A Project Report

on

VACCINE MANAGEMENT SYSTEM

Submitted in partial fulfillment of the
requirement for the award of the degree of

Bachelor of Technology in Computer Science and Engineering

(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

Under The Supervision of
Ms. Kiran Singh
Professor
Department of Computer Science and Engineering

Submitted By

Deepak Sahu (18SCSE1010286)
Divyankar Sharma (18SCSE1010374)

SCHOOL OF COMPUTING SCIENCE AND ENGINEERING DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
GALGOTIAS UNIVERSITY, GREATER NOIDA INDIA
May , 2022

SCHOOL OF COMPUTING SCIENCE AND ENGINEERING
GALGOTIAS UNIVERSITY, GREATER NOIDA

CANDIDATE'S DECLARATION

I/We hereby certify that the work which is being presented in the project, entitled **"VACCINE MANAGEMENT SYSTEM"** in partial fulfillment of the requirements for the award of the **BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE AND ENGINEERING** submitted in the School of Computing Science and Engineering of Galgotias University, Greater Noida, is an original work carried out during the period of **JANUARY-2022 to MAY-2022**, under the supervision of Ms. Kiran Singh, Professor, Department of Computer Science and Engineering/Computer Application and Information and Science, of School of Computing Science and Engineering , Galgotias University, Greater Noida .

The matter presented in the project has not been submitted by me/us for the award of any other degree of this or any other places.

Deepak Sahu(18SCSE1010286)

Divyankar Sharma(18SCSE1010374)

This is to certify that the above statement made by the candidates is correct to the best of my knowledge.

Ms. Kiran Singh
Professor

CERTIFICATE

The Final Project Viva-Voce examination of **Deepak Sahu(18SCSE1010286) and Divyankar Sharma(18SCSE1010374)** has been held on_____and his/her work is recommended for the award of **BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE AND ENGINEERING.**

Signature of Examiner(s) **Signature of Supervisor(s)**

Signature of Project Coordinator **Signature of Dean**

Date:

Place: Greater Noida

Abstract

The domestic vaccine manufacturing industry of India has put in all efforts to develop and manufacture COVID-19 vaccines. The vaccines that have been granted permission for restricted use in emergency situation by the National Regulator, i.e. Central Drugs Standard Control Organization (CDSCO) and are being used in the National COVID-19.A unique digital platform Co-WIN supports the COVID-19 vaccination initiative, helping the programmer managers in registration and tracking of every beneficiary of COVID-19 vaccination and every vaccination event along with real time information on the available stocks of vaccine, their storage temperature, actual vaccination process, generation of digital certificates, etc. Co-WIN app serves as the single source of truth for all data related to beneficiaries, vaccines and vaccination. The WHO has come up with an EVM (Effective Vaccine Management) initiative. VMS 2.0 focuses on providing qualitative vaccines in the lowest possible time. The prime objectives of this initiative include: Providing immunization supply chains for every country ,Ensure vaccines quality, and Increased supply chain efficiency for proper distribution . Vaccine management software helps in the above processes. It is a GUI based system which streamlines the flow of vaccine management. It helps in improving vaccine tracking, inventory management, and managing the vaccines. Moreover, it also identifies the vaccinated patients and follows up on their conditions. The main objective of this vaccine management project is to manage all the data which are present in the vaccine centre. This project is for a simple hospital who find hard to manage All the data .So this project can be used as a reference for making a large database.

Table of Contents

TABLE OF TABLES

List of Figures

Acronyms

COVID19	**Coronavirus Disease 2019**
CDSCO	**Central Drugs Standard Control Organization**
Co-WIN	**Covid Vaccine Intelligence Network**
WHO	**World Health Organization**
EVM	**Effective Vaccine Management**
GUI	**graphical user interface**
VMS	**Vaccine Management System**

CHAPTER-1

Introduction

1.1 Introduction:

The first case of COVID-19 was detected in December 2019 in China and it soon spread across the World. The outbreak was declared a Public Health Emergency of International concern in January 2020, and a pandemic in March 2020. The Government of India took proactive steps to respond to the pandemic and initiated the preparedness of the health system to respond to all aspects of COVID-19 management. India managed to maintain lowest positivity and mortality rates coupled with one of the highest recovery rate globally during the pandemic. The country's public health efforts were strongly supported by its research and development capacity in developing vaccines against COVID-19. The planning of vaccination drive started well in advance based on scientific evidence and global best practices.

Government of India is taking all necessary steps to ensure that we are prepared well to face the challenge and threat posed by the growing pandemic of COVID-19 the Corona Virus. The most important factor in preventing the spread of the Virus locally is to empower the citizens with the right information and taking precautions as per the advisories being issued by Ministry of Health & Family Welfare.

In addition to review of the data for regulatory purposes, the evidence must also be reviewed for the purpose of policy recommendations on how the vaccines should be used.

The vaccines must be manufactured in large quantities, which are a major and unprecedented challenge – all the while continuing to produce all the other important life-saving vaccines already in use.

1.2 Formulation of Problem:

Vaccination in India is going on; many people are taking vaccine on their own turn.
So, we need the database and program to manage the record of vaccines. We can use project like vaccine management system for managing record of

millions of people who are getting vaccines. So this project can be used as a reference for making a large database.

1.2.1 Tool and Technology Used:

Software requirement specification considers all the phases of the software Life cycle, which begins with a formal problem specification, and programmers to the design of a solution, it simple implementation as a program, testing of the program and maintenance. Software engineer develop software tools and collections of tools called programming environments to improve the development process. For example, tools can help to manage the many components of a large program that Is being written by a team of programmers.
Software requirement specification is an abstract description of structured and methodological development and modification process applied to the main stages of producing and developing software.

REQUIREMENT ANALYSIS

The needs of users are called requirements. To make these requirements computerized into software, we need to specify the basic needs and wishes of users to do this we have to think about the problem domain of the system that user requests processes to do this, this is requirement engineering.

INPUT MEDIA AND DEVICE

Source data are input into the system through the keyboard. For example,If we fill the form of vaccinated people then we use the keyboard for input the required information.

CONTROLLING THE AMOUNT OF DATA

In this system reducing data requirement is a major concern. By reducing input requirement, we speed the entire process from data capture to processing to provide results to user.

AVOIDING DELAYS

When processing is delayed wing to data preparation or data entry the cause is called abbot tleneck. To avoid bottlenecks when designing input is one of the objectives of this system.

KEEPING THE PROCESS SIMPLE

In this system achievement of all the objectives are mentioned in the simplest possible manner which is user friendly.

SOFTWARE ENGEERING

Software engineering process required development software properly.It is important to understand the steps of system engineering. It helps to design a software develop a software properly.

1.2.2 SOFWARE REQUIREMENTS :

1. Software Used :- C++
2. IDE used :- CODE::BLOCKS
3. Concept used :- oop's& file handling in c++
4. Module Designed: -
   1. Main.cpp
   2. Vaccine.cpp
   3. Vaccinedoseregistration.cpp
   4. Searching.cpp
   5. Rapidcovidtest.cpp
5. External Headrefile :- "conios's versions" &conio source file.

1.2.3 HARDWARE REQUIREMENTS :

PROCESSOR:	**Intel**
RAM:	2 GB or More
HARDDISK:	500GB or more
OPERATING SYSTEM:	Window7,8,10,11

CHAPTER-2

Literature Surveys/Project Design

Various Research have been conducted that focused on vaccine management system. The summary of those researches are as following:

Johns Hopkins University & Medicine [1] COVID-19 dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU). he was trying to manage the vacceination and did research on it. But there project are not very userfriendly ,Coronavirus Resource Center, Johns Hopkins University & Medicine, 2021

Aaby, K., Herrmann, J. W., Jordan, C. S., Treadwell, M., & Wood, K. (2006). [2] tried to manage the vaccination clinics .Montgomery County's Public Health Service Uses Operations Research to Plan Emergency Mass Dispensing and Vaccination Clinics. Interfaces, 36 (6), 569-579. they were used very high technology for covid 19 vaccination but not user friendly .

Adida, E., Dey, D., & Mamani, H. (2013).[3] tried to solve Operational issues and network effects in vaccine markets.alse did research on how to manage the COVID 19 Vaccination . European Journal of Operational Research, 231 (2), 414 - 427.

Dan, JM, Mateus, J, Kato, Y, et al.[4] Immunological memory to SARS-CoV-2 assessed for up to 8 months after infection. Science 2021; 371(6529): eabf4063. tried to find that how to assesed the SARS-CoV-2 and then later on did research on covid 19 vaccination management system.

COVID-19 Vaccine AstraZeneca,[5] COVID-19 Vaccine (ChAdOx1-S [Recombinant]) (ed European Medicines Agency) . European Medicines Agency, 2021, https://www.ema.europa.eu/en/medicines/human/EPAR/vaxzevria-previously-covid-19-vaccine-astrazeneca, they tried to research on vaccine management and did survey on vaccination to collect the data ,but due to some wrong data, In the matter of vaccine management.the government has lost a huge amount .

Palacios, R, Batista, AP, Albuquerque, CS, et al.[6] Efficacy and safety of a COVID-19 inactivated vaccine in healthcare professionals in Brazil: the PROFISCOV study, 2021, https://europepmc.org/article/ppr/ppr341815.
This team did research on safty of a covid 19 and made an interface for covid vaccine management. But due to lack to good graphical user interface covid 19 patient suffer to book the covid 19 vaccine .

Research carried out by the WHO also made an estimate that if vaccination operations were to be widely and efficiently carried out, two million more deaths among children under the age of five years can be averted (WHO Publications,1985).

Globally, governments use different ways to manage and disseminate vaccines to their people.In the United States of America, the US Department of Health and Human Services implementation well efficient system which deals with Vaccine Inventory Management, Storage Unit Temperature Monitoring, Cold Chain Management as well as Staff Organization.

In this project we are trying to overcome the issue of cold management System and we are trying to fulfill the issues of the demand of the vaccine in this era .So we are creating some GUI and applications for the vaccination so that people can vaccinated and they are notify about their doses in this management System.

CHAPTER-3

Functionality/Working of Project

3.1 Basic Operations:

- User can give Rapid covid test.
- An User panel for registration of vaccination

.

- Option given for registration of second dose.
- Admin can manage the vaccine records and inventory.
- Proper searching of data.
- It would be fully file handled program with basic Update and delete operations.

3.2 Algorithms used:

At first on running the program you will see key controlled menu which you can control with left and right arrow keys There are 5 options in this menu:

1) Rapid covid test

2) 2nd dose registration

3) Exit option

4) Searching

5) Vaccine inventory

Menu: - 01 Rapid covid test: - First you have to give the Rapid covid test if you are entering in option one.

Step: - 01 In Rapid Covid Test you have to answer basic questions which are necessary for Knowing your rate of infection. On the basis of which program will decide that you will be eligible for vaccination.

It will show your Rate of being infected in Percentage % and the zone also :

If you are in green zone or in orange zone then you will be getting vaccine and if you are in red zone then you will not get the vaccine.

Step: - 02 After giving Rapid Covid Test If you are eligible for vaccination then you have to enter basic detail needed for vaccination like age, Aadhar number, name etc.After that the program will generate a unique reference id through which you can find your data and go for second dose of vaccination. In our program.

Menu: - 02: Get second dose – By pressing this option you can get your 2nd dose of vaccination. You just have to enter the unique reference Id which you get in first dose. By entering that you will be successfully get registered for 2nd dose of vaccination.

Menu: - 03: Exit - This will stop the program or end the program. After press Exit option program will terminate.

Menu: - 04: SEARCH DATA - In this you will get criteria to search the data of the vaccinated people.

1) By unique reference id: - By entering the unique reference Id which you got from your first dose registration you will get your all details printed on the screen.

2) By Aadhar: - You can simply type hype the Aadhar no the search the specific data of the person.

3) BY Age: - You can find the data in the list view of the people who are vaccinated of the search age criteria.

4) By Gender: - You can find the data in the list view of the people who are vaccinated of the search gender criteria.

5) By Profession: - You can find the data in the list view of the people who are vaccinated of the search profession criteria.

For this we are opening the main file in the read mode and calling the whole class and performing the search operation .

Menu: - 05: Manage vaccine Records - By pressing this option you will come to vaccine inventory option. Here you can manage the record of vaccines in vaccine management system.

It has a submenu which contains 5 functions.

3.3 GUI Used: -

We have used the header file conio2.h and conio3.h for GUI support in code blocks. It has many functions like textcolor(), textbackground(), gotoxy(), clrscr() etc. which were the vaccine function of conio.h.

Although the old version of conio.h header file does not support in code blocks IDE; So we have downloaded it explicitly and Used it in our program for creating the GUI.

Note: - We did not use the header file graphics.h for GUI support. The only thing we have used is just basic functions of header file conio.h.

Key control mechanism: -

We have controlled the left, right, up and down arrow keys using ASCII codes of the keys and we have controlled enter key also. By using this approach.

second dose Expected date: -

This is the best point of our program that it can automatically calculate the expected date of second dose of vaccination. By knowing the number of days gap between two doses of vaccines that you have entered while adding vaccine in the database.

For example: - “If you are taking covishield then minimum 84 days of gap is required so our program will automatically calculate the gap of 84 days and tell you expected date. By knowing the system date on which you took the first dose of vaccination.”

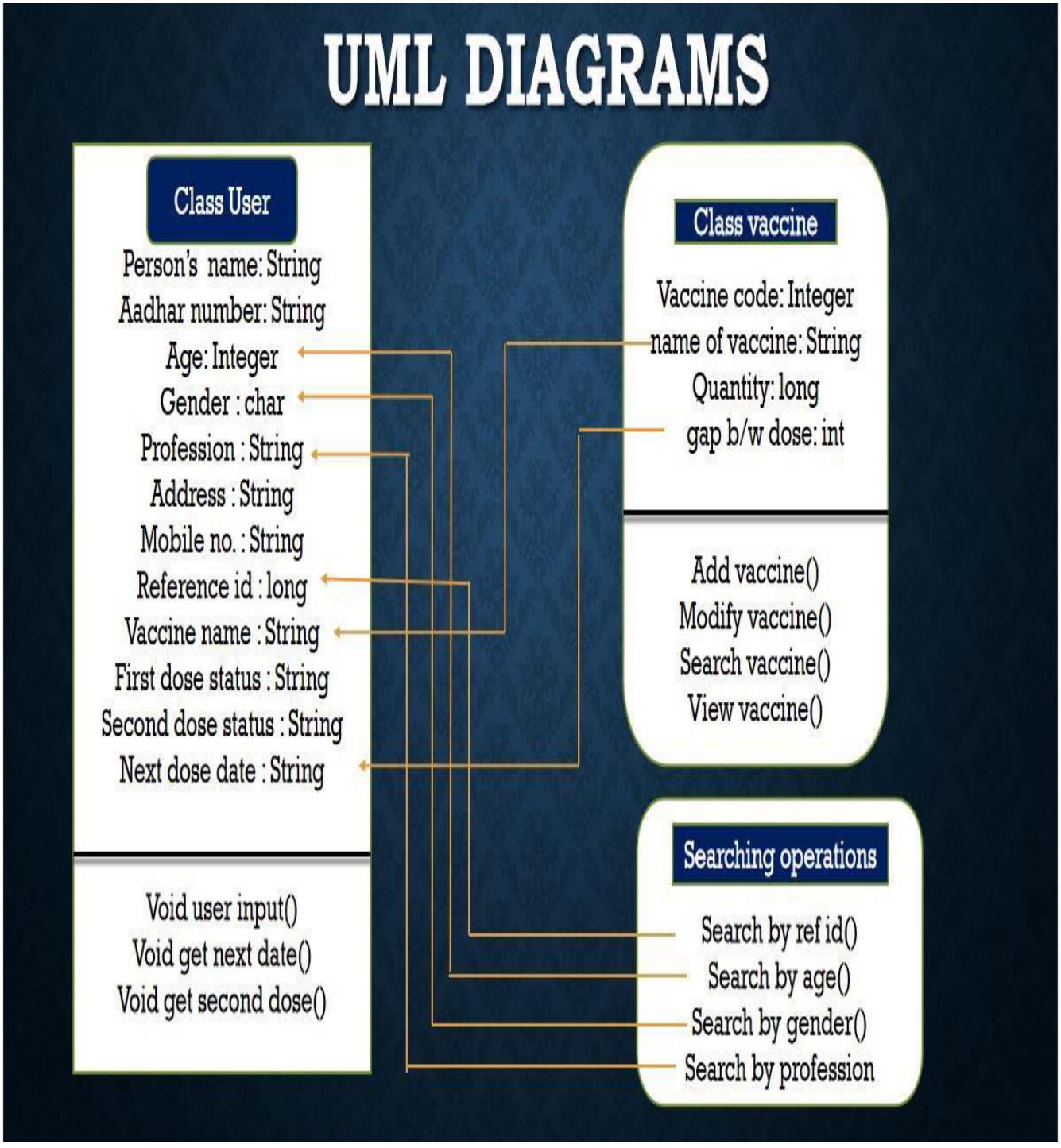
3.4 Special approach used for GUI :-

- We have used the header file conio2.h and conio3.h for GUI support in code blocks. It has many functions like textcolor(), textbackground(), gotoxy(), clrscr() etc. which were the vaccine function of conio.h.

- Although the old version of conio.h header file does not support in code blocks IDE; So we have downloaded it explicitly and Used it in our program for creating the GUI.

- **Key control :-** We have controlled the left, right, up and down arrow keys using ASCII codes of the keys and we have controlled enter key also. By using this approach.

3.5 Unified Modeling Language (UML) Diagram.

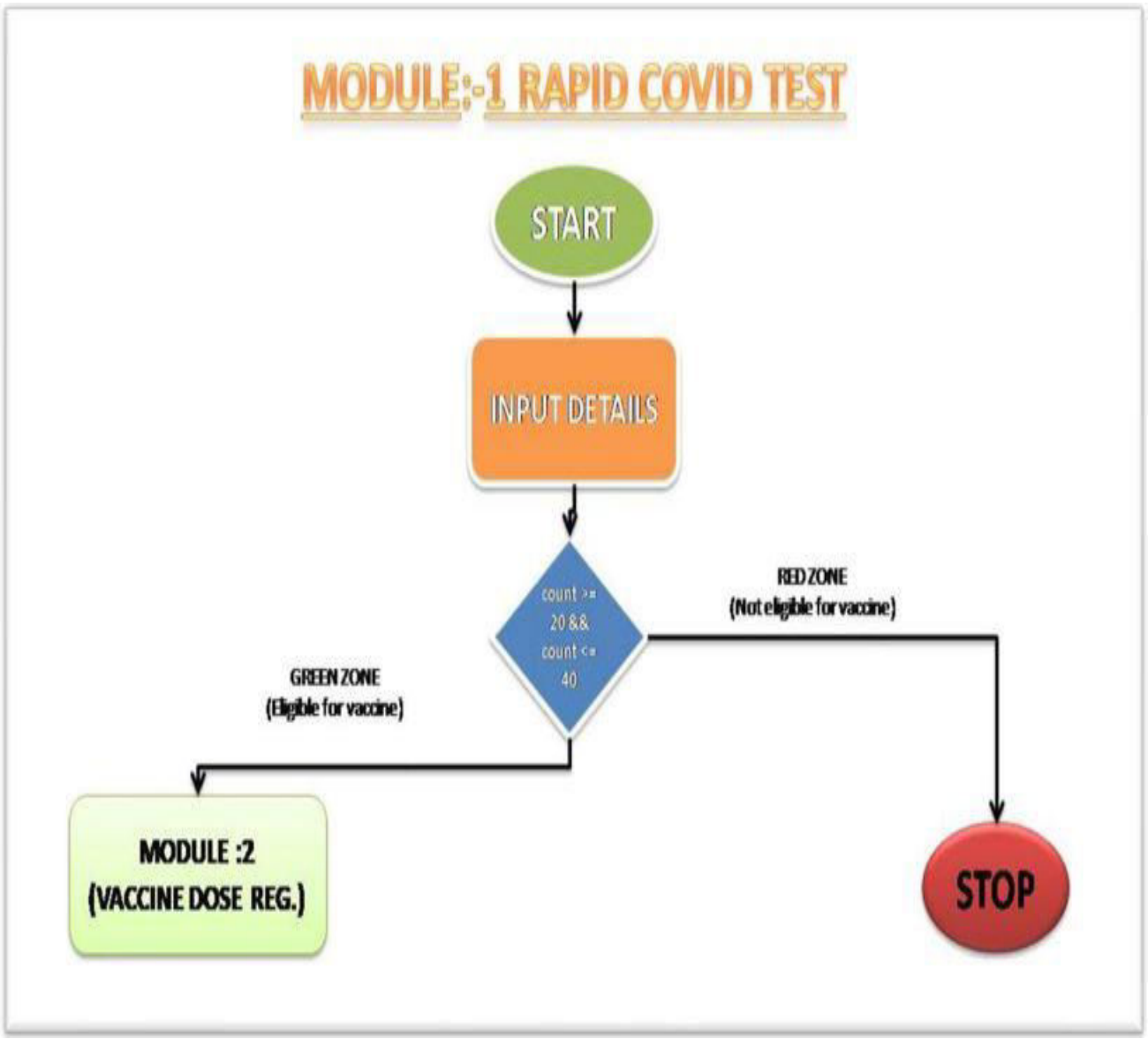


CHAPTER-4

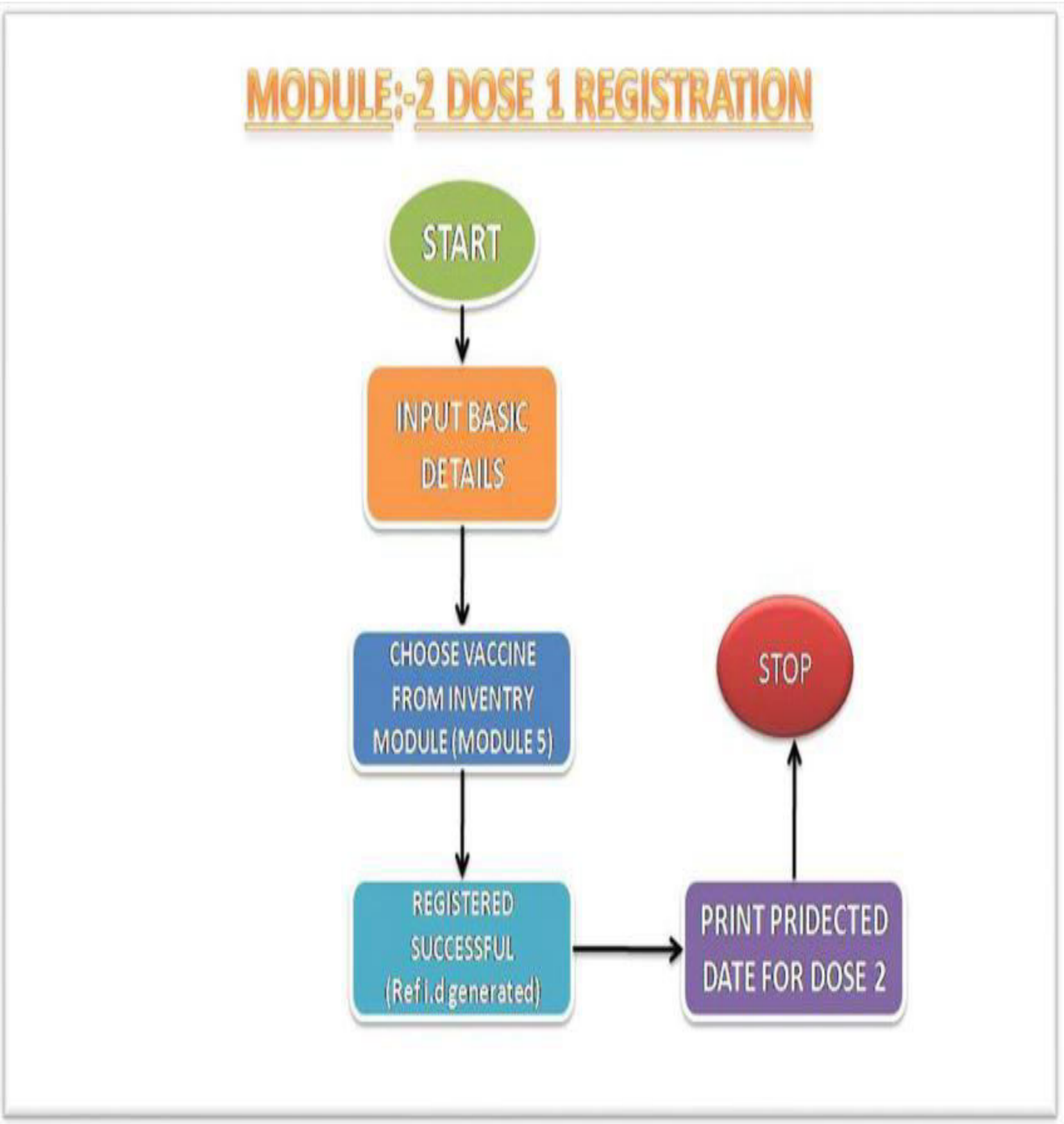
Modules Description/ Workflow Diagram

4.1 Workflow Diagram

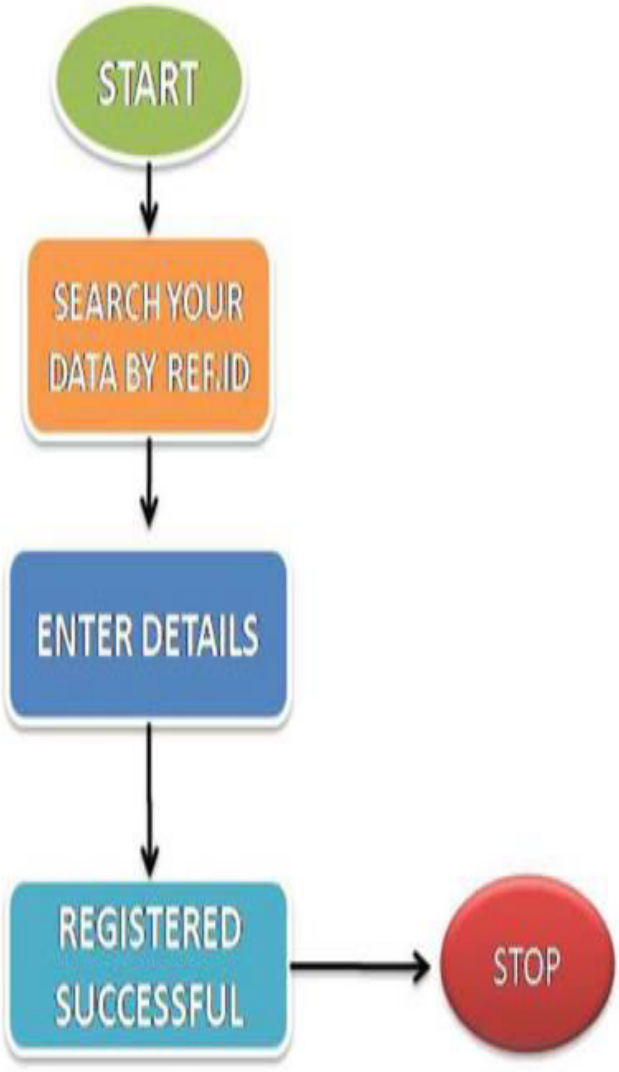
The workflow diagram for our project is given below:

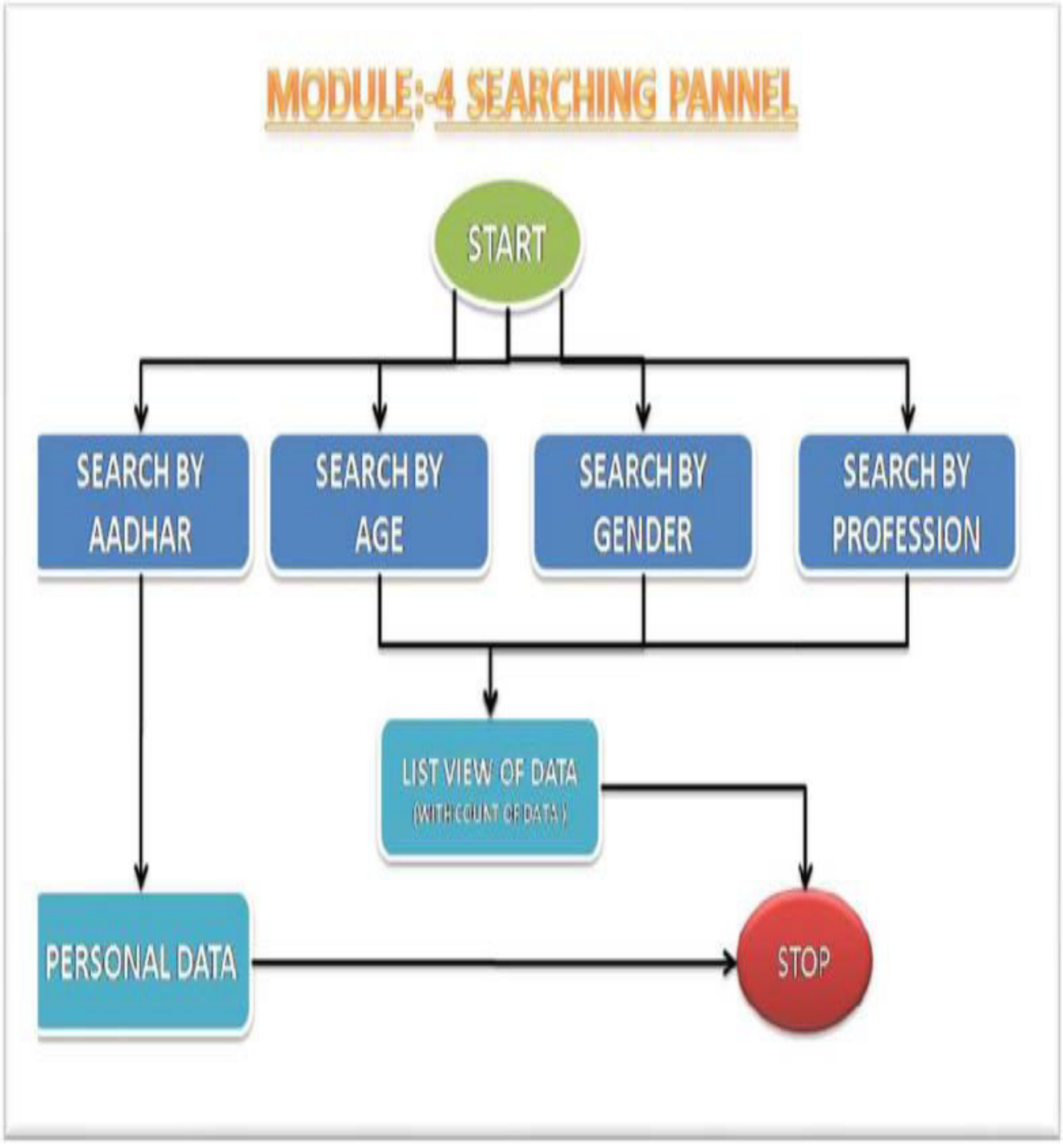


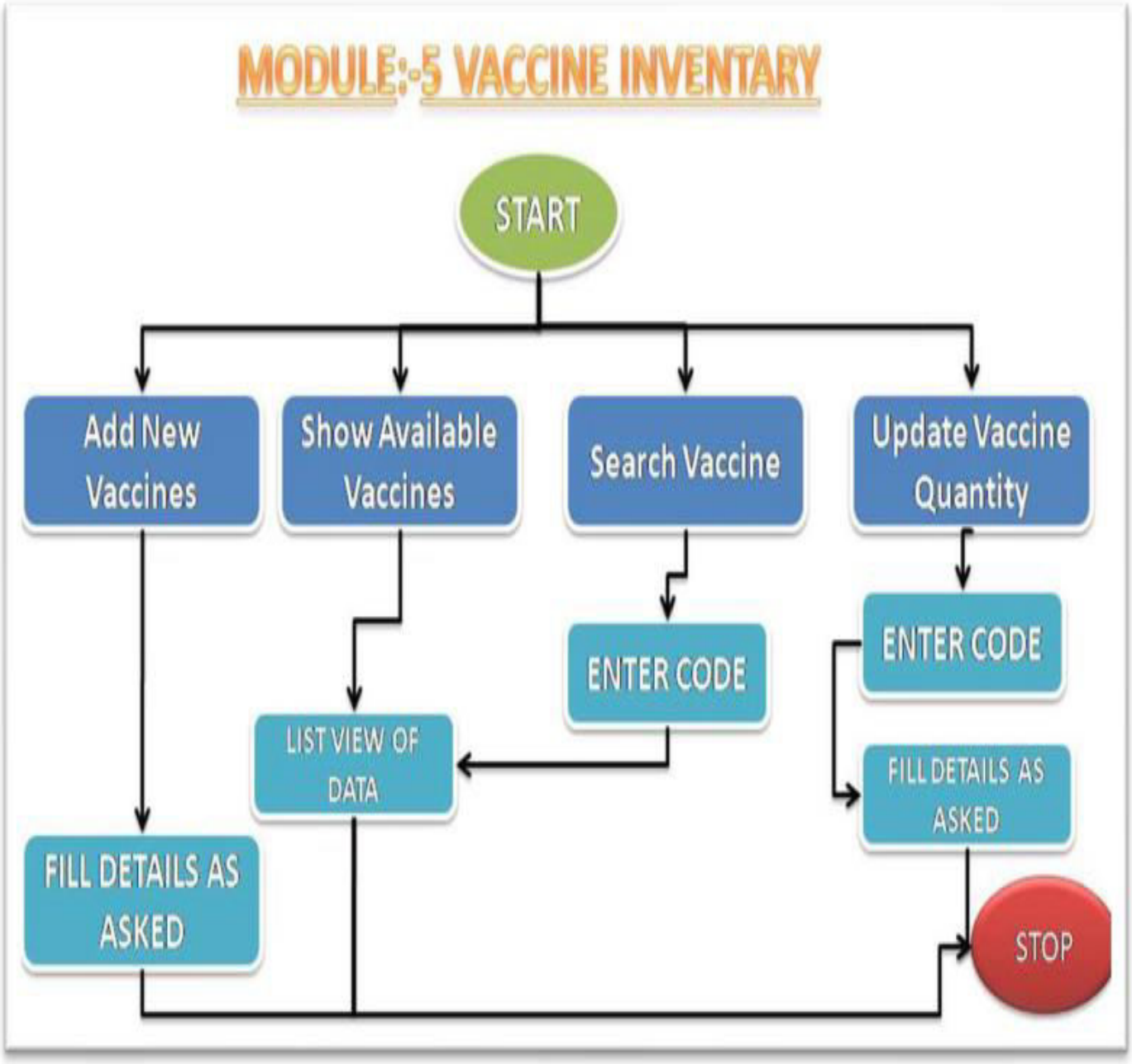
MODULE:-2 DOSE 1 REGISTRATION



MODULE:-3 DOSE 2 REGISTRATION



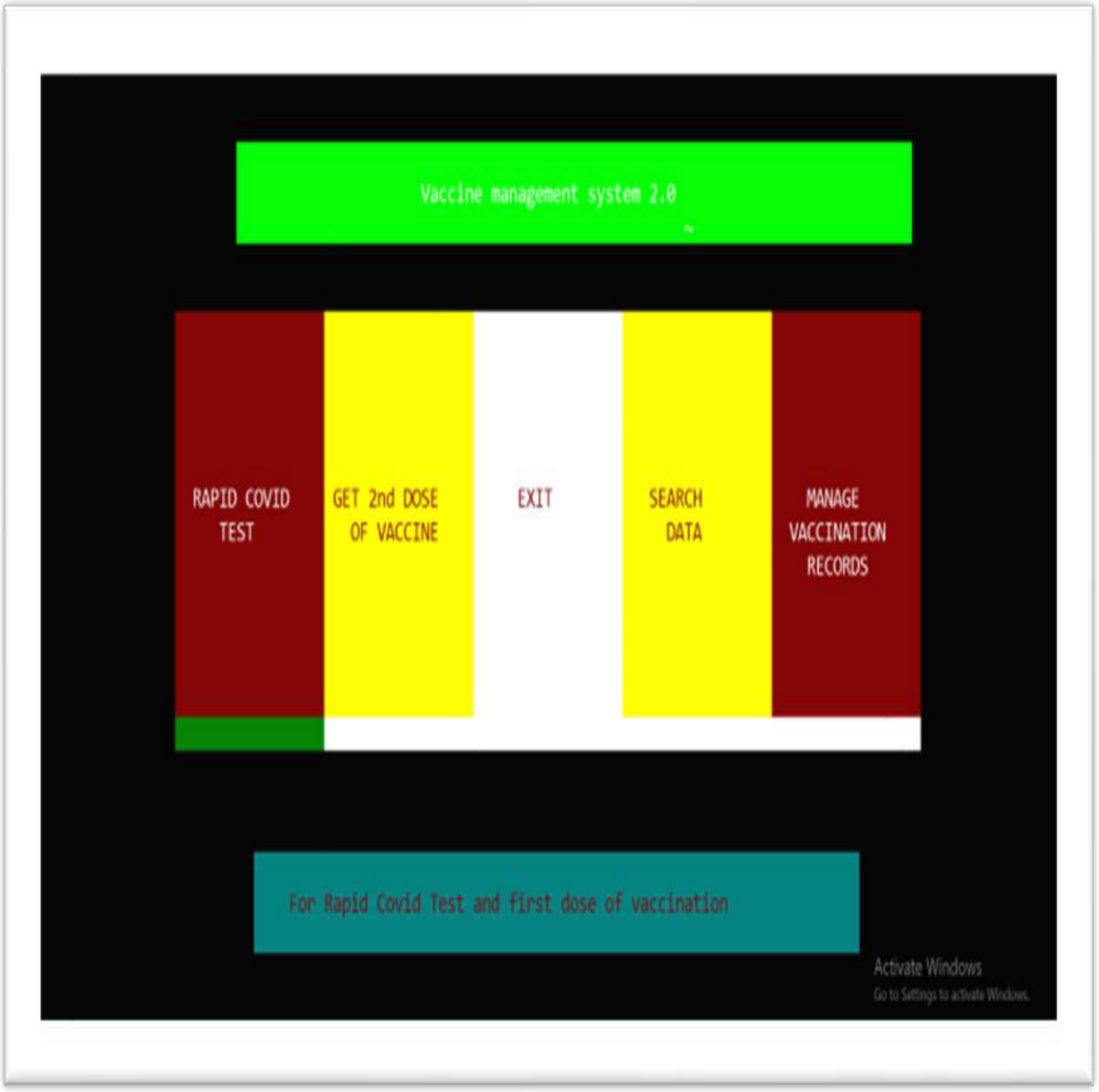

MODULE:-4 SEARCHING PANNEL
START
SEARCH BY AADHAR
SEARCH BY AGE
SEARCH BY GENDER
SEARCH BY PROFESSION
LIST VIEW OF DATA
(WITH COUNT OF DATA)
PERSONAL DATA
STOP

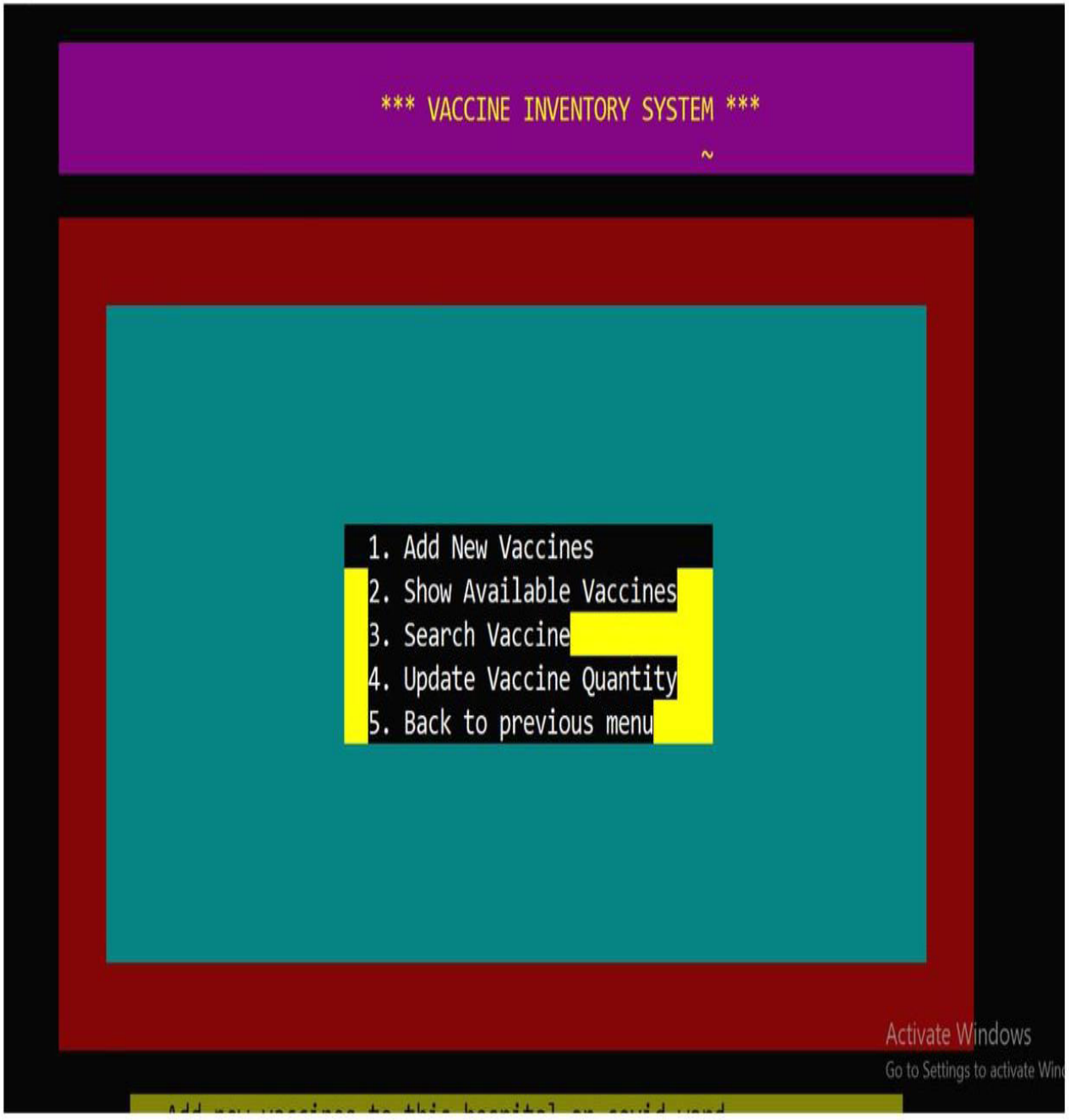

MODULE:-5 VACCINE INVENTARY
START
Add New Vaccines
Show Available Vaccines
Search Vaccine
Update Vaccine Quantity
ENTER CODE
ENTER CODE
LIST VIEW OF DATA
FILL DETAILS AS ASKED
FILL DETAILS AS ASKED
STOP

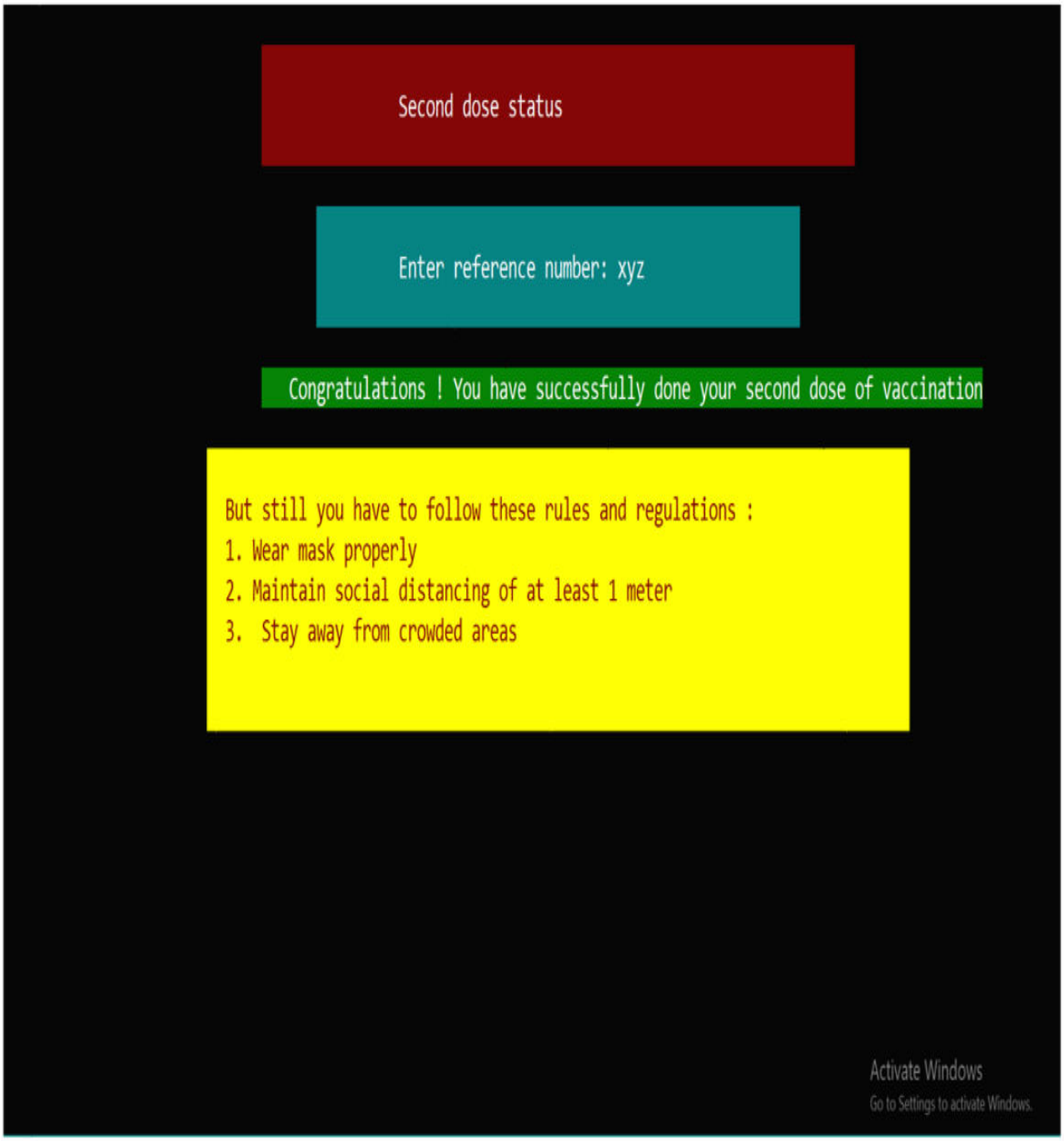
CHAPTER-5

Results and Discussions

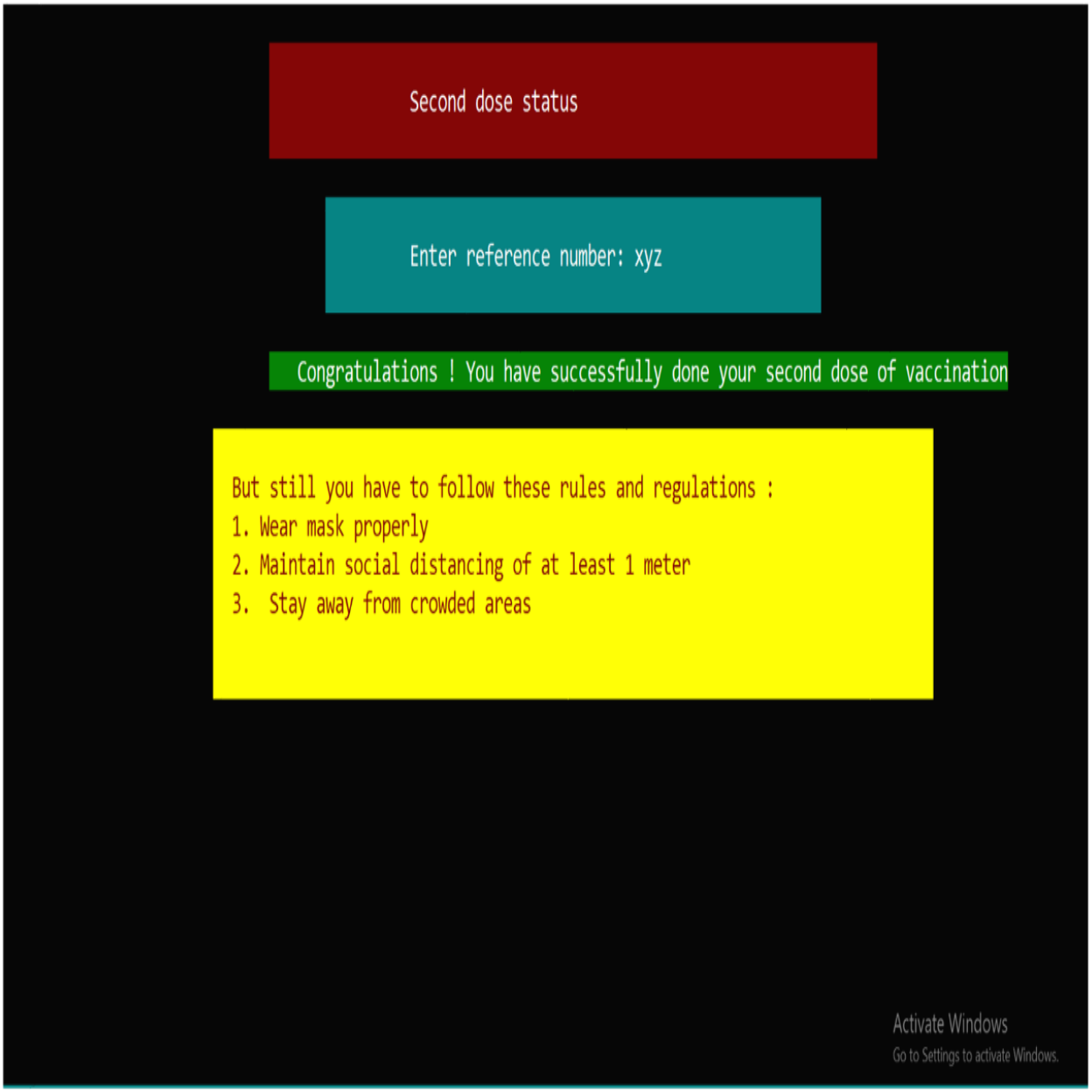
5.1 RESULT AND OUTPUT




*** VACCINE INVENTORY SYSTEM ***
~
1. Add New Vaccines
2. Show Available Vaccines
3. Search Vaccine
4. Update Vaccine Quantity
5. Back to previous menu
Activate Windows
Go to Settings to activate Win


Second dose status
Enter reference number: xyz
Congratulations ! You have successfully done your second dose of vaccination
But still you have to follow these rules and regulations :
1. Wear mask properly
2. Maintain social distancing of at least 1 meter
3. Stay away from crowded areas
Activate Windows
Go to Settings to activate Windows.


**** RAPID COVID TEST ****
~By
PLEASE ENTER YOUR BASIC INFORMATION
NAME:-
Activate Windows
Go to Settings to activate Windows.


Second dose status
Enter reference number: xyz
Congratulations ! You have successfully done your second dose of vaccination
But still you have to follow these rules and regulations :
1. Wear mask properly
2. Maintain social distancing of at least 1 meter
3. Stay away from crowded areas
Activate Windows
Go to Settings to activate Windows.

CHAPTER-6

Conclusions and Future Scope

6.1 CONCLUSION

So project is just to efficiently manage and access the record of person who is going to vaccinated. It is based on real world application. In the current situation we need the database and managing option same as mentioned in this project.

6.2 FUTURE SCOPE

This project will be useful for any school and college with slightly modifications.
It can be used by any of the small or big hospital who are finding it very difficult to manage the data of the vaccinated people.
The domestic vaccine manufacturing industry of India has put in all efforts to develop and manufacture COVID-19 vaccines. The vaccines that have been granted permission for restricted use in emergency situation by the National Regulator, i.e. Central Drugs Standard Control Organization (CDSCO) and are being used in the National COVID-19.
A unique digital platform Co-WIN supports the COVID-19 vaccination initiative, helping the programmer managers in registration and tracking of every beneficiary of COVID-19 vaccination and every vaccination event along with real time information on the available stocks of vaccine, their storage temperature, actual vaccination process, generation of digital certificates, etc. Co-WIN app serves as the single source of truth for all data related to beneficiaries, vaccines and vaccination.
The WHO has come up with an EVM (Effective Vaccine Management) initiative. VMS 2.0 focuses on providing qualitative vaccines in the lowest possible time. The prime objectives of this initiative include:

- Providing immunization supply chains for every country Ensure vaccines quality, and Increased supply chain efficiency for proper distribution.

- Vaccine management software helps in the above processes.

- It is a GUI based system which streamlines the flow of vaccine management.

- It helps in improving vaccine tracking, inventory management, and managing the vaccines. Moreover, it also identifies the vaccinated patients and follows up on their conditions.

- The main objective of this vaccine management project is to manage all the data which are present in the vaccine centre.

- This project is for a simple hospital who find hard to manage all the data.

It can also be beneficial in the following:-

- Proper data
- Proper record
- Proper data evaluation
- Vaccine status
- Region wise vaccine evaluation

6.3 Strategy for COVID-19 vaccination in India

Free vaccination against COVID-19 commenced in India on January 16, 2021, and the government is urging all of its citizens to be immunized, in what is expected to be the largest vaccination program in the world.
Out of the eight COVID-19 vaccines that are currently under various stages of clinical trials in India, four were developed in the country. India's drug regulator has approved restricted emergency use of Covishield (the name employed in India for the Oxford-AstraZeneca vaccine) and Covaxin, the home-grown vaccine produced by Bharat Biotech.

Indian manufacturers have stated that they have the capacity to meet the country's future needs for COVID-19 vaccines. The manpower and cold-chain infrastructure established before the pandemic are sufficient for the initial vaccination of 30 million healthcare workers.
The Indian government has taken urgent measures to expand the country's vaccine manufacturing capacity and has also developed an efficient digital system to address and monitor all the aspects of vaccine administration.
A year has passed since the first case of novel coronavirus infections was detected in China's Wuhan province. During the initial period of the disease, the efforts were concentrated on preventing and slowing down transmission1,2,3,4,5,6. Global analysis of herd immunity in COVID-19 has shown the urgent need for efficacious COVID-19 vaccines7. Currently, the vaccine development efforts have started to come to fruition as some of the leading vaccine candidates have shown positive results in the prevention of clinical disease8,9,10,11,12.

Although not mandatory, India with its estimated population of 1380 million (as of 2020) is planning to administer the vaccine to all its citizens who are willing to take it. Importation of vaccines might not be the best option for India due to its large population. According to the International Air Transport Association (IATA), it would require thousands of flights to transport the vaccine from the production sites abroad to the distribution areas.

India, which has a robust vaccine development program, not only plans for domestic manufacture of COVID-19 vaccine but also for its distribution in countries that cannot afford to buy expensive vaccines from the Western world. In India, the data emanating from clinical trials of different vaccines support their eligibility for emergency authorization, even though some of the final details are

not available yet. The emphasis now is on the quality control, quality production, and cost control of these vaccines to make them affordable to even the poorest nations in the world.

- **COVID-19 vaccination in India**

The government of India has constituted a National Expert Group on Vaccine Administration for COVID-19 (NEGVAC) to provide guidance on all aspects of COVID-19 vaccine administration in India19. According to NEGVAC, the COVID-19 vaccine will be offered first to healthcare workers, frontline workers, and to persons above 50 years of age (with first preference for those above 60), followed by persons younger than 50 years of age with associated comorbidities.

The government has set up a committee comprising experts from various specialties including oncology, nephrology, pulmonology, and cardiology to define the clinical criteria, based on which people with comorbidities should be prioritized for Covid-19 vaccination. Committee has recommended that anyone with a congenital heart disease that leads to pulmonary arterial hypertension, end-stage kidney disease, or cancers such as lymphoma, leukemia, myeloma, decompensated liver cirrhosis, primary immune deficiency conditions, and sickle cell anemia should be included in the priority.

The latest electoral roll for the general election will be used to identify the population aged 45 years or more. The cut-off date for determining the age will be January 1, 2021. There will be a provision for self-registration for vaccination, for those eligible persons who have been missed out from the rolls for one reason or other, after giving some proof of identity.

After vaccinating nearly 300 million of the population in the first phase, the remaining population will receive the vaccine based on the disease epidemiology and vaccine availability.

➢ RURAL COVID-19 INNOVATIONS: COVID-19 Vaccination

To prepare for the vaccine rollout, Central District Health (CDH), a public health district serving rural Boise, Elmore, and Valley counties, had weekly phone calls with community partners like schools, business leaders, and city councils to discuss ways to address pandemic-related challenges.

One major partner was a pharmacy with adequate cold storage freezers and capacity for mobile vaccination clinics. In about three months, Boise County vaccinated over 500 people at eight school-located events. In addition, CDH partnered with Idaho Meals on Wheels and the state's National Guard to vaccinate homebound people.
Source: Partnerships Key to COVID-19 Vaccinations in Rural and Frontier Central Idaho, Centers for Disease Control and Prevention

Funding free and charitable clinics to provide vaccines and information
North Carolina
August 26, 2021 - Blue Cross NC and the North Carolina Association of Free & Charitable Clinics awarded grant money to five free and charitable clinics to reduce health disparities and address the impacts of COVID-19. The Community Care Clinic in rural Elizabeth City is using its funding to expand clinics offered at large employers and reach out to underrepresented groups like Black and Latino people. The Community Care Clinic of Dare in Dare County will work with a sample group of Latino patients with diabetes to provide information about the vaccine and promote nutrition.

Bringing vaccines into hard-to-reach communities
Alabama
June 30, 2021 - Hill Hospital of Sumter County takes vaccines to surrounding communities without doctors or clinics. The hospital has staff who live in these communities and commute, so community members already know and trust the people working at the vaccination clinics. The hospital advertises its vaccination clinics through newspapers; social media; and local leaders like pastors, teachers, county commissioners, and the city council. Vaccination clinics are held at churches, fire departments, and local businesses. Hill Hospital provides transportation to those who can't get to a clinic on their own and brings vaccines to people who are homebound. About 70 to 80 people have attended each clinic.

References

- **BOOKS REFERENCE :**

For programming logics : C++ with OOP by balagurusamy.
Links:-

1) https://www.learncpp.com/

2) http://www.cplusplus.com/

3) https://edabit.com/challenge

4) https://www.source.forge.net

5) https://www.fluentcpp.com/

6) https://www.fluentcpp.com/

7) https://arne-mertz.de/

8) https://herbsutter.com/

9) https://godbolt.org/

10) https://habr.com/en/company/pvs-studio/blog/

- **Research Paper:**

https://www.cdc.gov/vaccines/covid-19/reporting/vams/index.html

https://apps.who.int/iris/bitstream/handle/10665/339993/WHO-2019-nCoV-vaccination-monitoring-2021.1-eng.pdf

[1] Johns Hopkins University & Medicine . COVID-19 dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU). Coronavirus Resource Center, Johns Hopkins University & Medicine, 2021, https://coronavirus.jhu.edu/map.html Google Scholar

[2] McCormick, LC, Benhamou, M, Pogkas, D. The Covid-19 pandemic has added $19.5 trillion to global debt. Bloomberg, 27 January 2021, https://www.bloomberg.com/graphics/2021-coronavirus-global-Google Scholar

[3] Dan, JM, Mateus, J, Kato, Y, et al. Immunological memory to SARS-CoV-2 assessed for up to 8 months after infection. Science 2021; 371(6529): eabf4063.
Google Scholar | Crossref | Medline

[4] WHO . COVID-19 vaccine tracker and landscape, 2021, https://www.who.int/publications/m/item/draft-landscape-of-covid-19-candidate-vaccines
Google Scholar
[5] Krammer, F. SARS-CoV-2 vaccines in development. Nature 2020; 586(7830): 516–527.
Google Scholar | Crossref | Medline

[6] Florindo, HF, Kleiner, R, Vaskovich-Koubi, D, et al. Immune-mediated approaches against COVID-19. Nat Nanotechnol 2020; 15(8): 630–645.
Google Scholar | Crossref | Medline

[7] Poland, GA, Ovsyannikova, IG, Kennedy, RB. SARS-CoV-2 immunity: review and applications to phase 3 vaccine candidates. Lancet 2020; 396(10262): 1595–1606.Google Scholar | Crossref | Medline

[8] Clem, A. Fundamentals of vaccine immunology. J Glob Infect Dis 2011; 3(1): 73–78.
Google Scholar | Crossref | Medline

[9] Polack, FP, Thomas, SJ, Kitchin, N, et al. Safety and efficacy of the BNT162b2 mRNA Covid-19 vaccine. N Engl J Med 2020; 383(27): 2603–2615.
Google Scholar | Crossref | Medline

[10] Pfizer COVID-19 Vaccine EUA Letter of Authorization. Sect. Section 564(b)(1)(C) (2020).
Google Scholar

[11] Walsh, EE, Frenck, RW, Falsey, AR, et al. Safety and immunogenicity of two RNA-based Covid-19 vaccine candidates. N Engl J Med 2020; 383(25): 2439–2450.
Google Scholar | Crossref | Medline

[12] Hinton, DM. REG 174 INFORMATION FOR UK HEALTHCARE PROFESSIONALS. The UK Department of Health and Social Care and the Medicines & Healthcare products Regulatory Agency, 2021, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/955899/Temporary_Authorisation_HCP_Information_BNT162_6_0_UK_editclean.pdf
Google Scholar

[13] World Health Organization (WHO). Interim recommendations for use of the Moderna mRNA-1273 vaccine against COVID-19: interim guidance. WHO, Geneva, 25 January 2021, https://www.who.int/publications/i/item/interim-recommendations-for-use-of-the-moderna-mrna-1273-vaccine-against-covid-19
Google Scholar

[14] Baden, LR, El Sahly, HM, Essink, B, et al. Efficacy and safety of the mRNA-1273 SARS-CoV-2 vaccine. N Engl J Med 2020; 384(5): 403–416.
Google Scholar | Crossref | Medline

[15] Interim clinical considerations for use of mRNA COVID-19 vaccines currently authorized in the United States , 2021, https://www.cdc.gov/vaccines/covid-19/clinical-considerations/covid-19-vaccines-us.html
Google Scholar

[16] Van Doremalen, N, Lambe, T, Spencer, A, et al. ChAdOx1 nCoV-19 vaccination prevents SARS-CoV-2 pneumonia in rhesus macaques. bioRxiv. Epub ahead of print 13 May 2020. DOI: 10.1101/2020.05.13.093195.
Google Scholar | Crossref

[17] Voysey, M, Clemens, SAC, Madhi, SA, et al. Safety and efficacy of the ChAdOx1 nCoV-19 vaccine (AZD1222) against SARS-CoV-2: an interim analysis of four randomised controlled trials in Brazil, South Africa, and the UK. Lancet 2021; 397(10269): 99–111.
Google Scholar | Crossref | Medline

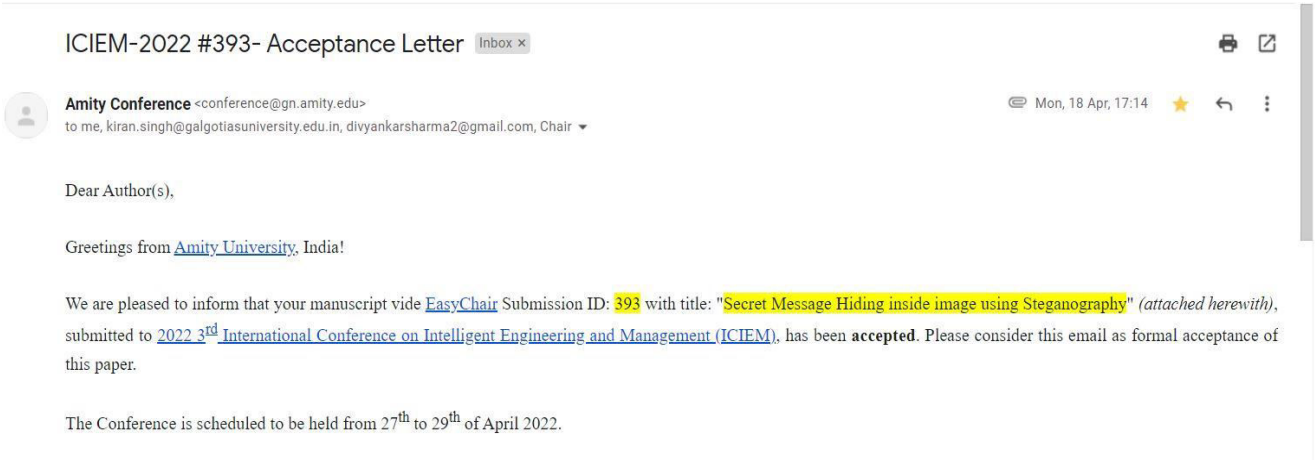
[18] Folegatti, PM, Ewer, KJ, Aley, PK, et al. Safety and immunogenicity of the ChAdOx1 nCoV-19 vaccine against SARS-CoV-2: a preliminary report of a phase 1/2, single-blind, randomised controlled trial. Lancet 2020; 396(10249): 467–478.
Google Scholar | Crossref | Medline

[19] WHO . Statement for healthcare professionals: how COVID-19 vaccines are regulated for safety and effectiveness, 2021, https://www.who.int/news/item/11-06-2021-statement-for-healthcare-professionals-how-covid-19-vaccines-are-regulated-for-safety-and-effectiveness
Google Scholar

[20] Sadoff, J, Gray, G, Vandebosch, A, et al. Safety and efficacy of single-dose Ad26.COV2.S vaccine against Covid-19. N Engl J Med 2021; 384(23): 2187–2201.
Google Scholar | Crossref | Medline

Publication/Copyright/Product

Communicated and Accepted My manuscript # 393 with "Secret Message Hiding inside image using Steganography" 2022 4th International Conference on Intelligent Engineering and Management (ICIEM).



ICIEM-2022 #393- Acceptance Letter Inbox ×

Amity Conference <conference@gn.amity.edu> Mon, 18 Apr, 17:14

to me, kiran.singh@galgotiasuniversity.edu.in, divyankarsharma2@gmail.com, Chair

Dear Author(s),

Greetings from Amity University, India!

We are pleased to inform that your manuscript vide EasyChair Submission ID: 393 with title: "Secret Message Hiding inside image using Steganography" *(attached herewith)*, submitted to 2022 3rd International Conference on Intelligent Engineering and Management (ICIEM), has been **accepted**. Please consider this email as formal acceptance of this paper.

The Conference is scheduled to be held from 27th to 29th of April 2022.