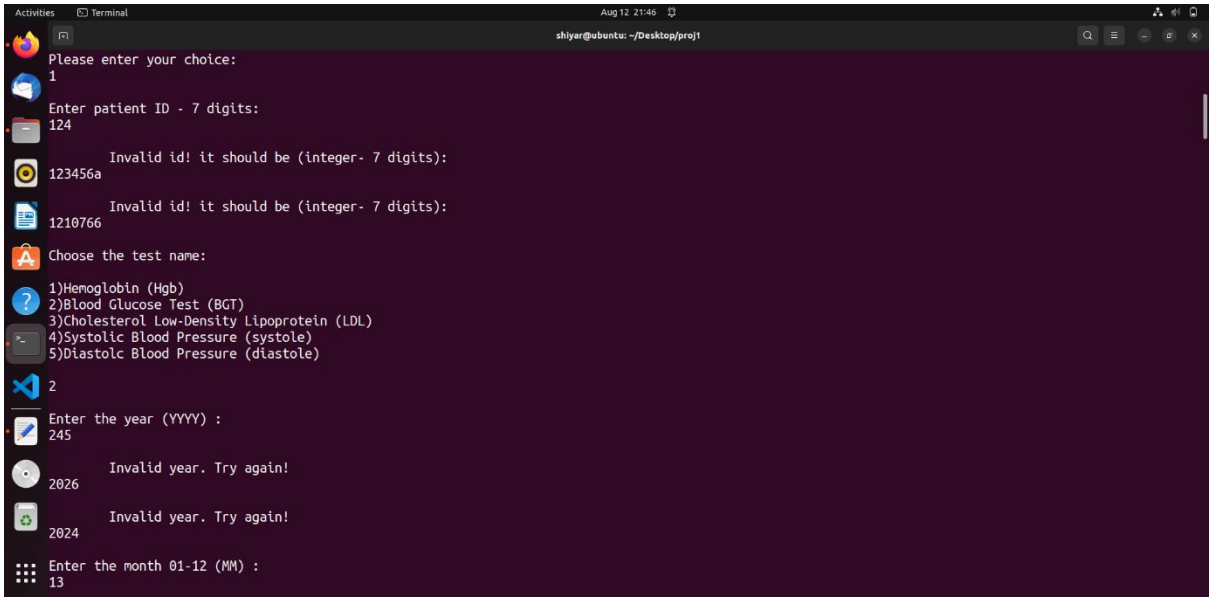
Testing Examples and Explanation

1. Add a new medical test record





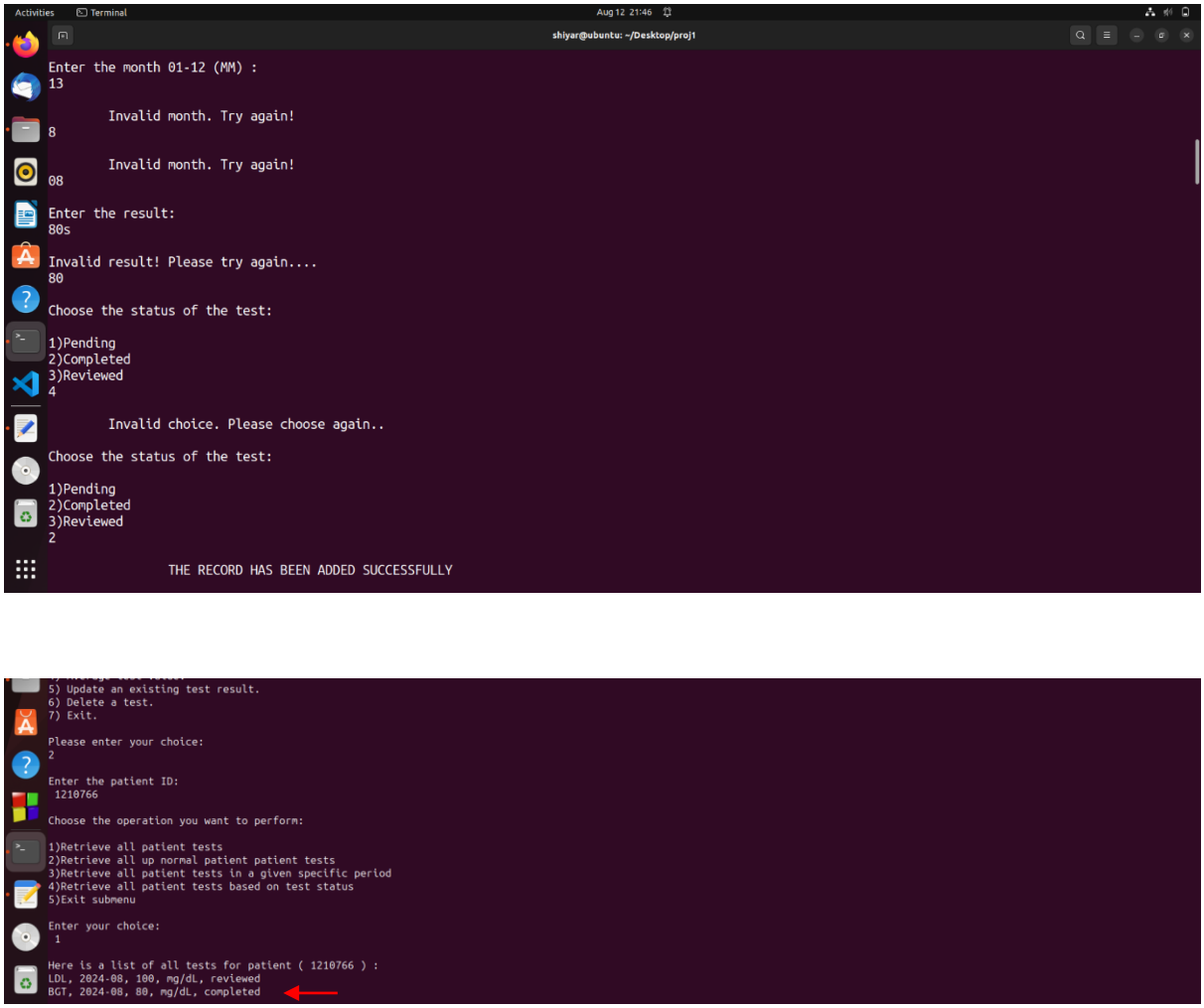


Figure 1 : Add a new medical test record

- **Explanation**

When the Medical Test Management System is launched, it presents a menu with several operations, such as adding new test results, updating existing records, deleting records, and retrieving specific test results based on patient ID or test type. If the user selects an option that is not listed, the system will display an error message: "Invalid choice. Please enter a number between 1 and 6." The user is then allowed to try again.

If the user selects the first operation, "Add a New Medical Test Record", the system will prompt for the required data. The first input required is the patient ID, which must be a fixed 7-digit number. If the user enters a number with fewer or more than 7 digits, or includes any non-numeric characters, an error message will be displayed: "Invalid

ID! It should be an integer with 7 digits". The user will then be prompted to enter the ID again.

Next, the system will ask for the medical test name. A list of available tests will be shown, and the user can select the desired test. After this, a date must be entered in the format (YYYY-MM). If the user enters a year greater than 2024 or in an incorrect format, the system will display an error message: "Invalid year. Try again!" Similarly, for the month section, if the user enters a month less than 1, greater than 12, or not in the "MM" format, an error message will appear: "Invalid month. Try again!"

For the test result section, if anything other than an integer or float number is entered, the system will display an error message: "Invalid result! Please try again". Finally, the system will prompt for the status of the test. A menu of available statuses will be displayed, and the user can choose the desired status. If the user selects an option that is not listed, the system will show an error message: "Invalid choice. Please choose again".

If all the sections are filled out correctly, the system will confirm with the message: "The record has been added successfully".

2. Search for a test by patient ID

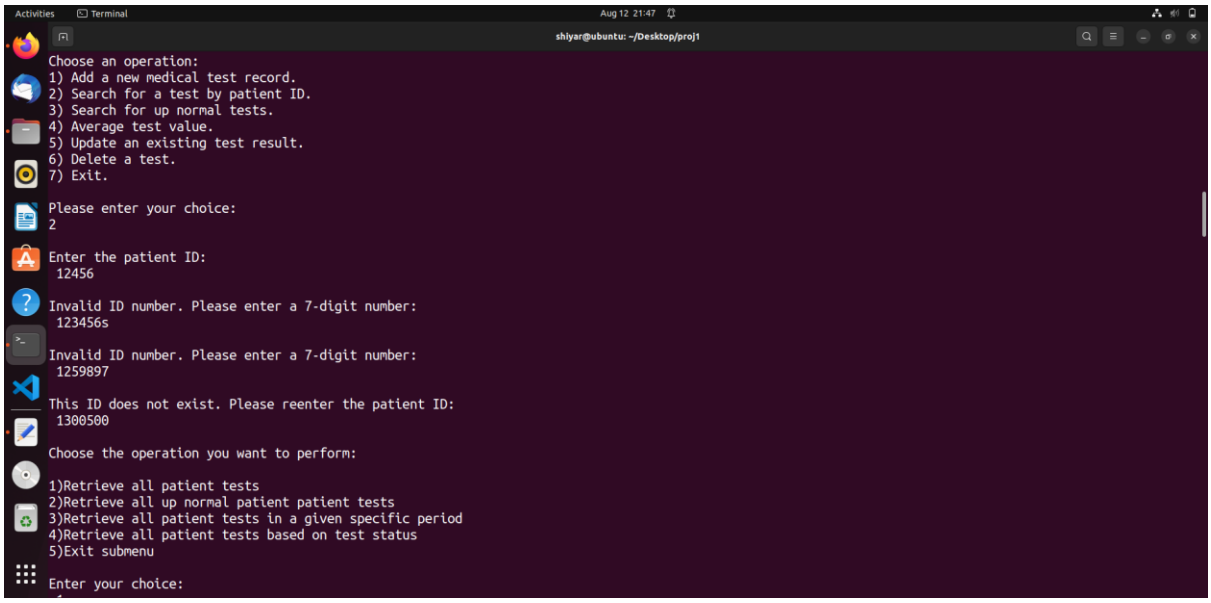


Figure 2 : Search for a test by patient ID

- **Explanation**

  If the user selects the second operation, "Search for a Test by Patient ID", the system will prompt for the necessary information. The first required input is the patient ID, as it serves as the basis for all subsequent operations. The patient ID must be a fixed 7-digit number. If the user enters a number with fewer or more than 7 digits or includes any non-numeric characters, an error message will be shown: "Invalid ID number. Please enter a 7-digit number". Additionally, if the user enters a 7-digit number that does not exist in the system, an error message will be displayed: "This ID does not exist. Please reenter the patient ID". The user will then be prompted to enter the ID again.

  Once a valid patient ID is entered, a submenu will appear, allowing the user to select the specific functionality they want the system to perform for the search.

2.1 Retrieve all patient tests

- **Example 1**

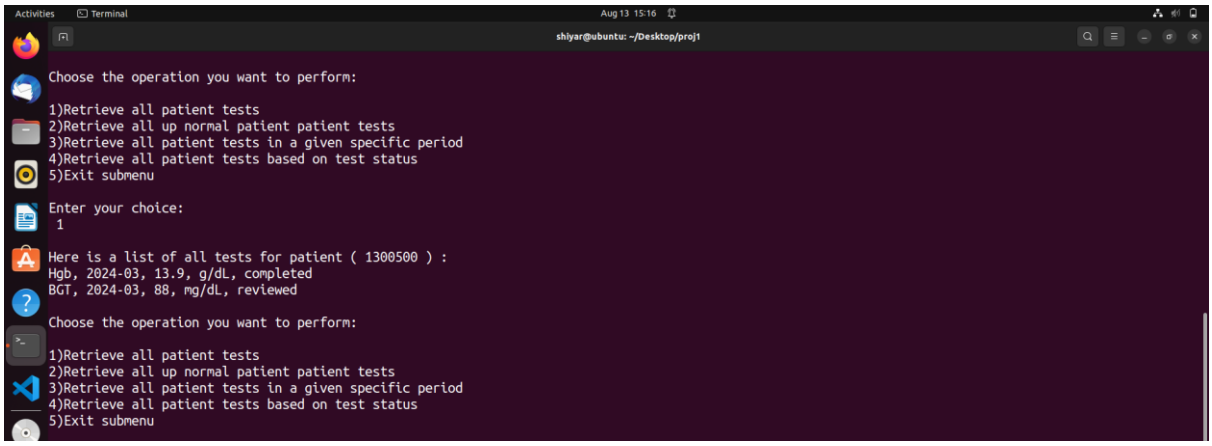


Figure3 : Search - Retrieve all patient tests - example 1

- **Example 2**

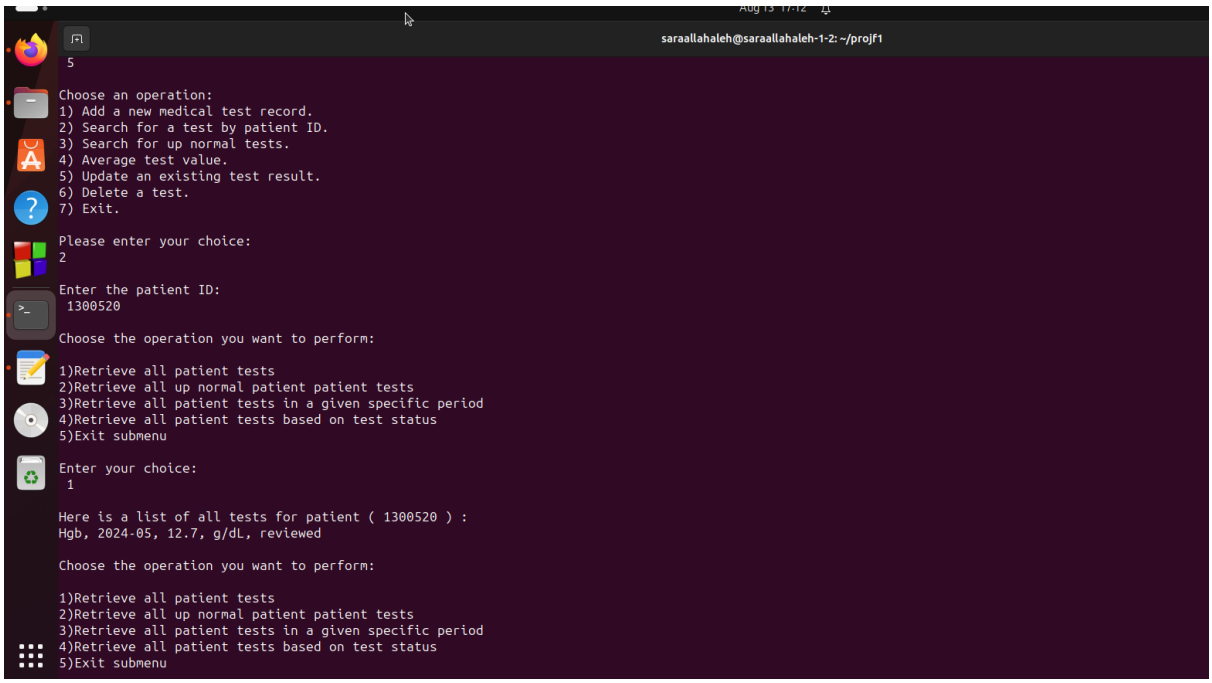


Figure4 : Search - Retrieve all patient tests - example 2

- **Explanation**

  If the user chooses the first option from the submenu, "Retrieve All Patient Tests", the system will search for the entered patient ID and retrieve all the medical test information associated with that patient.

2.2 Retrieve all up normal patient tests

- **Example 1**

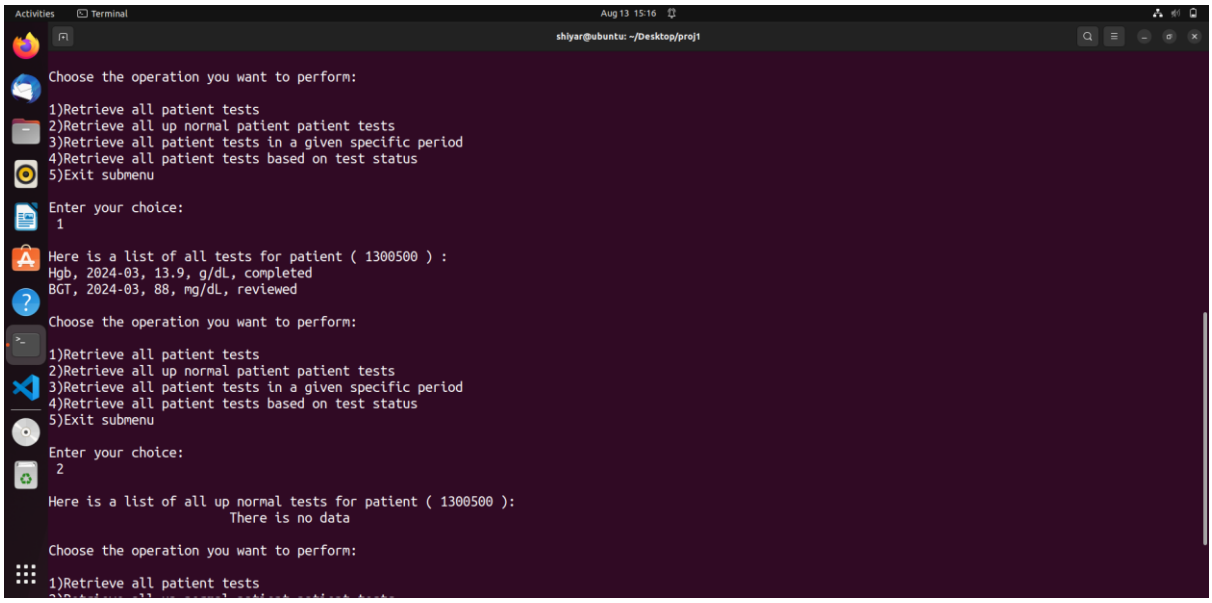


Figure5 : Search - Retrieve all abnormal patient tests - example 1

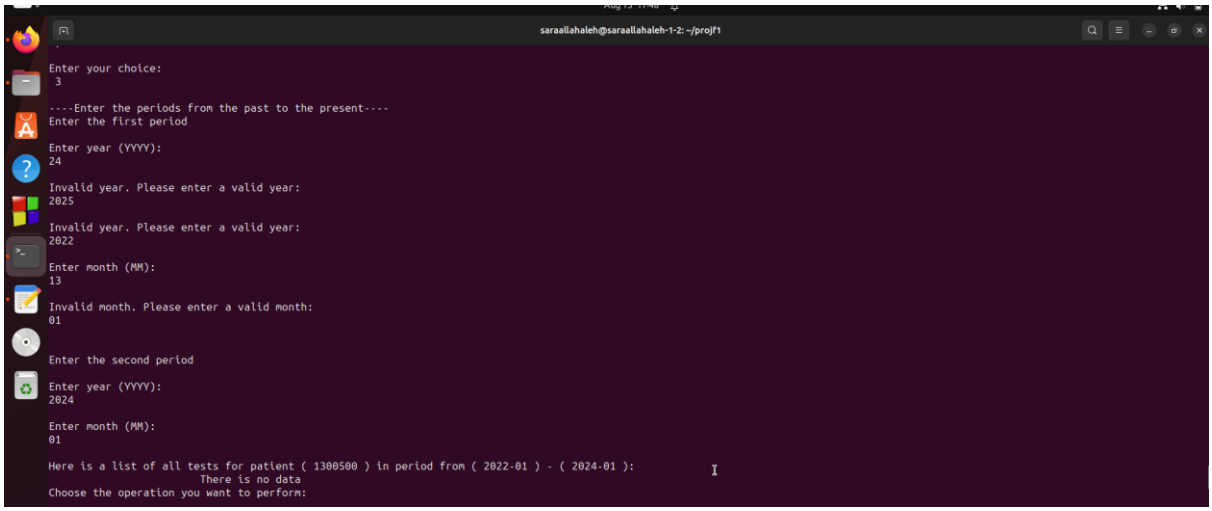
- **Example 2**

Figure6 : Search - Retrieve all abnormal patient tests - example 2

- **Explanation**

  If the user selects the second option from the submenu, "Retrieve All Abnormal Patient Tests", the system will search for the entered patient ID and retrieve all test results that are abnormal. These abnormal results are identified by comparing the patient's test values to the normal ranges stored in the medical test file. If the patient does not have any abnormal test results, the system will return a message stating that there is no data.

2.3 Retrieve all patient tests in a given specific period



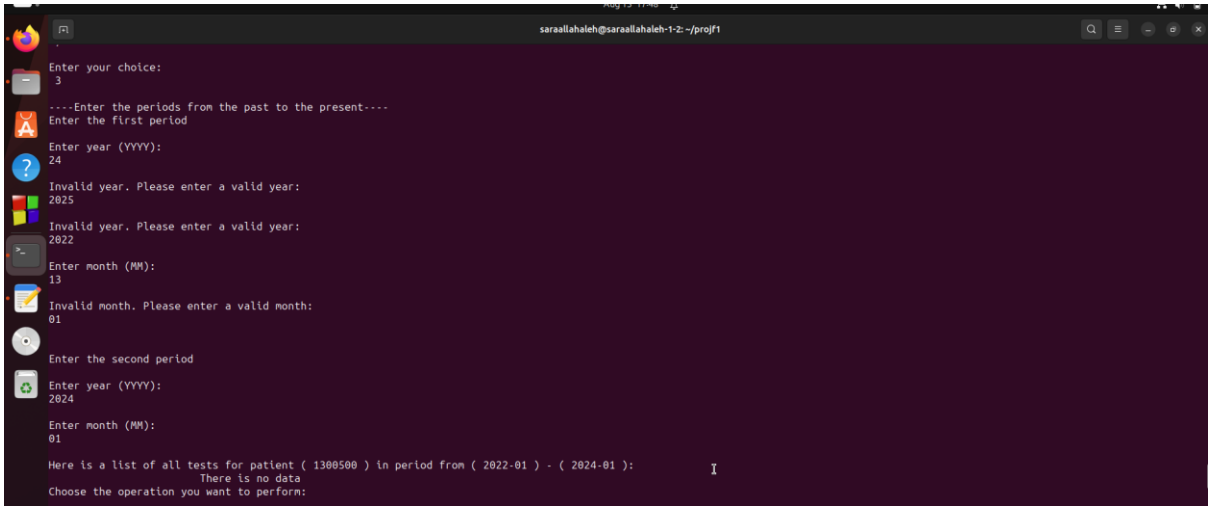


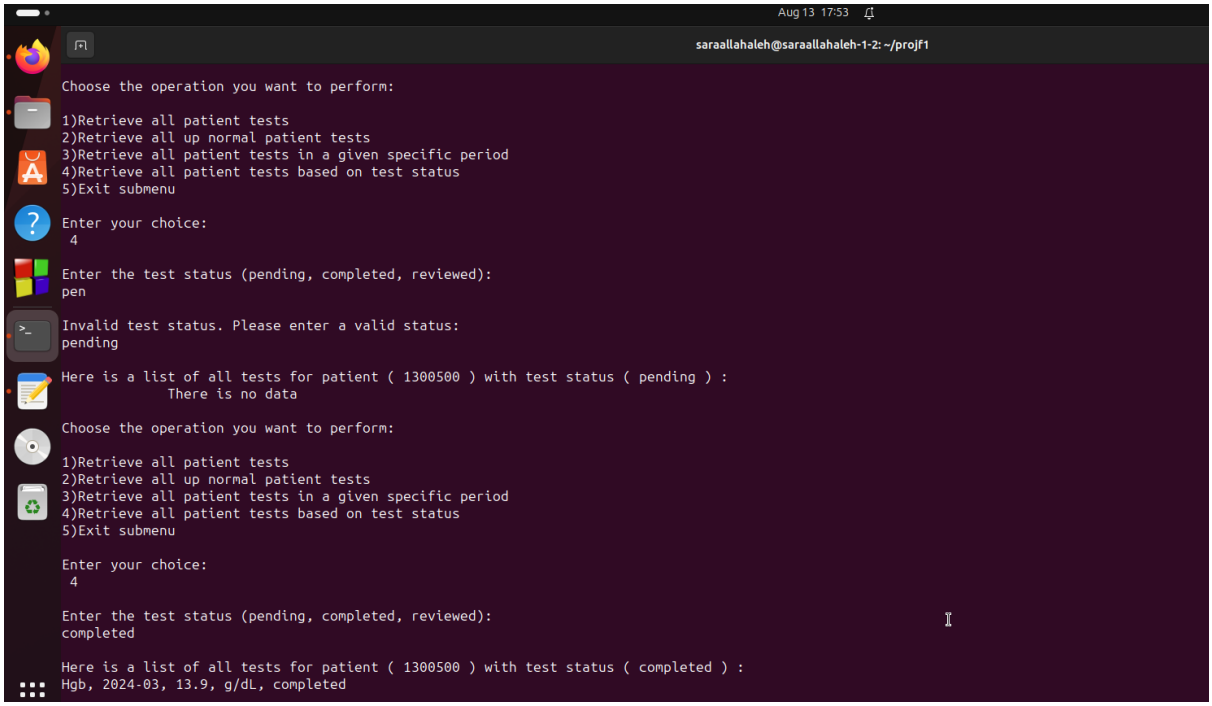
Figure 7 : Search - Retrieve all patient tests in a given specific period

- **Explanation**

  If the user selects the third option from the submenu, "Retrieve All Patient Tests in a Given Specific Period", the system will prompt the user to enter the first date (the earlier period) in the format (YYYY-MM). If the user enters a year greater than 2024 or uses an incorrect format, the system will display an error message: "Invalid year. Please enter a valid year". Similarly, for the month section, if the user enters a month less than 1, greater than 12, or not in the "MM" format, an error message will appear: "Invalid month. Please enter a valid month". The same validation applies for the second date (the later period).

  Once valid dates are entered for both periods, the system will search for the patient ID that was provided and retrieve all tests the patient underwent during that time frame. If no tests were performed by the patient within that specific period, the system will display a message indicating that there is no data.

2.4 Retrieve all patient tests based on test status



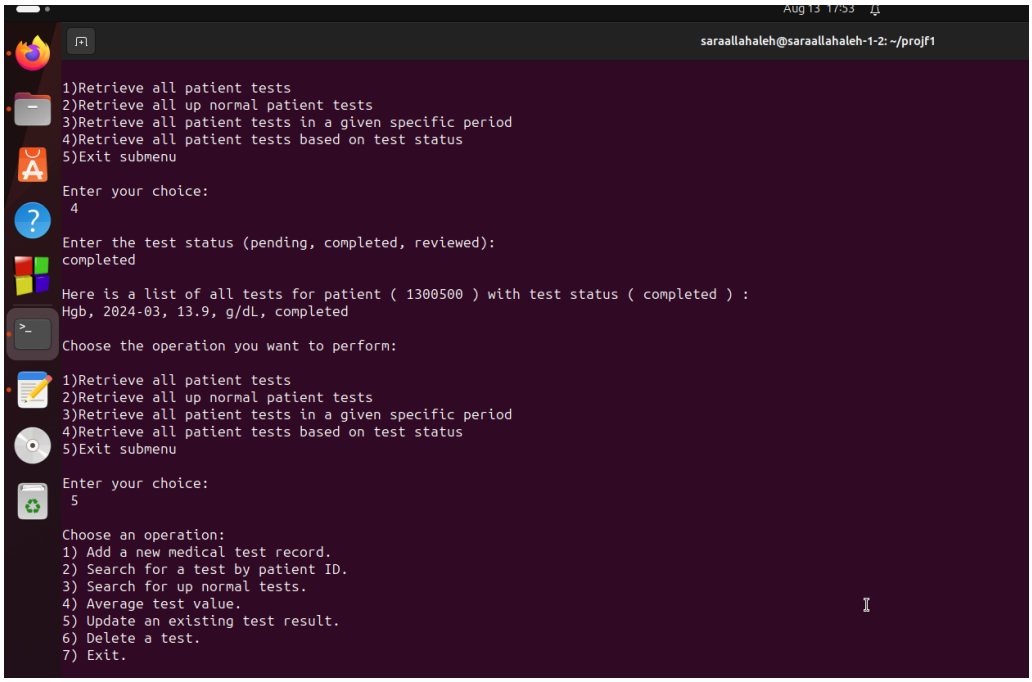


Figure 8 : Search - Retrieve all patient tests based on test status

- **Explanation**

  If the user selects the fourth option from the submenu, "Retrieve All Patient Tests Based on Test Status", the system will prompt the user to enter the test status they want to retrieve the patient's tests by. If the user enters anything other than "pending", "completed", or "reviewed" in these exact formats, the system will display an error message: "Invalid test status. Please enter a valid status".

  Once the user enters a valid status, the system will search for the entered patient ID and retrieve all tests associated with the specified status. If the patient does not have any tests with the entered status, the system will display a message indicating that there is no data.

3. Searching for up normal tests

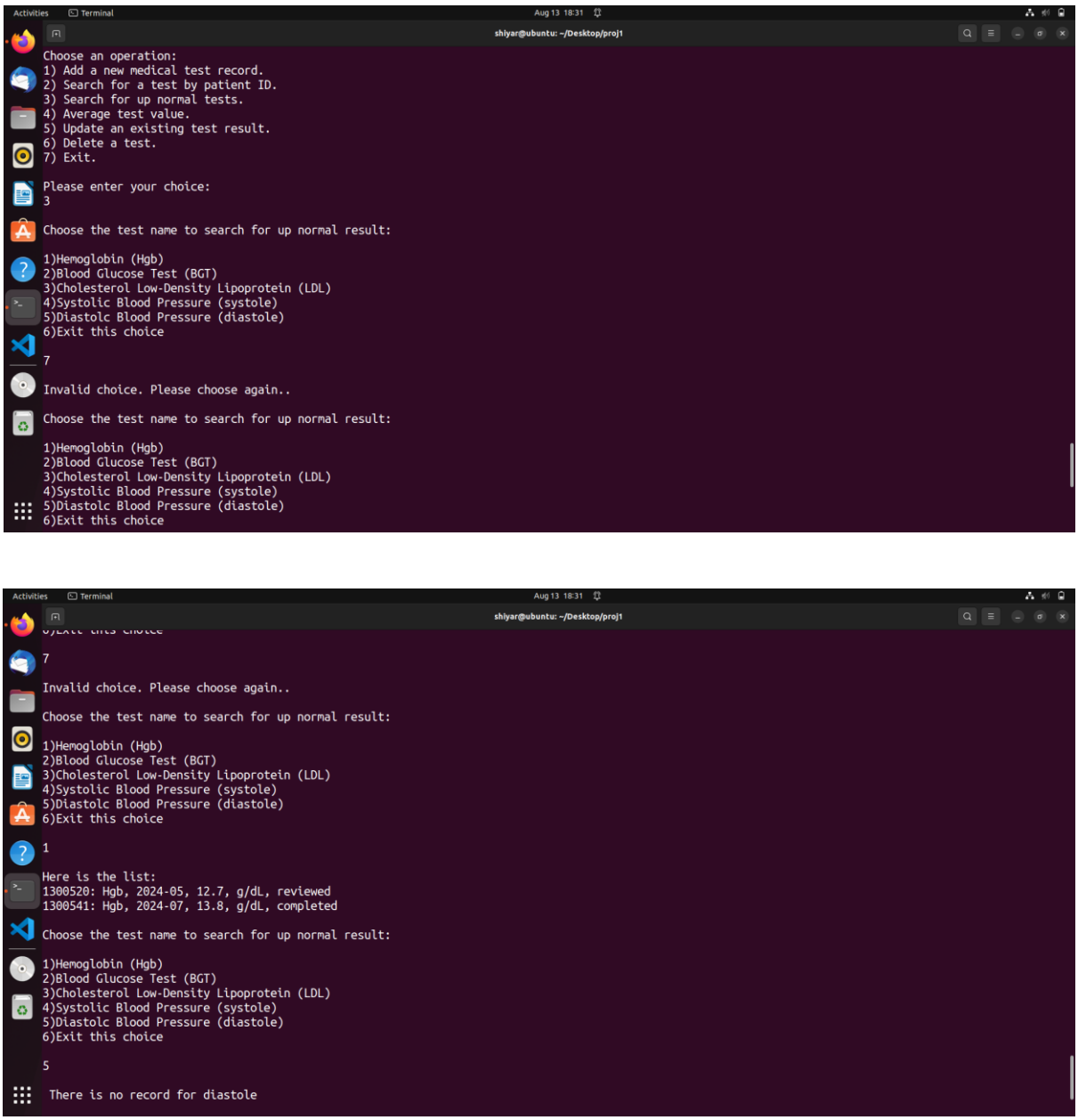


Figure 9: Searching for up normal patient tests

- **Explanation**

  If the user selects the third operation from the main menu, "Search for Abnormal Tests", the system will display a list of all available test names. If the user selects a number that is not in the displayed list, the system will show an error message: "Invalid choice. Please choose again".

Once the user enters a valid choice, the system will perform a search based on the selected test name and retrieve all patients, along with their medical test details, who have undergone the chosen test.

4. Average test value

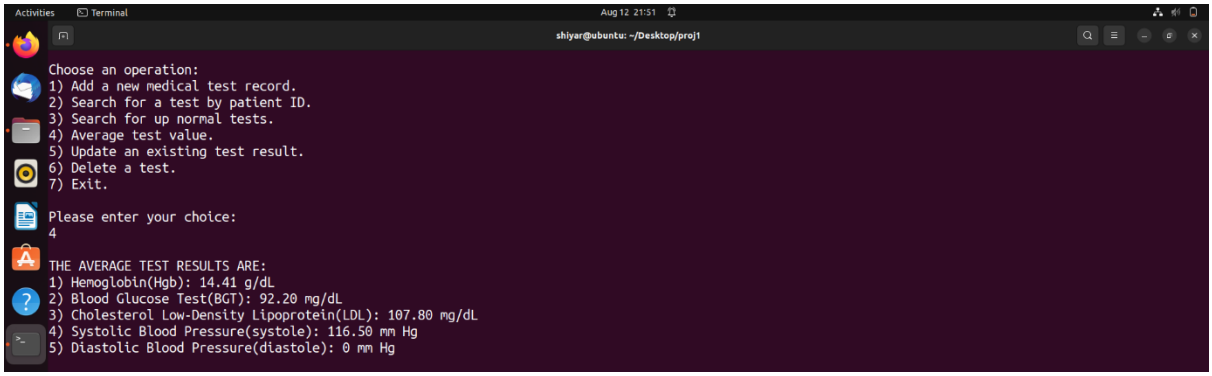
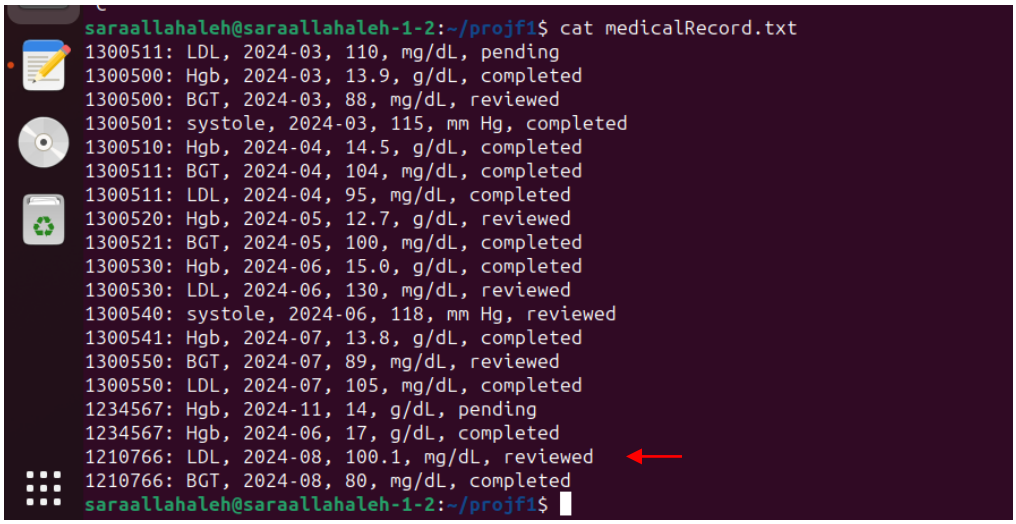


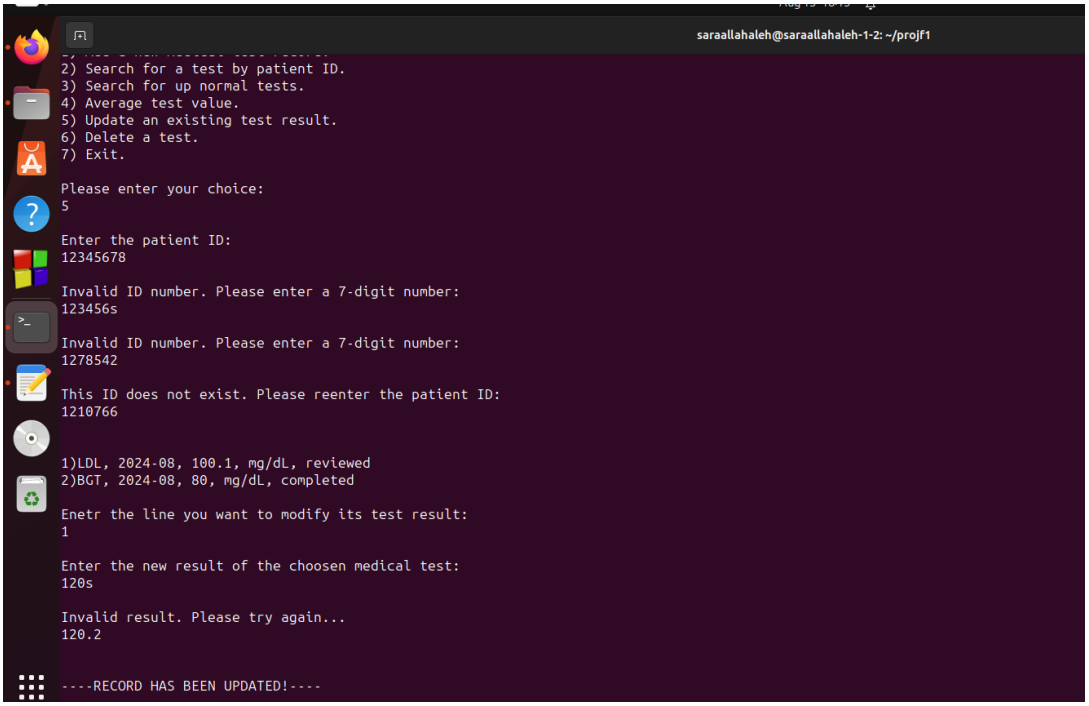
*Figure **10** : Average test value*

- **Explanation**

  If the user selects the fourth operation from the main menu, "Average Test Value", the system will display a list of all available medical tests along with their average values.

5. Update an existing test result





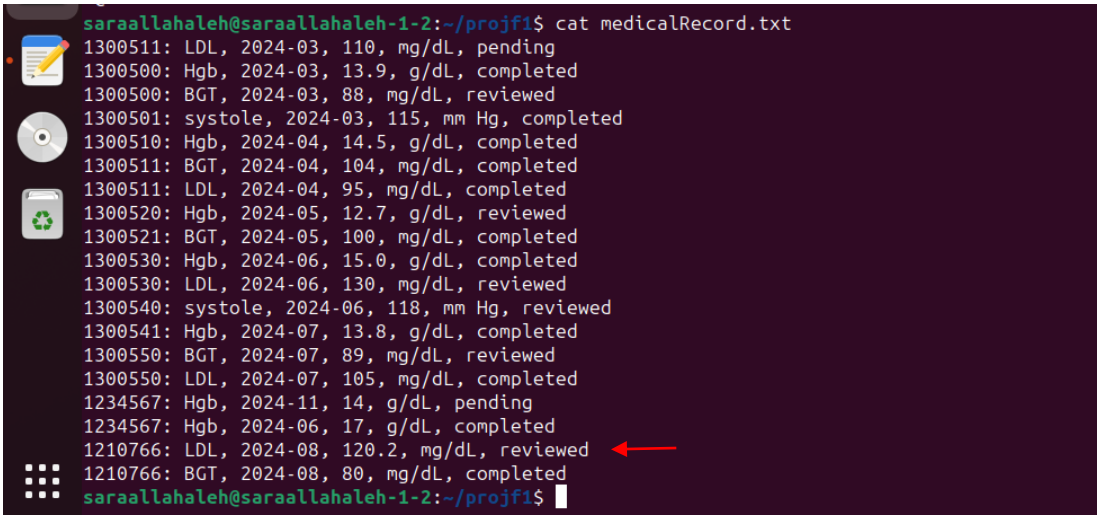


*Figure **11** : Update an existing test result*

- **Explanation**

If the user selects the fifth operation from the main menu, "Update an Existing Test Result", the system will first prompt for the patient ID, which is necessary for all subsequent actions. The patient ID must be a fixed 7-digit number. If the user enters a number with fewer or more than 7 digits or includes any non-numeric characters, the system will display an error message: "Invalid ID number. Please enter a 7-digit number". Additionally, if the user enters a 7-digit number that does not exist in the

system, an error message will be shown: "This ID does not exist. Please reenter the patient ID". The user will then be prompted to enter the ID again.

Once a valid patient ID is provided, a list of the patient's medical details will be displayed. The user must then choose which test result they want to modify. After selecting the test result, the user should enter the new value. If the user inputs anything other than an integer or float, an error message will appear: "Invalid result. Please try again".

If a valid test result is entered, the system will display the message: "Record has been updated!"

6. Delete an existing test record

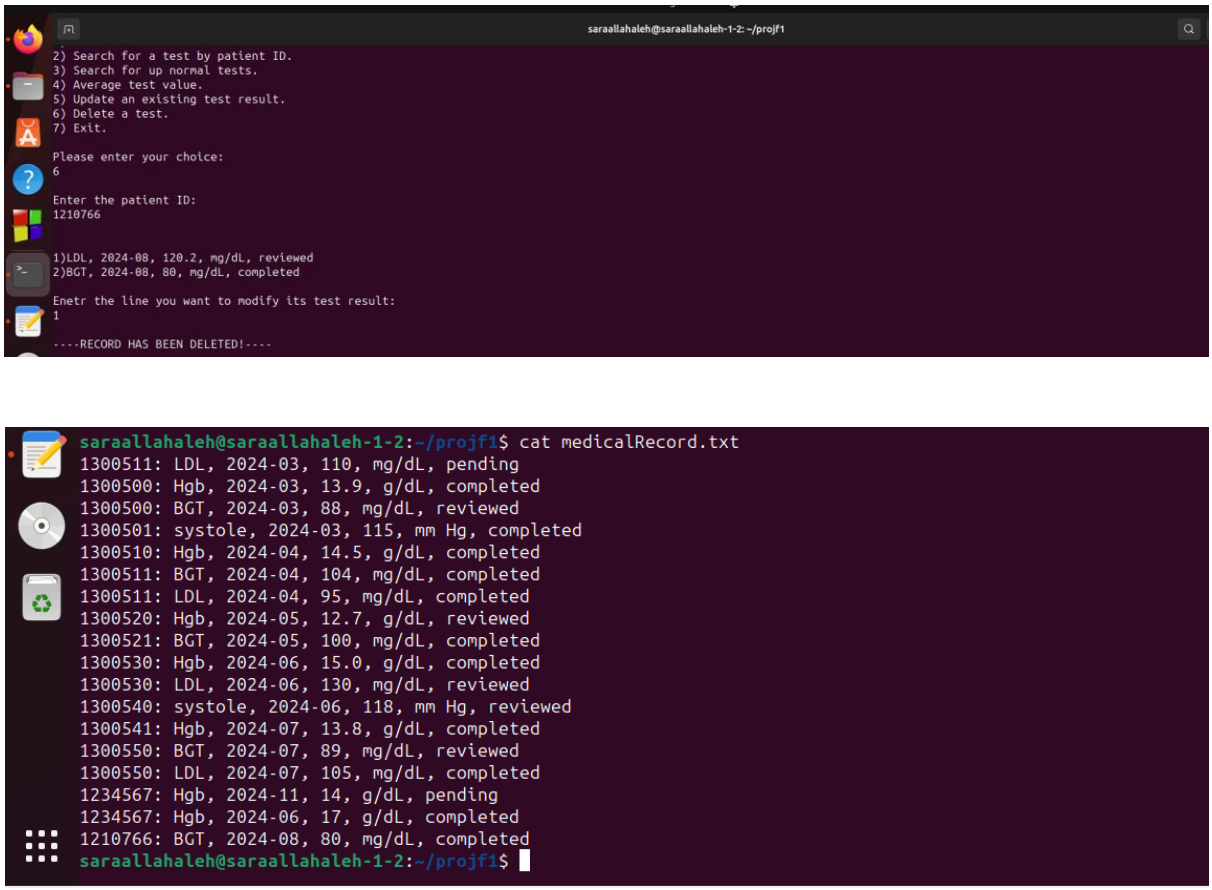


*Figure **12** : Delete an existing patient record*

- **Explanation**

  If the user selects the sixth operation from the main menu, "Delete an Existing Test Result", the system will first prompt for the patient ID, which is necessary for all subsequent actions. The patient ID must be a fixed 7-digit number. If the user enters a number with fewer or more than 7 digits or includes any non-numeric characters, the system will display an error message: "Invalid ID number. Please enter a 7-digit number". Additionally, if the user enters a 7-digit number that does not exist in the system, an error message will be shown: "This ID does not exist. Please reenter the patient ID". The user will then be prompted to enter the ID again.

  Once a valid patient ID is provided, a list of the patient's medical details will be displayed. The user must then choose which test result they want to delete. After making a selection, the system will display the message: "Record has been deleted!"

Conclusion

This project successfully demonstrates the creation of a shell scripting-based system for managing and retrieving medical test data, providing an efficient and reliable solution for patient record management. By implementing key features such as data validation, error handling, and a user-friendly text-based menu, the system ensures that medical records are accurately maintained and easily accessible. The ability to search for abnormal test results, calculate averages, and handle a variety of patient queries further enhances its functionality.

Overall, the project highlights the versatility of shell scripting in addressing real-world challenges within the healthcare domain. The system's design can be expanded or integrated into more complex healthcare management systems, underscoring the potential for further development and application in clinical environments.