COVID-19 VACCINE DATABASE MANAGEMENT SYSTEM

A PROJECT REPORT

Submitted by

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in partial fulfillment for the award of the degree

of

BACHELOR OF TECHNOLOGY
in

COMPUTER SCIENCE ENGINEERING
of

FACULTY OF ENGINEERING AND TECHNOLOGY

SRM
INSTITUTE OF SCIENCE & TECHNOLOGY
Deemed to be University u/s 3 of UGC Act, 1956

S.R.M. Nagar, Kattankulathur, Kancheepuram District

MAY 2021

ABSTRACT

The growing Covid-19 crisis has brought India’s medical system to its knees. A vast population catalyzed by mismanagement of already scarce vaccines is a major concern. A robust and easy to manage system capable enough to cater to the vast population is needed. Though the system may be unable to solve the ongoing pandemic, it can surely help to soften its effect. We broke down the cycle of transporting vaccines from manufactures to the patients into such a system that is simple to understand and will ensure equal distribution of the life-saving vaccine all over the country. Contrary to the current system of state vaccine stores get their supplies either from government medical store depots or directly from manufacturers, the system provides a more careful distribution and tracking system down to each dose.

ACKNOWLEDGEMENTS

We would like to express our deepest gratitude to our guide, Dr. D. Hemavathi for her valuable guidance, consistent encouragement, personal caring, timely help and providing us with an excellent atmosphere for doing the project. All through the work, in spite of her busy schedule, she has extended cheerful and cordial support to us for completing this research work.

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INTRODUCTION

“The main challenge is to work with a new vaccine and provide it across age groups, unlike the current vaccination program which focuses primarily on pregnant women and children. It will require working at scale across the country to reach all target populations, and ensure both the infrastructure and human resources are available to enable this.”

Covid-19 vaccine management system comprises of five tables containing details about manufactures, warehouse, state authority handling the vaccine, medical institute (that will be administering the vaccine), patient (recipient of the vaccine).

Manufacturer table, as the name suggests, contains attributes about the manufactures supplying the vaccine to the warehouse. The project works on the pre-requisite that India is divided into 4 parts on the basis of area. Namely- North, South, East, West zone. Each zone is allotted a warehouse where vaccines from manufacturers are stored and the data for same is stored in warehouse table. Concerned state authority will receive the designated vaccine from the warehouse of whose range it lies in and then distributes a pre-defined batch of vaccine to medical institutes. Medical institutes in-turn will be administering the vaccines to their patients.

This system ensures accountability and transparency of data of each dose of vaccine administered anywhere in India.

CHAPTER 1

MANUFACTURER TABLE

1.1 Creating Table

Create table manufacturer (manufacturerid int primary key, name char(50), Vaccinename char(50), vaccine_id_start int not null, vaccine_id_end int, manucity varchar(30));

1.2 Inserting Records

insert into manufacturer values ('1', 'CS', 'Covishield', '1', '1000', 'Delhi');

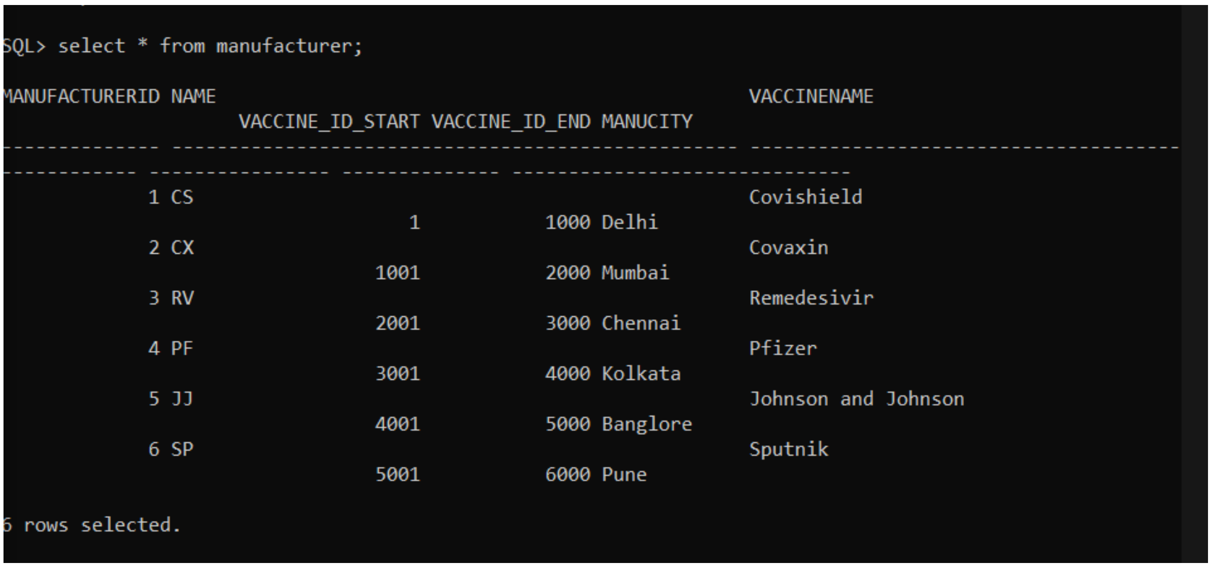
insert into manufacturer values ('2', 'CX', 'Covaxin', '1001', '2000', 'Mumbai');

insert into manufacturer values ('3', 'RV', 'Remedesivir', '2001', '3000', 'Chennai');

insert into manufacturer values ('4', 'PF', 'Pfizer', '3001', '4000', 'Kolkata');

insert into manufacturer values ('5', 'JJ','Johnson and Johnson', '4001', '5000','Banglore');

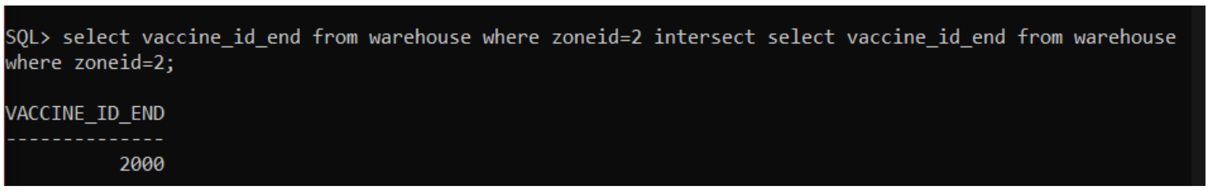
insert into manufacturer values ('6', 'SP','Sputnik', '5001', '6000','Pune');



```
SQL> select * from manufacturer;

MANUFACTURERID NAME                                               VACCINENAME
                    VACCINE_ID_START VACCINE_ID_END MANUCITY
-------------- -------------------------------------------------- -------------------------------------
----------- --------------- ------------- ------------------------------
             1 CS                                                 Covishield
                               1           1000 Delhi

             2 CX                                                 Covaxin
                            1001           2000 Mumbai

             3 RV                                                 Remedesivir
                            2001           3000 Chennai

             4 PF                                                 Pfizer
                            3001           4000 Kolkata

             5 JJ                                                 Johnson and Johnson
                            4001           5000 Banglore

             6 SP                                                 Sputnik
                            5001           6000 Pune

6 rows selected.
```

1.3 Operations

select vaccine_id_start from manufacturer where manufacturerid=2 minus select vaccine_id_start from warehouse where zoneid=4;

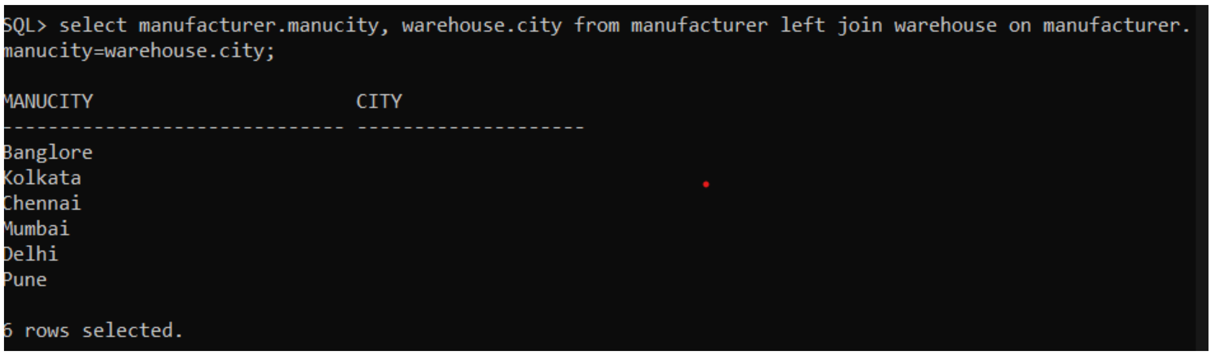


```
SQL> select vaccine_id_end from warehouse where zoneid=2 intersect select vaccine_id_end from warehouse
where zoneid=2;

VACCINE_ID_END
--------------
          2000
```

Joins

i. Left Join with warehouse table

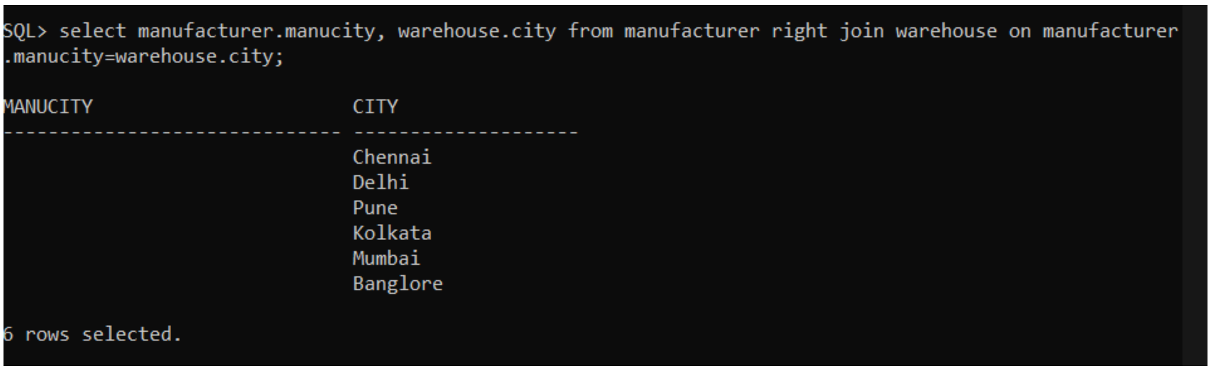
select manufacturer.manucity, warehouse.city from manufacturer left join warehouse on manufacturer.manucity=warehouse.city;



```
SQL> select manufacturer.manucity, warehouse.city from manufacturer left join warehouse on manufacturer.
manucity=warehouse.city;

MANUCITY                       CITY
------------------------------ --------------------
Banglore
Kolkata
Chennai
Mumbai
Delhi
Pune

6 rows selected.
```

ii. Right Join

select manufacturer.manucity, warehouse.city from manufacturer right join warehouse on manufacturer.manucity=warehouse.city;

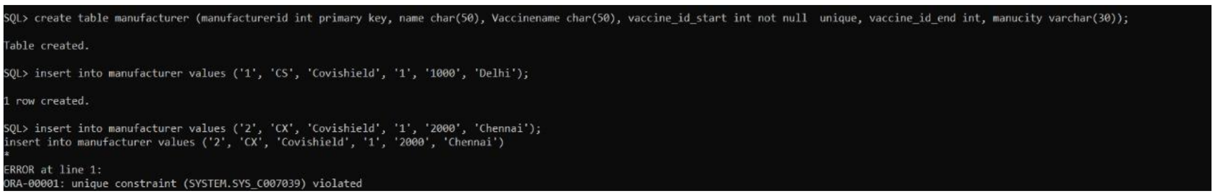


```
SQL> select manufacturer.manucity, warehouse.city from manufacturer right join warehouse on manufacturer
.manucity=warehouse.city;

MANUCITY                       CITY
------------------------------ --------------------
                               Chennai
                               Delhi
                               Pune
                               Kolkata
                               Mumbai
                               Banglore

6 rows selected.
```

Integrity Constraints:

i. Unique

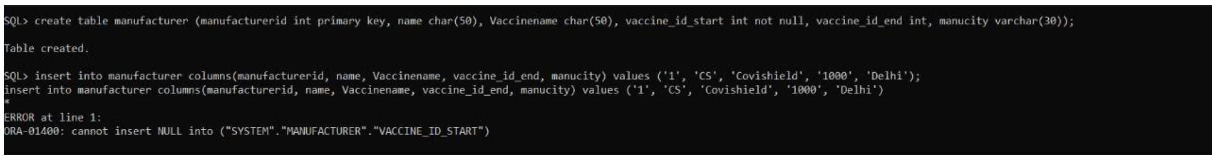
create table manufacturer (manufacturerid int primary key, name char(50), Vaccinename char(50), vaccine_id_start int not null **unique**, vaccine_id_end int, manucity varchar(30));



```
SQL> create table manufacturer (manufacturerid int primary key, name char(50), Vaccinename char(50), vaccine_id_start int not null  unique, vaccine_id_end int, manucity varchar(30));

Table created.

SQL> insert into manufacturer values ('1', 'CS', 'Covishield', '1', '1000', 'Delhi');

1 row created.

SQL> insert into manufacturer values ('2', 'CX', 'Covishield', '1', '2000', 'Chennai');
insert into manufacturer values ('2', 'CX', 'Covishield', '1', '2000', 'Chennai')
*
ERROR at line 1:
ORA-00001: unique constraint (SYSTEM.SYS_C007039) violated
```

ii. Not Null

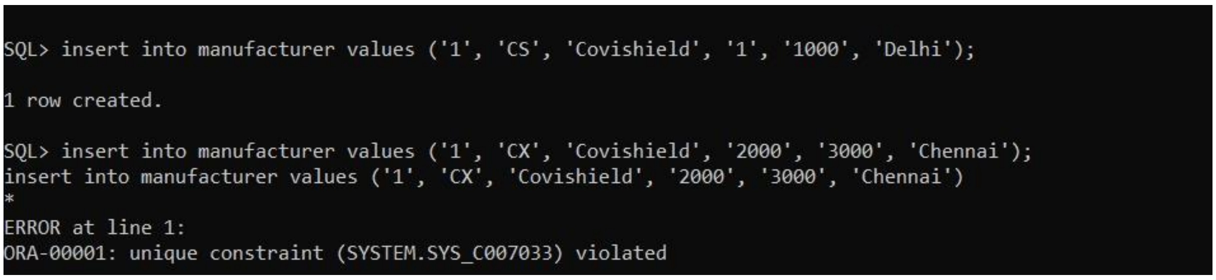
create table manufacturer (manufacturerid int primary key, name char(50), Vaccinename char(50), vaccine_id_start int **not null**, vaccine_id_end int, manucity varchar(30));



```
SQL> create table manufacturer (manufacturerid int primary key, name char(50), Vaccinename char(50), vaccine_id_start int not null, vaccine_id_end int, manucity varchar(30));

Table created.

SQL> insert into manufacturer columns(manufacturerid, name, Vaccinename, vaccine_id_end, manucity) values ('1', 'CS', 'Covishield', '1000', 'Delhi');
insert into manufacturer columns(manufacturerid, name, Vaccinename, vaccine_id_end, manucity) values ('1', 'CS', 'Covishield', '1000', 'Delhi')
*
ERROR at line 1:
ORA-01400: cannot insert NULL into ("SYSTEM"."MANUFACTURER"."VACCINE_ID_START")
```

iii. Primary Key

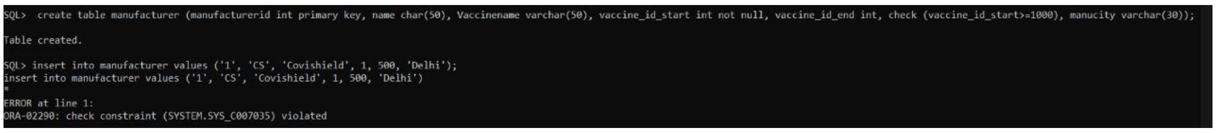
create table manufacturer (manufacturerid int **primary key**, name char(50), Vaccinename char(50), vaccine_id_start int not null, vaccine_id_end int, manucity varchar(30));



```
SQL> insert into manufacturer values ('1', 'CS', 'Covishield', '1', '1000', 'Delhi');

1 row created.

SQL> insert into manufacturer values ('1', 'CX', 'Covishield', '2000', '3000', 'Chennai');
insert into manufacturer values ('1', 'CX', 'Covishield', '2000', '3000', 'Chennai')
*
ERROR at line 1:
ORA-00001: unique constraint (SYSTEM.SYS_C007033) violated
```

iv. Check

create table manufacturer (manufacturerid int primary key, name char(50), Vaccinename char(50), vaccine_id_start int not null, vaccine_id_end int, **check (**vaccine_id_end>=1000), manucity varchar(30));



```
SQL>  create table manufacturer (manufacturerid int primary key, name char(50), Vaccinename varchar(50), vaccine_id_start int not null, vaccine_id_end int, check (vaccine_id_start>=1000), manucity varchar(30));

Table created.

SQL> insert into manufacturer values ('1', 'CS', 'Covishield', 1, 500, 'Delhi');
insert into manufacturer values ('1', 'CS', 'Covishield', 1, 500, 'Delhi')
*
ERROR at line 1:
ORA-02290: check constraint (SYSTEM.SYS_C007035) violated
```

CHAPTER 2

WAREHOUSE TABLE

2.1 Creating Table

create table warehouse (zoneid int(25) primary key, city char(20), warehouse_name char(30), vaccine_id_start int(25), vaccine_id_end int(25), vaccine_id int(25));

2.2 Inserting Records

insert into warehouse values ('1', 'Delhi','Biomass', '1', '1000','1');

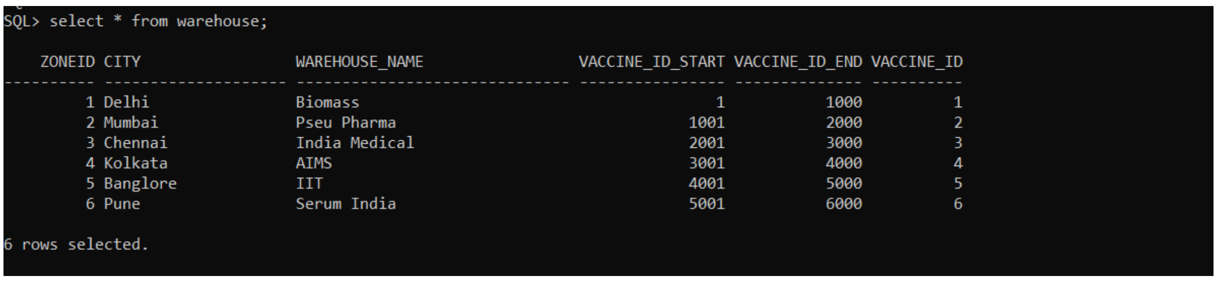
insert into warehouse values ('2', 'Mumbai','Pseu Pharma', '1001', '2000','2');

insert into warehouse values ('3', 'Chennai','India Medical', '2001', '3000','3');

insert into warehouse values ('4', 'Kolkata','AIMS', '3001', '4000','4');

insert into warehouse values ('5', 'Banglore','IIT', '4001', '5000','5');

insert into warehouse values ('6', 'Pune','Serum India', '5001', '6000','6');



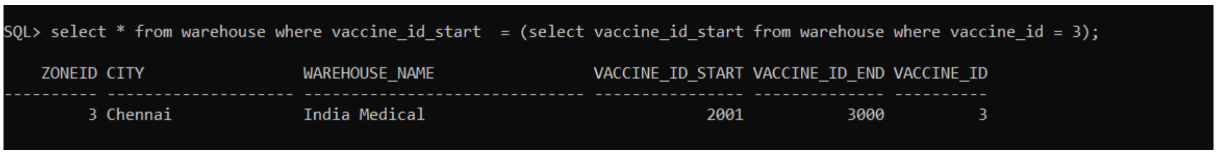
```
SQL> select * from warehouse;

    ZONEID CITY                 WAREHOUSE_NAME                 VACCINE_ID_START VACCINE_ID_END VACCINE_ID
---------- -------------------- ------------------------------ ---------------- -------------- ----------
         1 Delhi                Biomass                                       1           1000          1
         2 Mumbai               Pseu Pharma                                1001           2000          2
         3 Chennai              India Medical                              2001           3000          3
         4 Kolkata              AIMS                                       3001           4000          4
         5 Banglore             IIT                                        4001           5000          5
         6 Pune                 Serum India                                5001           6000          6

6 rows selected.
```

2.3 Operations

Subqueries

i. Where

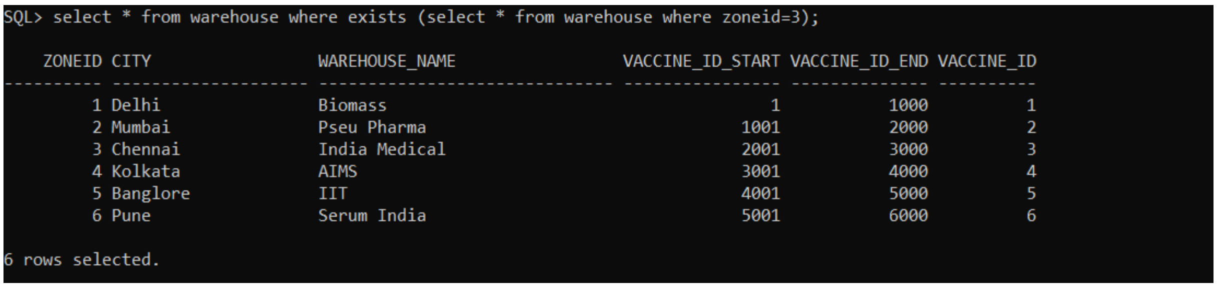
select * from warehouse where vaccine_id_start = (select vaccine_id_start from warehouse where vaccine_id = 3);



```
SQL> select * from warehouse where vaccine_id_start  = (select vaccine_id_start from warehouse where vaccine_id = 3);

    ZONEID CITY                WAREHOUSE_NAME                 VACCINE_ID_START VACCINE_ID_END VACCINE_ID
---------- ------------------- ------------------------------ ---------------- -------------- ----------
         3 Chennai             India Medical                              2001           3000          3
```

ii. Exist

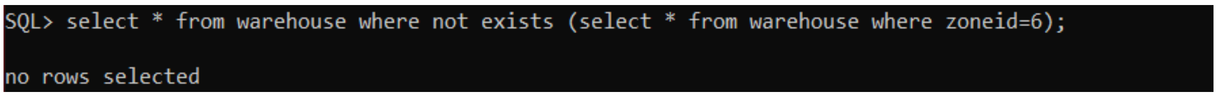
select * from warehouse where exists (select * from warehouse where zoneid=3);



```
SQL> select * from warehouse where exists (select * from warehouse where zoneid=3);

    ZONEID CITY                WAREHOUSE_NAME                 VACCINE_ID_START VACCINE_ID_END VACCINE_ID
---------- ------------------- ------------------------------ ---------------- -------------- ----------
         1 Delhi               Biomass                                       1           1000          1
         2 Mumbai              Pseu Pharma                                1001           2000          2
         3 Chennai             India Medical                              2001           3000          3
         4 Kolkata             AIMS                                       3001           4000          4
         5 Banglore            IIT                                        4001           5000          5
         6 Pune                Serum India                                5001           6000          6

6 rows selected.
```

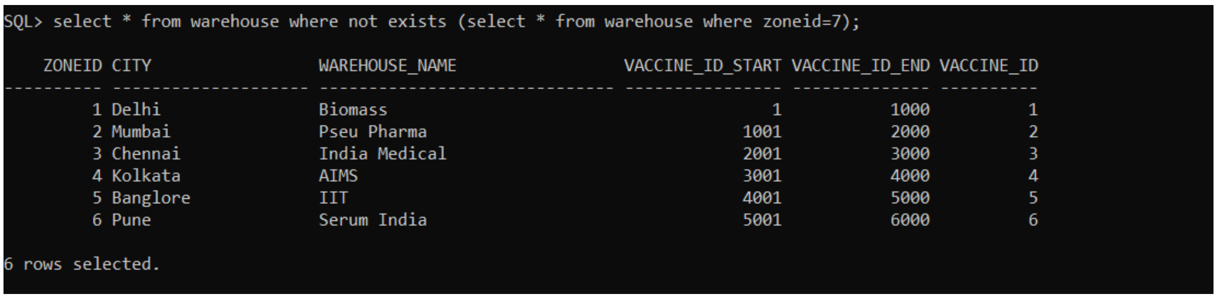
iii. Not Exist

select * from warehouse where not exists (select * from warehouse where zoneid=6);



```
SQL> select * from warehouse where not exists (select * from warehouse where zoneid=6);

no rows selected
```

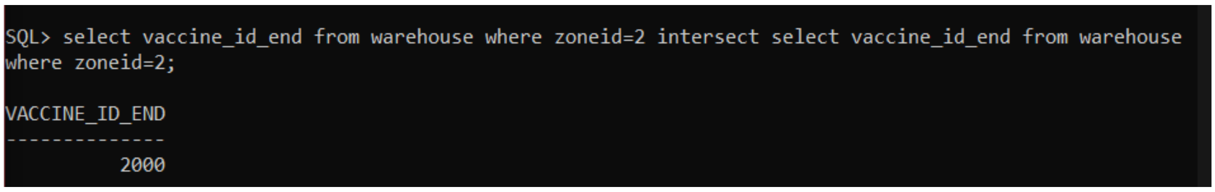
select * from warehouse where not exists (select * from warehouse where zoneid=7);



```
SQL> select * from warehouse where not exists (select * from warehouse where zoneid=7);

    ZONEID CITY                WAREHOUSE_NAME                 VACCINE_ID_START VACCINE_ID_END VACCINE_ID
---------- ------------------- ------------------------------ ---------------- -------------- ----------
         1 Delhi               Biomass                                       1           1000          1
         2 Mumbai              Pseu Pharma                                1001           2000          2
         3 Chennai             India Medical                              2001           3000          3
         4 Kolkata             AIMS                                       3001           4000          4
         5 Banglore            IIT                                        4001           5000          5
         6 Pune                Serum India                                5001           6000          6

6 rows selected.
```

Intersect

select vaccine_id_end from warehouse where zoneid=2 intersect select vaccine_id_end from warehouse where zoneid=2;



```
SQL> select vaccine_id_end from warehouse where zoneid=2 intersect select vaccine_id_end from warehouse
where zoneid=2;

VACCINE_ID_END
--------------
          2000
```

CHAPTER 3

STATE’S VACCINE HANDLING AUTHORITY TABLE

3.1 Creating Table

create table state_ut(state_ut_name varchar(30) primary key,zoneid int check(zoneid<10), vaccine_id_start int, vaccine_id_end int, medical_institute varchar(30) unique, governing_authority varchar(30) default ‘state_government’);

3.2 Inserting Records

insert into state_ut values ('BR','1',’1', '1000','BR_medical',’state_government’);

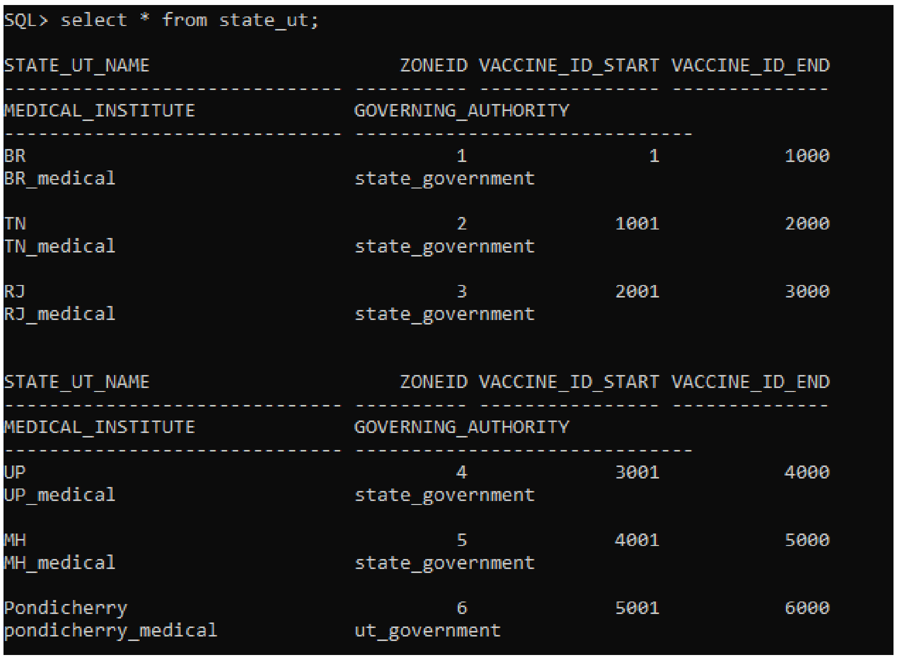
insert into state_ut values ('TN','2', '1001', '2000','TN_medical',’state_government’);

 insert into state_ut values ('RJ',’3’, '2001', '3000','RJ_medical',’state_government’);

insert into state_ut values ('UP’,’4’,'3001','4000',’UP_medical’,’state_government');

insert into state_ut values ('MH','5', '4001', '5000','MH_medical',’state_government’);

insert into state_ut values ('Pondicherry', '6', '5001', '6000', 'pondicherry_medical', ‘ut_government’);



```
SQL> select * from state_ut;

STATE_UT_NAME                      ZONEID VACCINE_ID_START VACCINE_ID_END
------------------------------ ---------- ---------------- --------------
MEDICAL_INSTITUTE              GOVERNING_AUTHORITY
------------------------------ ------------------------------
BR                                      1                1           1000
BR_medical                     state_government

TN                                      2             1001           2000
TN_medical                     state_government

RJ                                      3             2001           3000
RJ_medical                     state_government


STATE_UT_NAME                      ZONEID VACCINE_ID_START VACCINE_ID_END
------------------------------ ---------- ---------------- --------------
MEDICAL_INSTITUTE              GOVERNING_AUTHORITY
------------------------------ ------------------------------
UP                                      4             3001           4000
UP_medical                     state_government

MH                                      5             4001           5000
MH_medical                     state_government

Pondicherry                             6             5001           6000
pondicherry_medical            ut_government
```

3.3 Operations

DDL commands

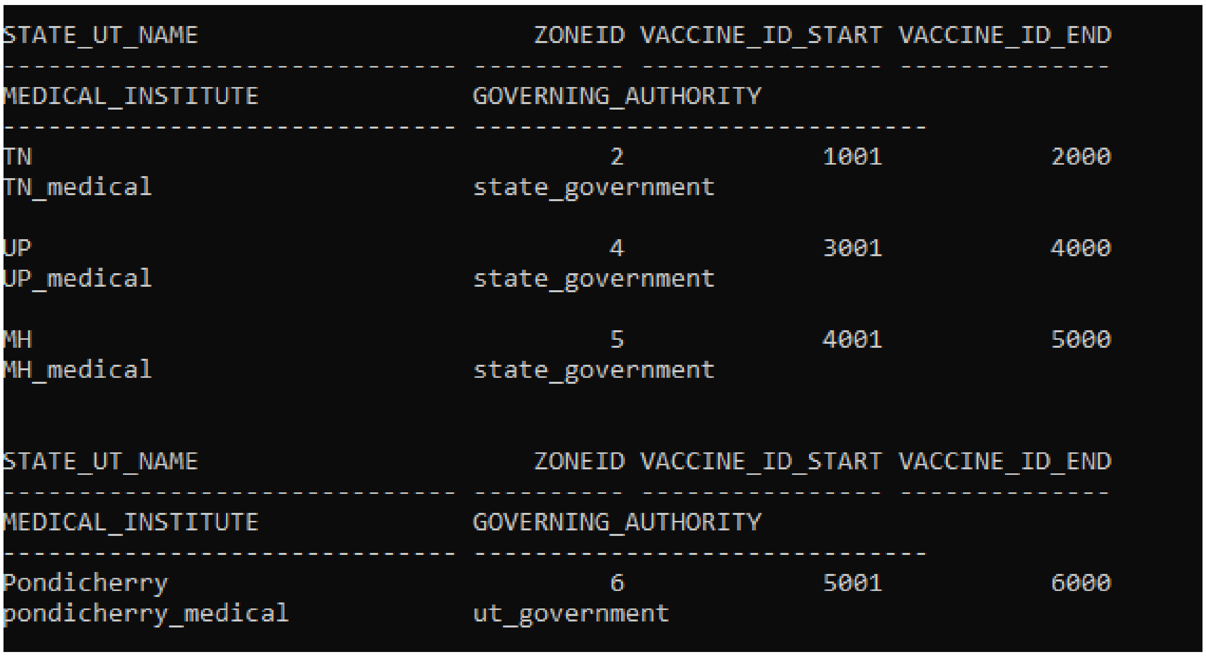
i. alter table state_ut add(state_name int);
Table altered.

ii. alter table state_ut modify state_name varchar(30);
Table altered.

iii. alter table state_ut drop column state_name;
Table altered.

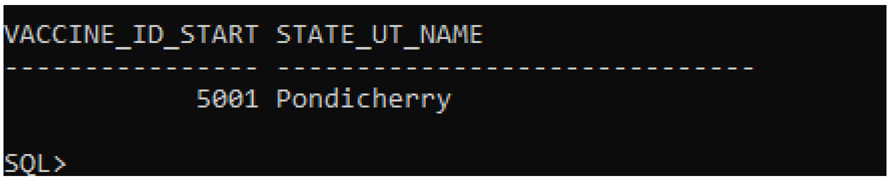
Advance select statements

i. select * from state_ut where vaccine_id_end<>3000;



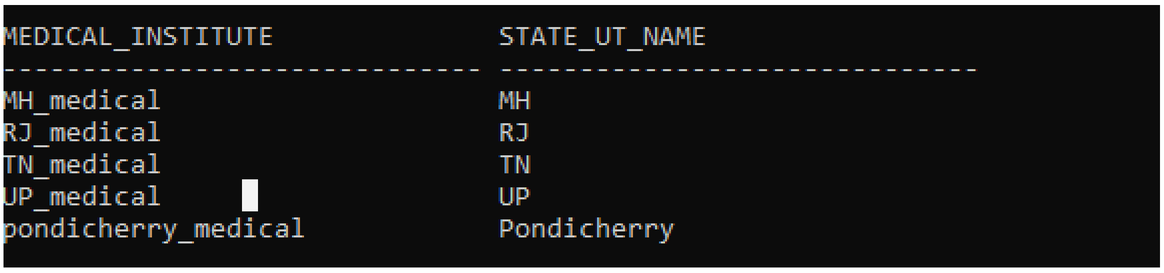
```
STATE_UT_NAME                      ZONEID VACCINE_ID_START VACCINE_ID_END
------------------------------ ---------- ---------------- --------------
MEDICAL_INSTITUTE              GOVERNING_AUTHORITY
------------------------------ ------------------------------
TN                                      2             1001           2000
TN_medical                     state_government

UP                                      4             3001           4000
UP_medical                     state_government

MH                                      5             4001           5000
MH_medical                     state_government


STATE_UT_NAME                      ZONEID VACCINE_ID_START VACCINE_ID_END
------------------------------ ---------- ---------------- --------------
MEDICAL_INSTITUTE              GOVERNING_AUTHORITY
------------------------------ ------------------------------
Pondicherry                             6             5001           6000
pondicherry_medical            ut_government
```

ii. select vaccine_id_start,state_ut_name from state_ut where governing_authority NOT IN ('state_government');



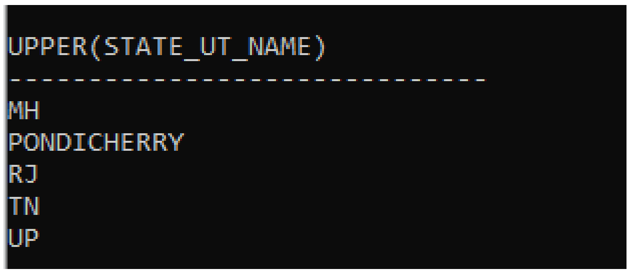
```
VACCINE_ID_START STATE_UT_NAME
---------------- ------------------------------
            5001 Pondicherry

SQL>
```

iii. select medical_institute,state_ut_name from state_ut where medical_institute LIKE '%medical';

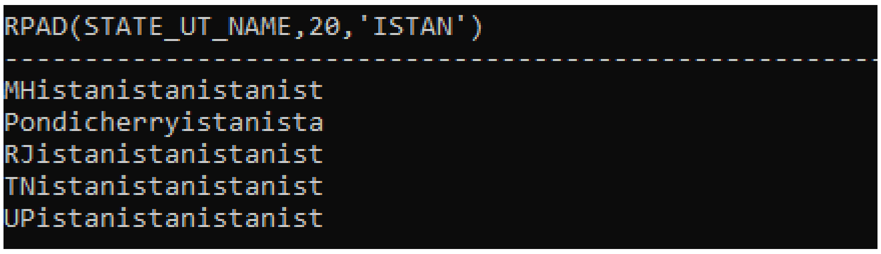

```
MEDICAL_INSTITUTE              STATE_UT_NAME
------------------------------ ------------------------------
MH_medical                     MH
RJ_medical                     RJ
TN_medical                     TN
UP_medical                     UP
pondicherry_medical            Pondicherry
```

SQL Single-Row Functions

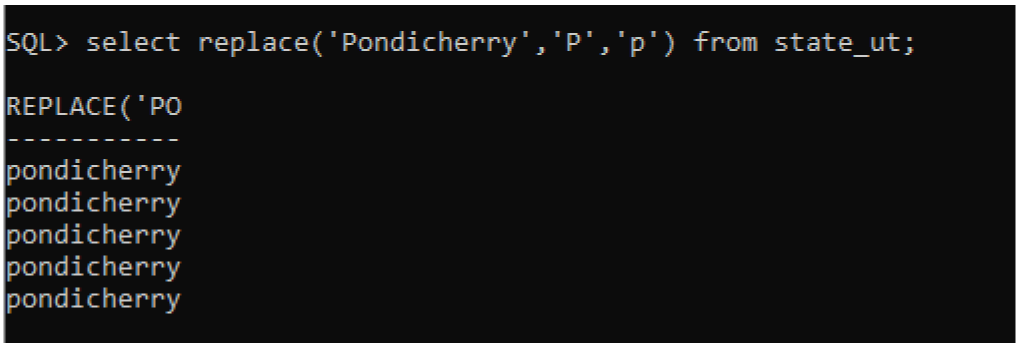
i. select upper(state_ut_name) from state_ut;


```
UPPER(STATE_UT_NAME)
------------------------------
MH
PONDICHERRY
RJ
TN
UP
```

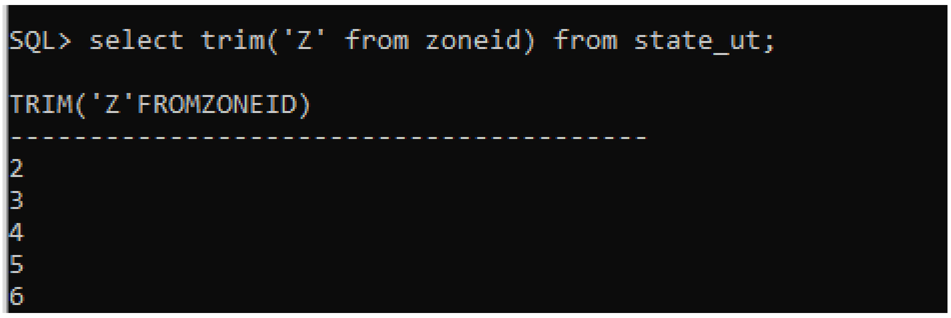
ii. select rpad(state_ut_name,20,'istan') from state_ut;


```
RPAD(STATE_UT_NAME,20,'ISTAN')
-------------------------------------------------------
MHistanistanistanist
Pondicherryistanista
RJistanistanistanist
TNistanistanistanist
UPistanistanistanist
```

iii. select replace('Pondicherry','P','p') from state_ut;

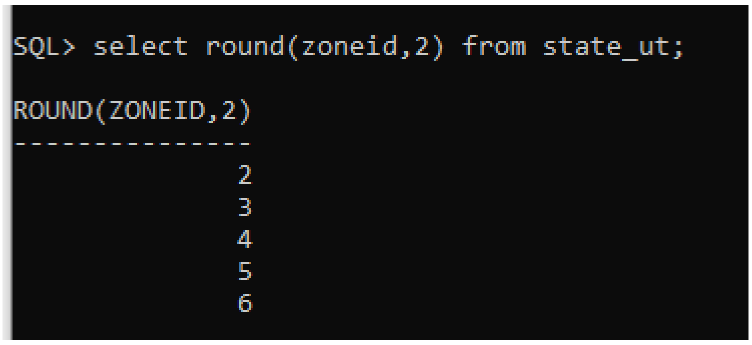

```
SQL> select replace('Pondicherry','P','p') from state_ut;

REPLACE('PO
-----------
pondicherry
pondicherry
pondicherry
pondicherry
pondicherry
```

iv. select trim('Z' from zoneid) from state_ut;



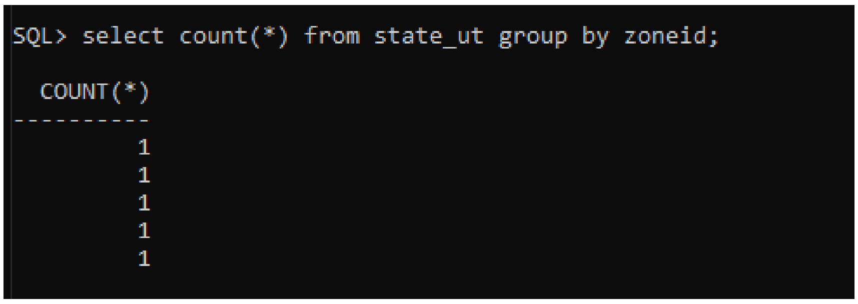
```
SQL> select trim('Z' from zoneid) from state_ut;

TRIM('Z'FROMZONEID)
----------------------------------------
2
3
4
5
6
```

v. select round(zoneid,2) from state_ut;



```
SQL> select round(zoneid,2) from state_ut;

ROUND(ZONEID,2)
---------------
              2
              3
              4
              5
              6
```

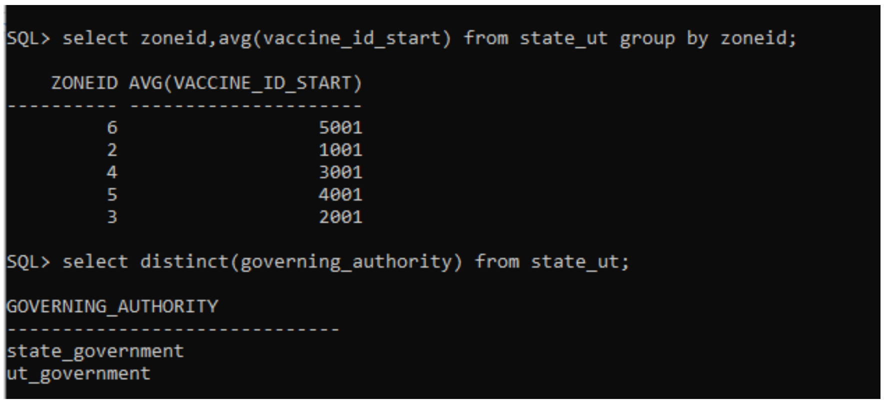
vi. select count(*) from state_ut group by zoneid;



```
SQL> select count(*) from state_ut group by zoneid;

  COUNT(*)
----------
         1
         1
         1
         1
         1
```

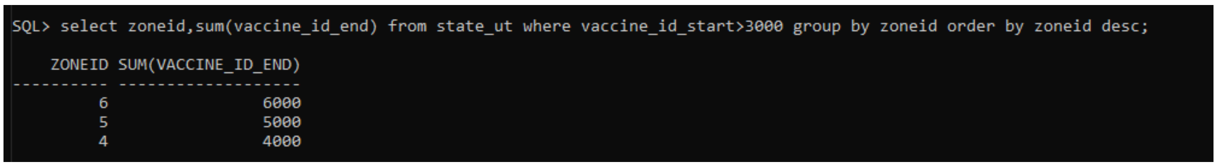
SQL Aggregate Functions

i. select zoneid, avg(vaccine_id_start) from state_ut group by zoneid;



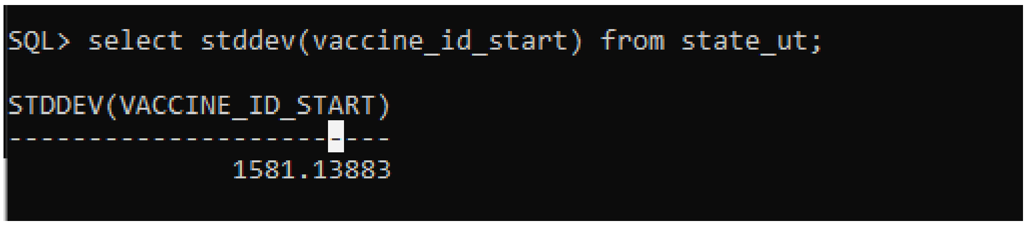
```
SQL> select zoneid,avg(vaccine_id_start) from state_ut group by zoneid;

    ZONEID AVG(VACCINE_ID_START)
---------- ---------------------
         6                  5001
         2                  1001
         4                  3001
         5                  4001
         3                  2001

SQL> select distinct(governing_authority) from state_ut;

GOVERNING_AUTHORITY
------------------------------
state_government
ut_government
```

ii. select zoneid, sum(vaccine_id_end) from state_ut where vaccine_id_start>3000 group by zoneid order by zoneid desc;



```
SQL> select zoneid,sum(vaccine_id_end) from state_ut where vaccine_id_start>3000 group by zoneid order by zoneid desc;

    ZONEID SUM(VACCINE_ID_END)
---------- -------------------
         6                6000
         5                5000
         4                4000
```

iii. select stddev(vaccine_id_start) from state_ut;



```
SQL> select stddev(vaccine_id_start) from state_ut;

STDDEV(VACCINE_ID_START)
------------------------
              1581.13883
```

CHAPTER 4

MEDICAL INSTITUTE TABLE

4.1 Creating Table

create table medical_institute(institute_name varchar(30),vaccine_id_start int not null, vaccine_id_end int check(vaccine_id_end<10000),state_ut_name varchar(30) unique,institute_city varchar(30));

4.2 Inserting Records

insert into medical_institute values('BR_medical','1','1000','BR','Patna');

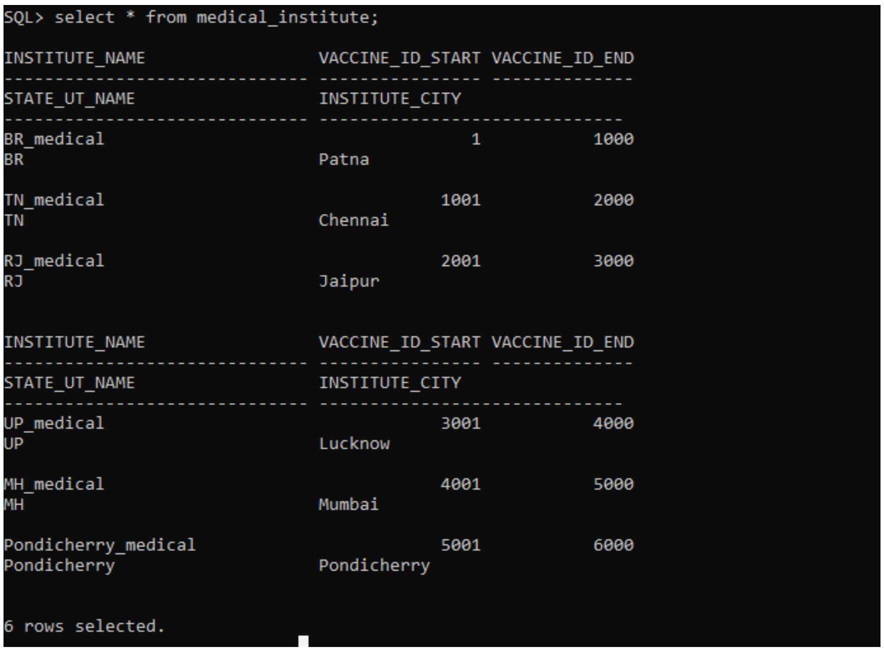
insert into medical_institute values('TN_medical','1001','2000','TN','Chennai');

insert into medical_institute values('RJ_medical','2001','3000','RJ','Jaipur');

insert into medical_institute values('UP_medical','3001','4000','UP','Lucknow');

insert into medical_institute values('MH_medical','4001','5000','MH','Mumbai');

insert into medical_institute values ('Pondicherry_medical', '5001', '6000', 'Pondicherry', 'Pondicherry');

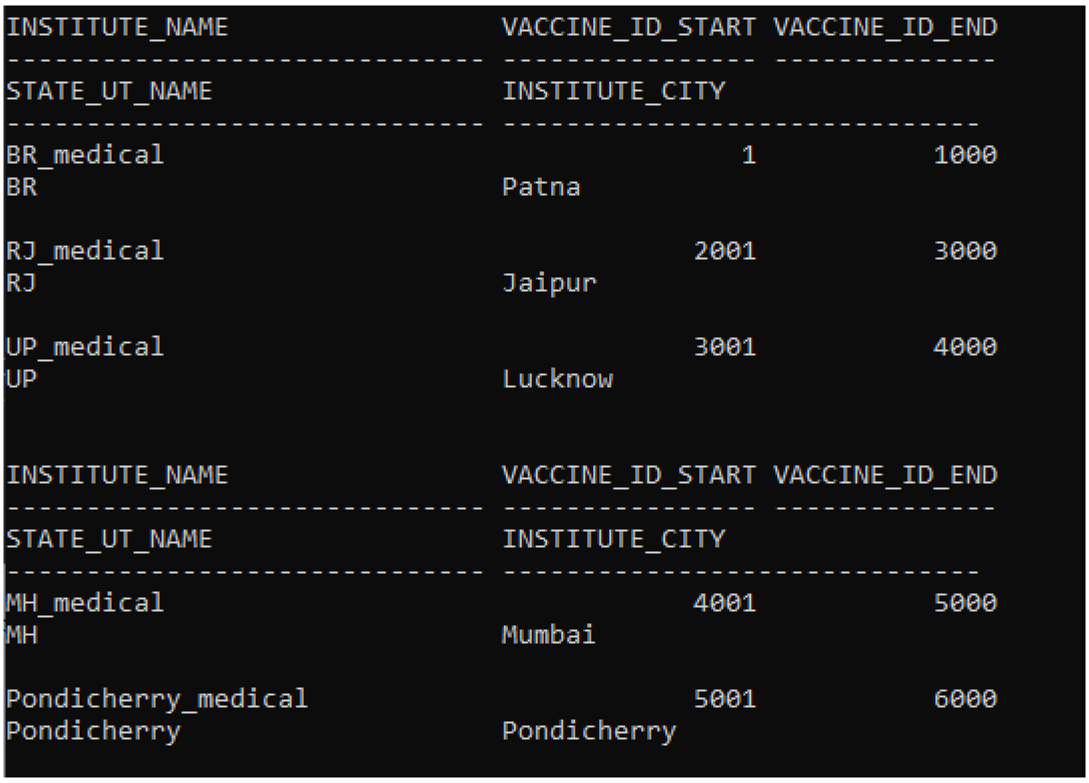


```
SQL> select * from medical_institute;

INSTITUTE_NAME                 VACCINE_ID_START VACCINE_ID_END
------------------------------ ---------------- --------------
STATE_UT_NAME                  INSTITUTE_CITY
------------------------------ ------------------------------
BR_medical                                    1           1000
BR                             Patna

TN_medical                                 1001           2000
TN                             Chennai

RJ_medical                                 2001           3000
RJ                             Jaipur


INSTITUTE_NAME                 VACCINE_ID_START VACCINE_ID_END
------------------------------ ---------------- --------------
STATE_UT_NAME                  INSTITUTE_CITY
------------------------------ ------------------------------
UP_medical                                 3001           4000
UP                             Lucknow

MH_medical                                 4001           5000
MH                             Mumbai

Pondicherry_medical                        5001           6000
Pondicherry                    Pondicherry


6 rows selected.
```

4.3 Operations

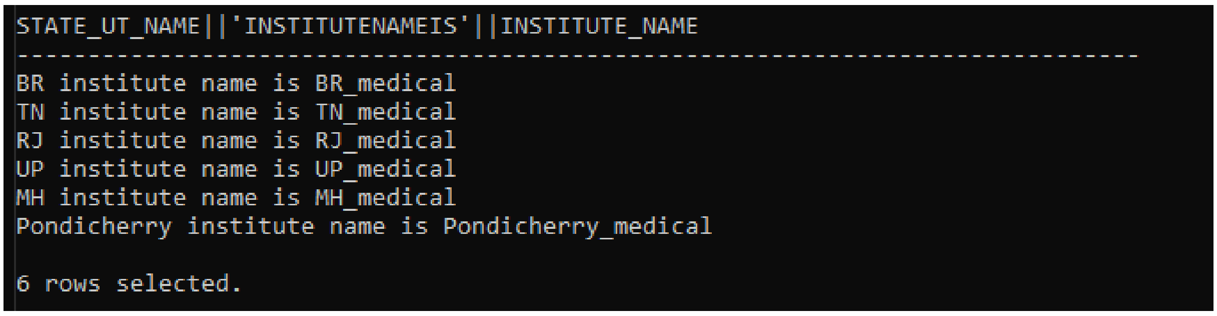
Advance select statements

i. select * from medical_institute where vaccine_id_start>2000 or institute_city='Patna';



```
INSTITUTE_NAME                 VACCINE_ID_START VACCINE_ID_END
------------------------------ ---------------- --------------
STATE_UT_NAME                  INSTITUTE_CITY
------------------------------ ------------------------------
BR_medical                                    1           1000
BR                             Patna

RJ_medical                                 2001           3000
RJ                             Jaipur

UP_medical                                 3001           4000
UP                             Lucknow


INSTITUTE_NAME                 VACCINE_ID_START VACCINE_ID_END
------------------------------ ---------------- --------------
STATE_UT_NAME                  INSTITUTE_CITY
------------------------------ ------------------------------
MH_medical                                 4001           5000
MH                             Mumbai

Pondicherry_medical                        5001           6000
Pondicherry                    Pondicherry
```

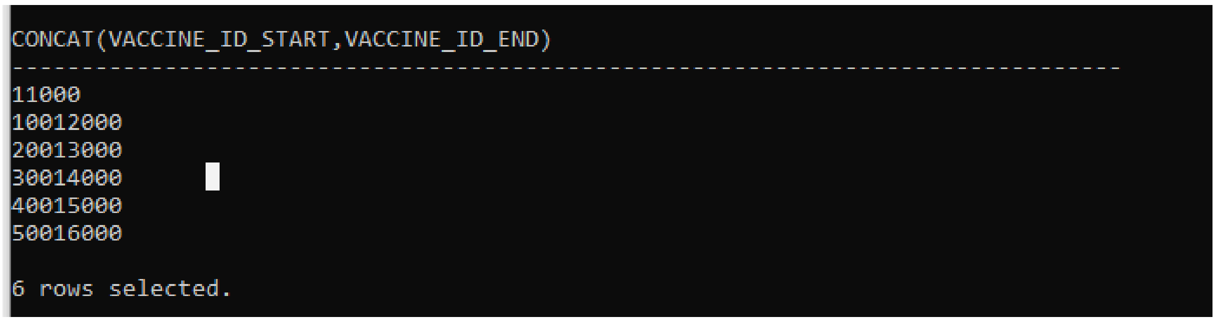
ii. select state_ut_name||' institute name is '||institute_name from medical_institute;



```
STATE_UT_NAME||'INSTITUTENAMEIS'||INSTITUTE_NAME
--------------------------------------------------------------------------------
BR institute name is BR_medical
TN institute name is TN_medical
RJ institute name is RJ_medical
UP institute name is UP_medical
MH institute name is MH_medical
Pondicherry institute name is Pondicherry_medical

6 rows selected.
```

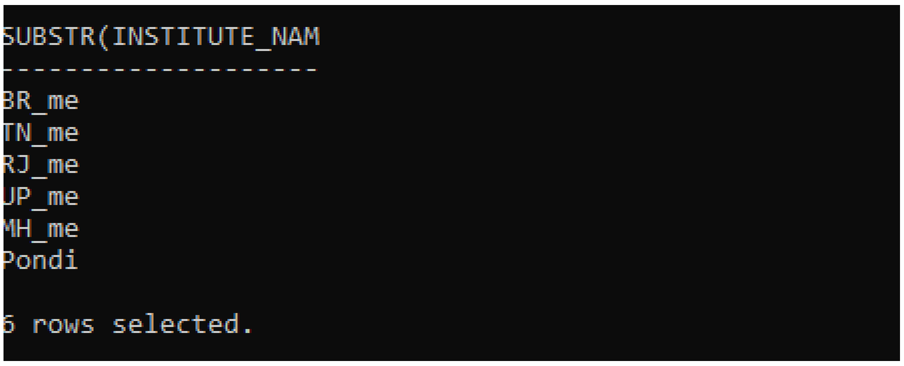
SQL Single-Row Functions

i. select concat(vaccine_id_start,vaccine_id_end) from medical_institute;



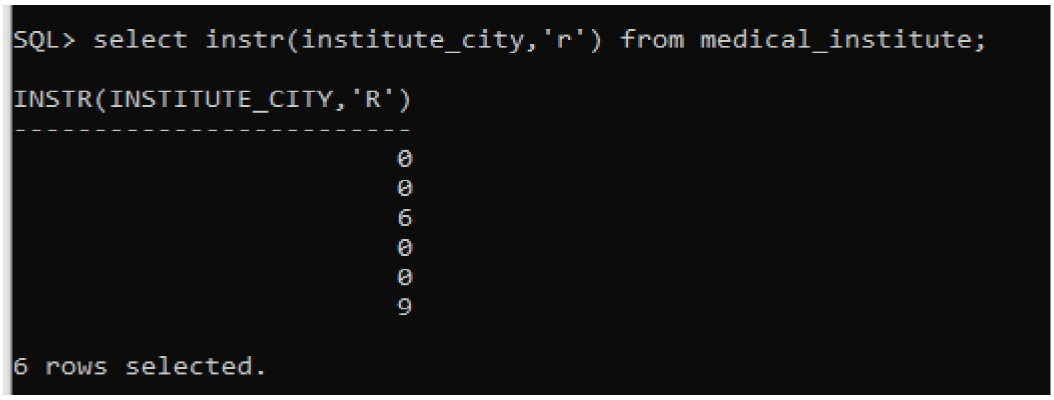
```
CONCAT(VACCINE_ID_START,VACCINE_ID_END)
--------------------------------------------------------------------------------
11000
10012000
20013000
30014000
40015000
50016000

6 rows selected.
```

ii. select substr(institute_name,1,5) from medical_institute;



```
SUBSTR(INSTITUTE_NAM
--------------------
BR_me
TN_me
RJ_me
UP_me
MH_me
Pondi

6 rows selected.
```

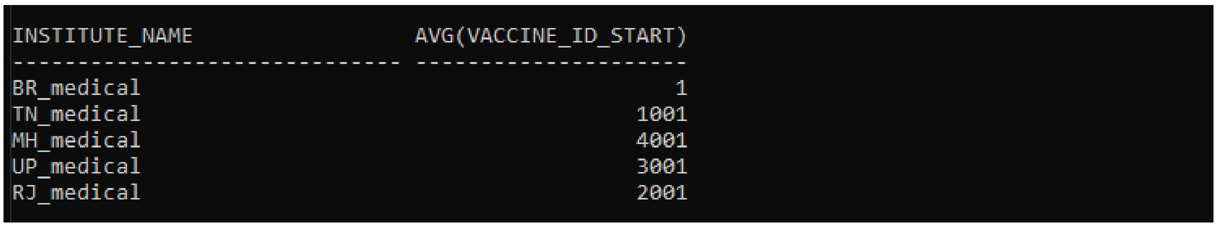
iii. select instr(institute_city,'r') from medical_institute;



```
SQL> select instr(institute_city,'r') from medical_institute;

INSTR(INSTITUTE_CITY,'R')
-------------------------
                        0
                        0
                        6
                        0
                        0
                        9

6 rows selected.
```

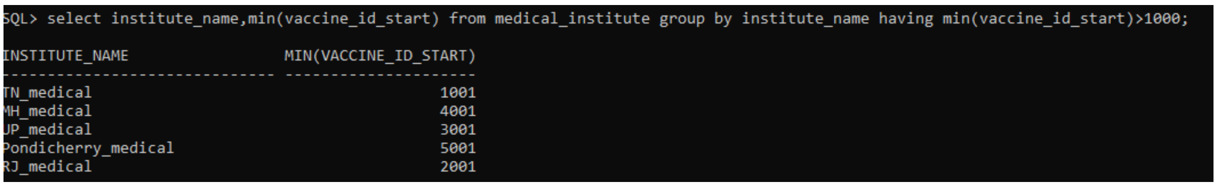
SQL Aggregate Functions

i. select institute_name,avg(vaccine_id_start) from medical_institute group by institute_name having avg(vaccine_id_start)<5000;



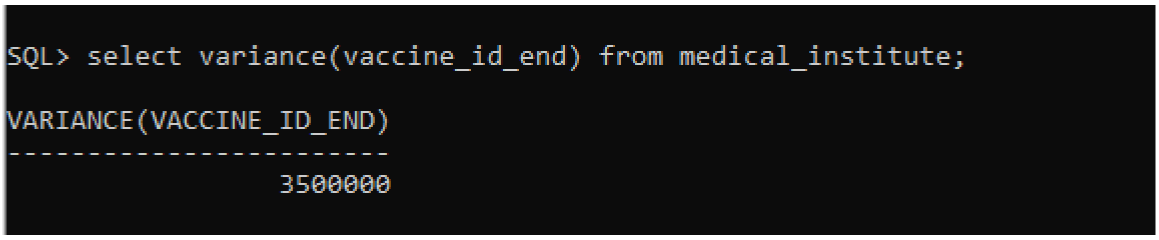
```
INSTITUTE_NAME                 AVG(VACCINE_ID_START)
------------------------------ ---------------------
BR_medical                                         1
TN_medical                                      1001
MH_medical                                      4001
UP_medical                                      3001
RJ_medical                                      2001
```

ii. select institute_name,min(vaccine_id_start) from medical_institute group by institute_name having min(vaccine_id_start)>1000;



```
SQL> select institute_name,min(vaccine_id_start) from medical_institute group by institute_name having min(vaccine_id_start)>1000;

INSTITUTE_NAME                MIN(VACCINE_ID_START)
----------------------------- ---------------------
TN_medical                                     1001
MH_medical                                     4001
UP_medical                                     3001
Pondicherry_medical                            5001
RJ_medical                                     2001
```

iii. select variance(vaccine_id_end) from medical_institute;



```
SQL> select variance(vaccine_id_end) from medical_institute;

VARIANCE(VACCINE_ID_END)
------------------------
                 3500000
```

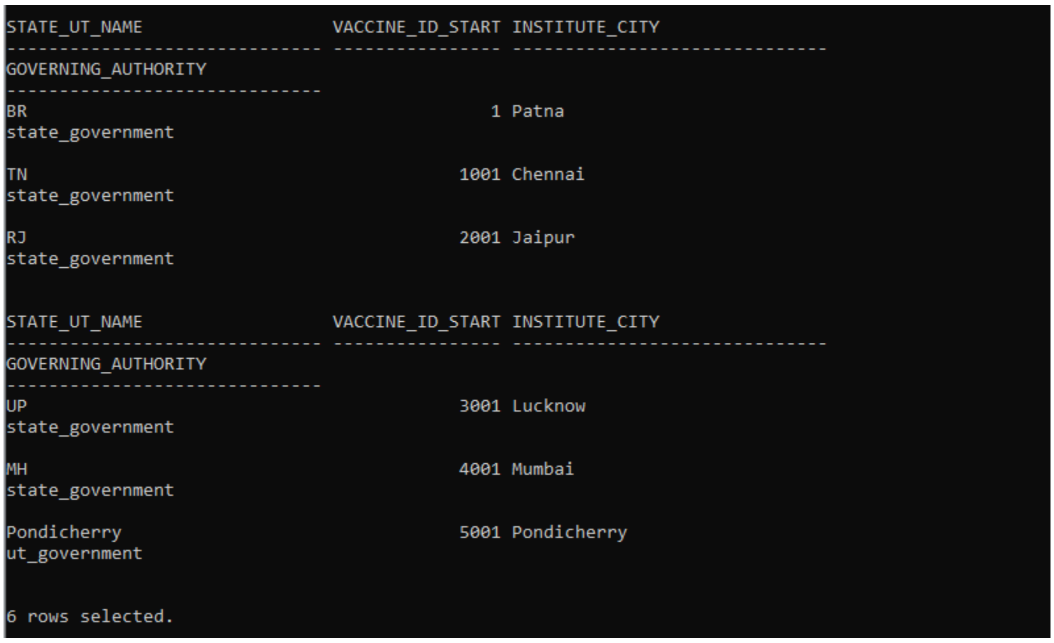
Joins on table State/U.T. and Medical Institute

alter table state_ut rename to st;
Table altered.

alter table medical_institute rename to mi;
Table altered.

i. Natural Join:

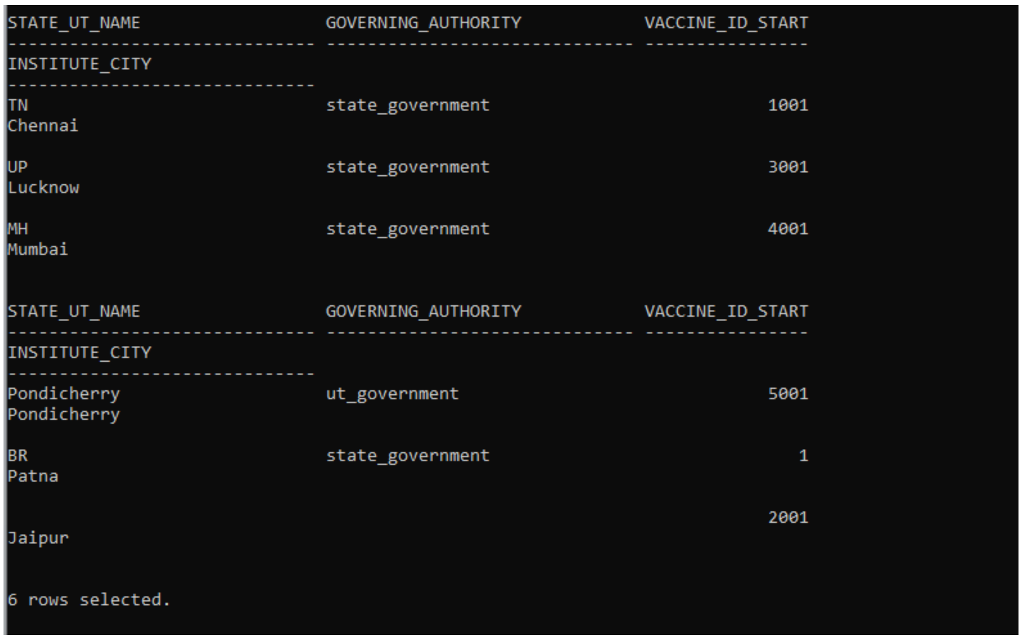
select state_ut_name,vaccine_id_start,institute_city,governing_authority from st natural join mi;



```
STATE_UT_NAME                 VACCINE_ID_START INSTITUTE_CITY
----------------------------- ---------------- -----------------------------
GOVERNING_AUTHORITY
-----------------------------
BR                                           1 Patna
state_government

TN                                        1001 Chennai
state_government

RJ                                        2001 Jaipur
state_government

STATE_UT_NAME                 VACCINE_ID_START INSTITUTE_CITY
----------------------------- ---------------- -----------------------------
GOVERNING_AUTHORITY
-----------------------------
UP                                        3001 Lucknow
state_government

MH                                        4001 Mumbai
state_government

Pondicherry                               5001 Pondicherry
ut_government


6 rows selected.
```

ii. Left Join:

select st.state_ut_name,st.governing_authority,mi.vaccine_id_start,mi.institute_city from st right outer join mi on st.vaccine_id_start=mi.vaccine_id_start;



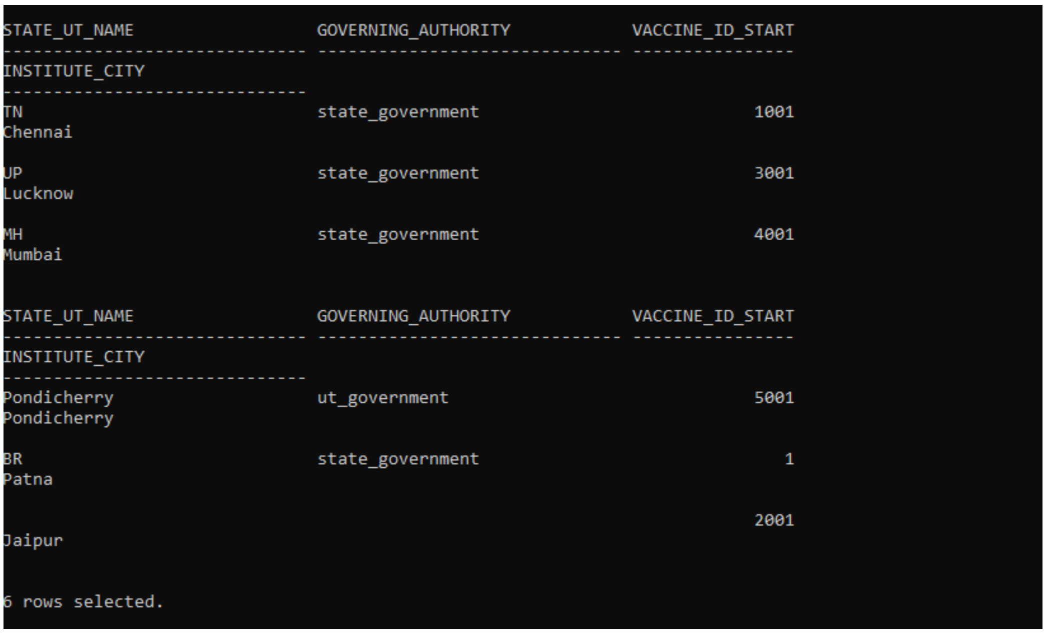
```
STATE_UT_NAME                  GOVERNING_AUTHORITY            VACCINE_ID_START
------------------------------ ------------------------------ ----------------
INSTITUTE_CITY
------------------------------
TN                             state_government                           1001
Chennai

UP                             state_government                           3001
Lucknow

MH                             state_government                           4001
Mumbai


STATE_UT_NAME                  GOVERNING_AUTHORITY            VACCINE_ID_START
------------------------------ ------------------------------ ----------------
INSTITUTE_CITY
------------------------------
Pondicherry                    ut_government                              5001
Pondicherry

BR                             state_government                              1
Patna

                                                                          2001
Jaipur


6 rows selected.
```

Deleting a row to more accurately understand outer joins:

delete from st where state_ut_name='RJ';
1 row deleted.

iii. Right Outer join

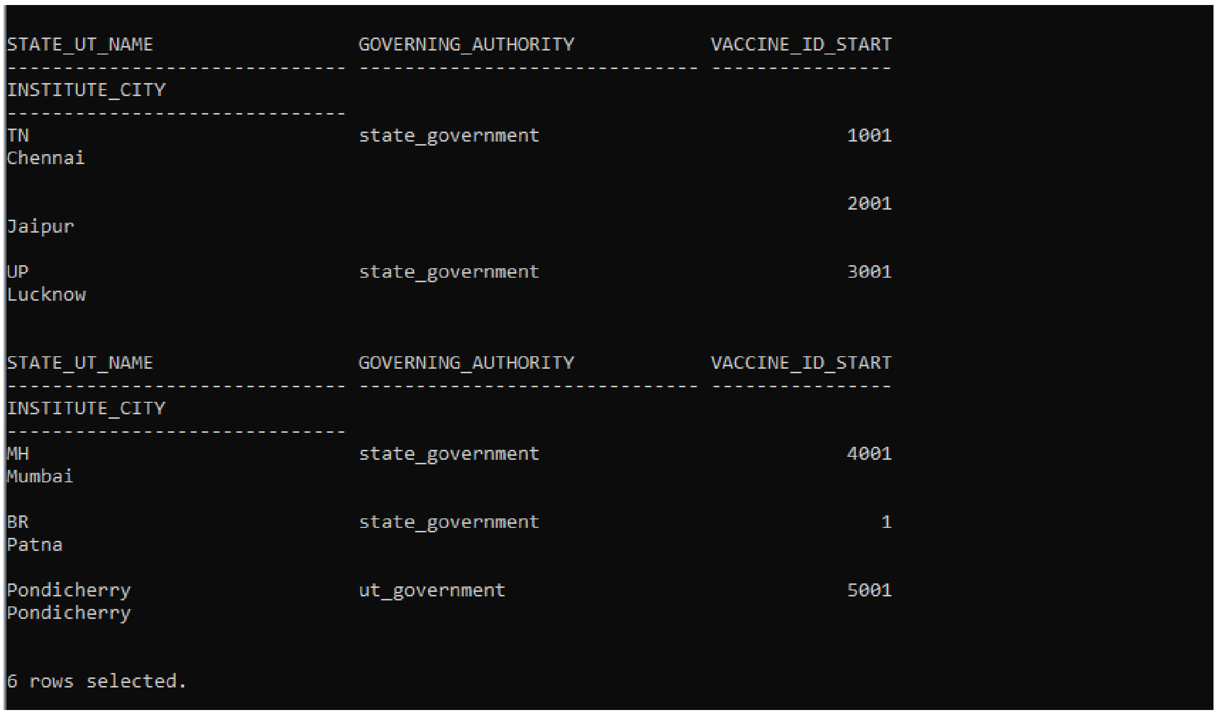
select st.state_ut_name,st.governing_authority,mi.vaccine_id_start,mi.institute_city from st right outer join mi on st.vaccine_id_start=mi.vaccine_id_start;



```
STATE_UT_NAME                  GOVERNING_AUTHORITY            VACCINE_ID_START
------------------------------ ------------------------------ ----------------
INSTITUTE_CITY
------------------------------
TN                             state_government                           1001
Chennai

UP                             state_government                           3001
Lucknow

MH                             state_government                           4001
Mumbai


STATE_UT_NAME                  GOVERNING_AUTHORITY            VACCINE_ID_START
------------------------------ ------------------------------ ----------------
INSTITUTE_CITY
------------------------------
Pondicherry                    ut_government                              5001
Pondicherry

BR                             state_government                              1
Patna

                                                                          2001
Jaipur


6 rows selected.
```

iv. Full Outer join:

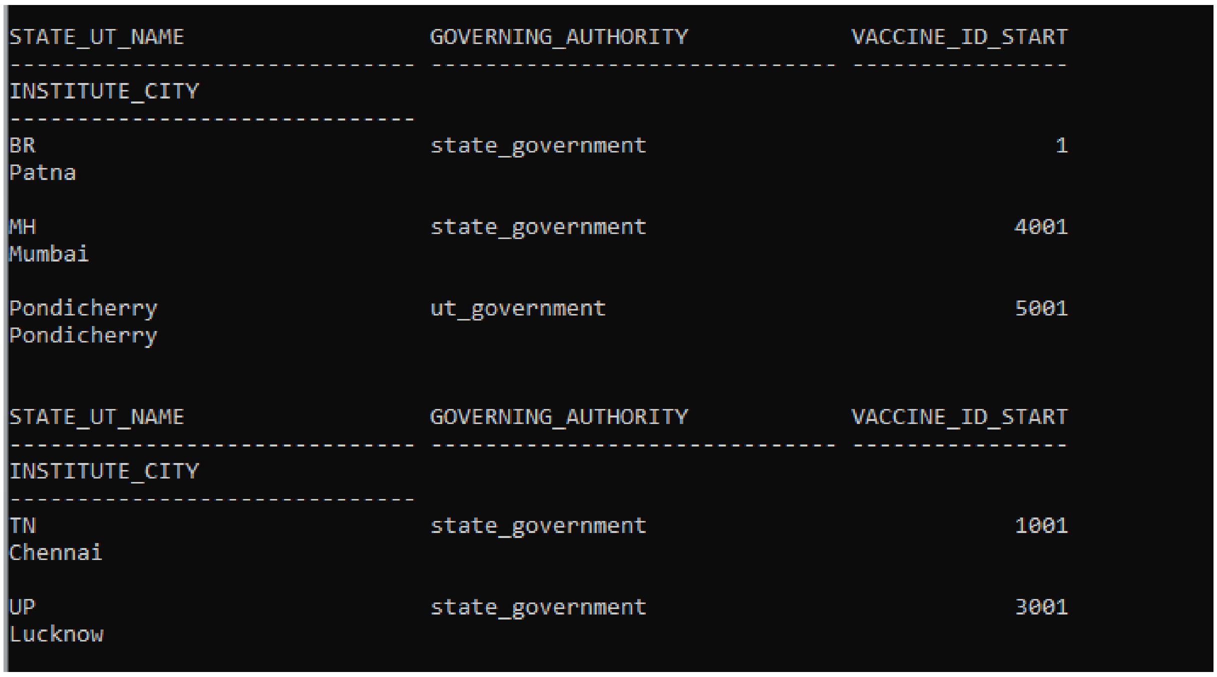
select st.state_ut_name,st.governing_authority,mi.vaccine_id_start,mi.institute_city from st full outer join mi on st.vaccine_id_start=mi.vaccine_id_start order by mi.institute_city;



```
STATE_UT_NAME                  GOVERNING_AUTHORITY            VACCINE_ID_START
------------------------------ ------------------------------ ----------------
INSTITUTE_CITY
------------------------------
TN                             state_government                           1001
Chennai

                                                                          2001
Jaipur

UP                             state_government                           3001
Lucknow


STATE_UT_NAME                  GOVERNING_AUTHORITY            VACCINE_ID_START
------------------------------ ------------------------------ ----------------
INSTITUTE_CITY
------------------------------
MH                             state_government                           4001
Mumbai

BR                             state_government                              1
Patna

Pondicherry                    ut_government                              5001
Pondicherry


6 rows selected.
```

v. Inner Join:

select st.state_ut_name,st.governing_authority,mi.vaccine_id_start,mi.institute_city from st inner join mi on st.vaccine_id_start=mi.vaccine_id_start order by st.state_ut_name;



```
STATE_UT_NAME                  GOVERNING_AUTHORITY            VACCINE_ID_START
------------------------------ ------------------------------ ----------------
INSTITUTE_CITY
------------------------------
BR                             state_government                              1
Patna

MH                             state_government                           4001
Mumbai

Pondicherry                    ut_government                              5001
Pondicherry


STATE_UT_NAME                  GOVERNING_AUTHORITY            VACCINE_ID_START
------------------------------ ------------------------------ ----------------
INSTITUTE_CITY
------------------------------
TN                             state_government                           1001
Chennai

UP                             state_government                           3001
Lucknow
```

CHAPTER 5

PATIENTS TABLE

5.1 Creating Table

create table Patients(Patient_Name varchar(20) NOT NULL, Age number(3) Check (age>=18), Aadhar_ID varchar(15) NOT NULL, Vaccine_id int PRIMARY KEY, Dose_date date, Vaccine_name varchar(20) NOT NULL, Dose_no number(2) Default 1);

5.2 Inserting Records

insert into Patients values('Sanjay Dutt', 29, 678898767890, 4002, '29-APR-2021', 'Johnson and Johnson', 1);

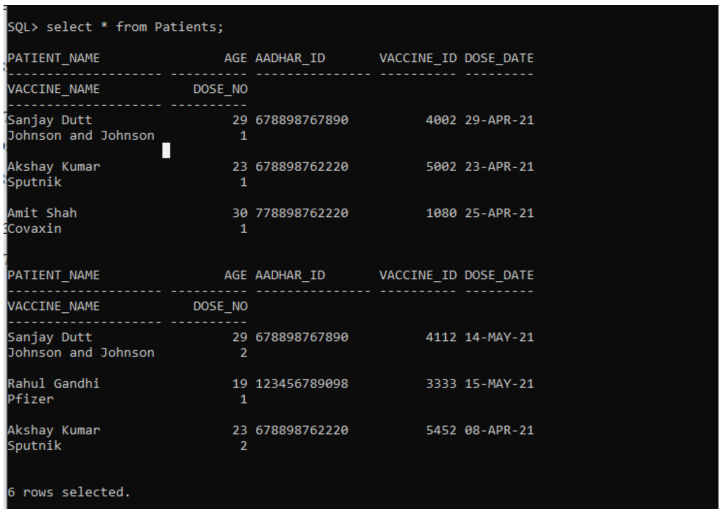
insert into Patients values('Akshay Kumar', 23, 678898762220, 5002, '23-APR-2021', 'Sputnik', 1);

insert into Patients values('Amit Shah', 30, 778898762220, 1080, '25-APR-2021', 'Covaxin', 1);

insert into Patients values('Sanjay Dutt', 29, 678898767890, 4112, '14-May-2021', 'Johnson and Johnson', 2);

insert into Patients values('Rahul Gandhi', 19, 123456789098, 3333, '15-May-2021', 'Pfizer', 1);

insert into Patients values('Akshay Kumar', 23, 678898762220, 5452, '08-APR-2021', 'Sputnik', 2);



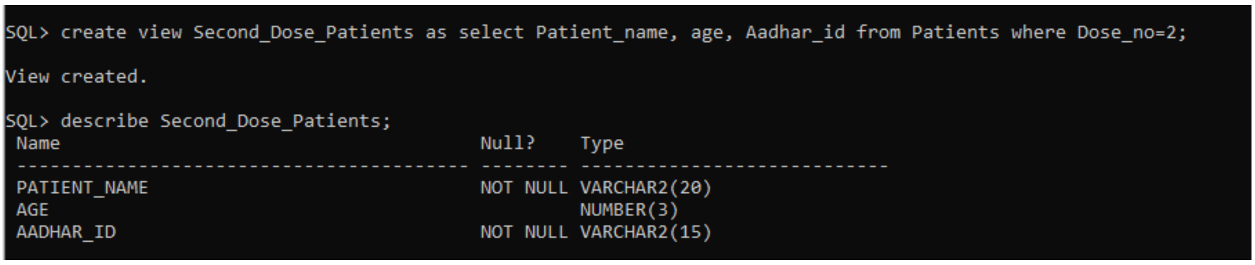
```
SQL> select * from Patients;

PATIENT_NAME                AGE AADHAR_ID       VACCINE_ID DOSE_DATE
-------------------- ---------- --------------- ---------- ---------
VACCINE_NAME            DOSE_NO
-------------------- ----------
Sanjay Dutt                  29 678898767890          4002 29-APR-21
Johnson and Johnson           1

Akshay Kumar                 23 678898762220          5002 23-APR-21
Sputnik                       1

Amit Shah                    30 778898762220          1080 25-APR-21
Covaxin                       1


PATIENT_NAME                AGE AADHAR_ID       VACCINE_ID DOSE_DATE
-------------------- ---------- --------------- ---------- ---------
VACCINE_NAME            DOSE_NO
-------------------- ----------
Sanjay Dutt                  29 678898767890          4112 14-MAY-21
Johnson and Johnson           2

Rahul Gandhi                 19 123456789098          3333 15-MAY-21
Pfizer                        1

Akshay Kumar                 23 678898762220          5452 08-APR-21
Sputnik                       2


6 rows selected.
```

5.3 Operations

Views

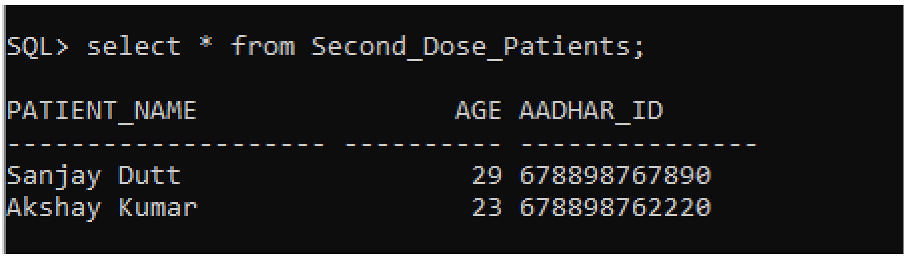
i. create view Second_Dose_Patients as select Patient_name, age, Aadhar_id from Patients where Dose_no=2;

ii. describe Second_Dose_Patients;



```
SQL> create view Second_Dose_Patients as select Patient_name, age, Aadhar_id from Patients where Dose_no=2;

View created.

SQL> describe Second_Dose_Patients;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 PATIENT_NAME                              NOT NULL VARCHAR2(20)
 AGE                                                NUMBER(3)
 AADHAR_ID                                 NOT NULL VARCHAR2(15)
```

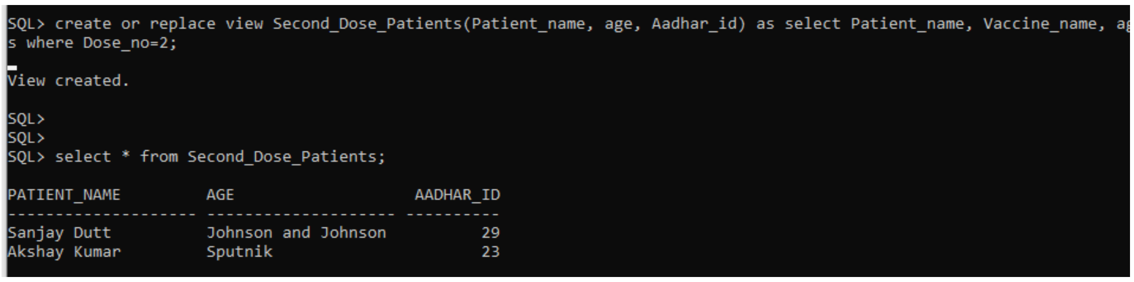
iii. select * from Second_Dose_Patients;



```
SQL> select * from Second_Dose_Patients;

PATIENT_NAME                AGE AADHAR_ID
-------------------- ---------- ---------------
Sanjay Dutt                  29 678898767890
Akshay Kumar                 23 678898762220
```

iv. create or replace view Second_Dose_Patients(Patient_name, age, Aadhar_id) as select Patient_name, Vaccine_name, age from Patients where Dose_no=2;

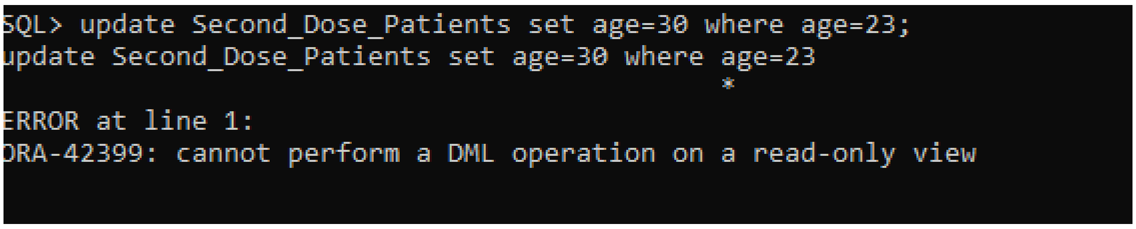
v. select * from Second_Dose_Patients;



```
SQL> create or replace view Second_Dose_Patients(Patient_name, age, Aadhar_id) as select Patient_name, Vaccine_name, ag
s where Dose_no=2;

View created.

SQL>
SQL>
SQL> select * from Second_Dose_Patients;

PATIENT_NAME         AGE                  AADHAR_ID
-------------------- -------------------- ----------
Sanjay Dutt          Johnson and Johnson          29
Akshay Kumar         Sputnik                      23
```

vi. create or replace view Second_Dose_Patients as select * from Patients where Dose_no=2 with read only;

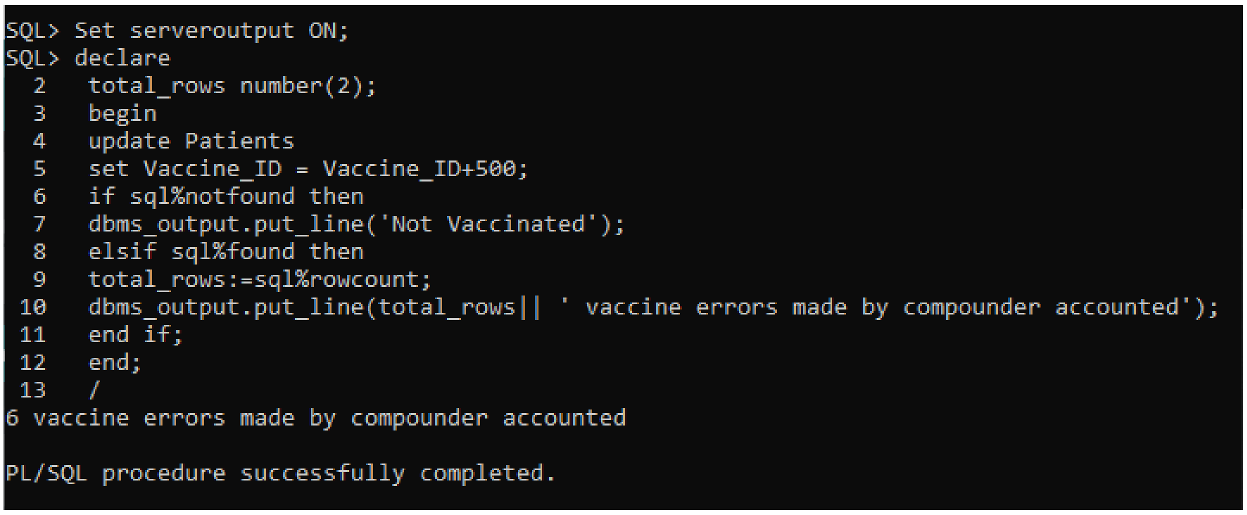
vii. update Second_Dose_Patients set age=30 where age=23;


```
SQL> update Second_Dose_Patients set age=30 where age=23;
update Second_Dose_Patients set age=30 where age=23
                                             *
ERROR at line 1:
ORA-42399: cannot perform a DML operation on a read-only view
```

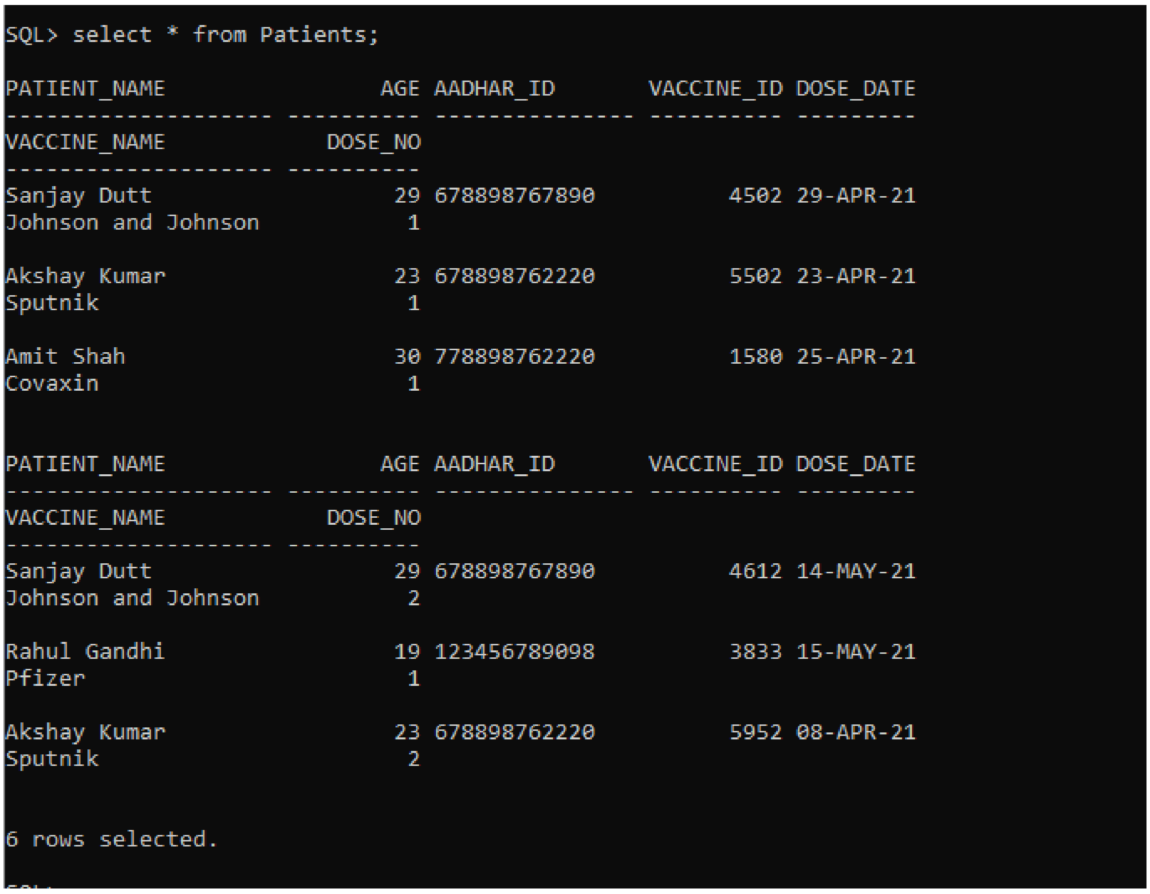
Cursors

i. Implicit Cursor

```
Set serveroutput ON;
declare
 total_rows number(2);
 begin
 update Patients
 set Vaccine_ID = Vaccine_ID+500;
 if sql%notfound then
 dbms_output.put_line('Not Vaccinated');
 elsif sql%found then
 total_rows:=sql%rowcount;
 dbms_output.put_line(total_rows|| ' vaccine errors made by compounder accounted');
 end if;
 end;
 /
```


```
SQL> Set serveroutput ON;
SQL> declare
     total_rows number(2);
     begin
     update Patients
     set Vaccine_ID = Vaccine_ID+500;
     if sql%notfound then
     dbms_output.put_line('Not Vaccinated');
     elsif sql%found then
     total_rows:=sql%rowcount;
     dbms_output.put_line(total_rows|| ' vaccine errors made by compounder accounted');
     end if;
     end;
     /
6 vaccine errors made by compounder accounted

PL/SQL procedure successfully completed.
```

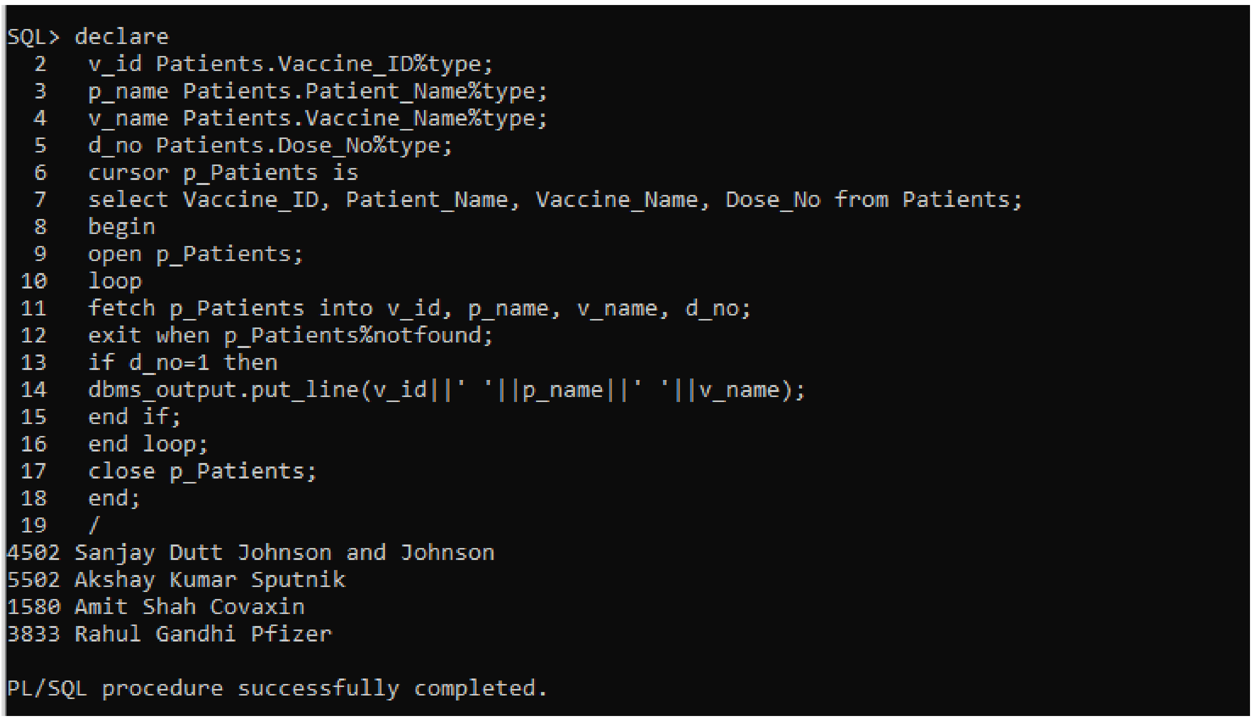
select * from Patients;



```
SQL> select * from Patients;

PATIENT_NAME                AGE AADHAR_ID       VACCINE_ID DOSE_DATE
-------------------- ---------- --------------- ---------- ---------
VACCINE_NAME            DOSE_NO
-------------------- ----------
Sanjay Dutt                  29 678898767890          4502 29-APR-21
Johnson and Johnson           1

Akshay Kumar                 23 678898762220          5502 23-APR-21
Sputnik                       1

Amit Shah                    30 778898762220          1580 25-APR-21
Covaxin                       1


PATIENT_NAME                AGE AADHAR_ID       VACCINE_ID DOSE_DATE
-------------------- ---------- --------------- ---------- ---------
VACCINE_NAME            DOSE_NO
-------------------- ----------
Sanjay Dutt                  29 678898767890          4612 14-MAY-21
Johnson and Johnson           2

Rahul Gandhi                 19 123456789098          3833 15-MAY-21
Pfizer                        1

Akshay Kumar                 23 678898762220          5952 08-APR-21
Sputnik                       2


6 rows selected.
```

ii. Explicit Cursor

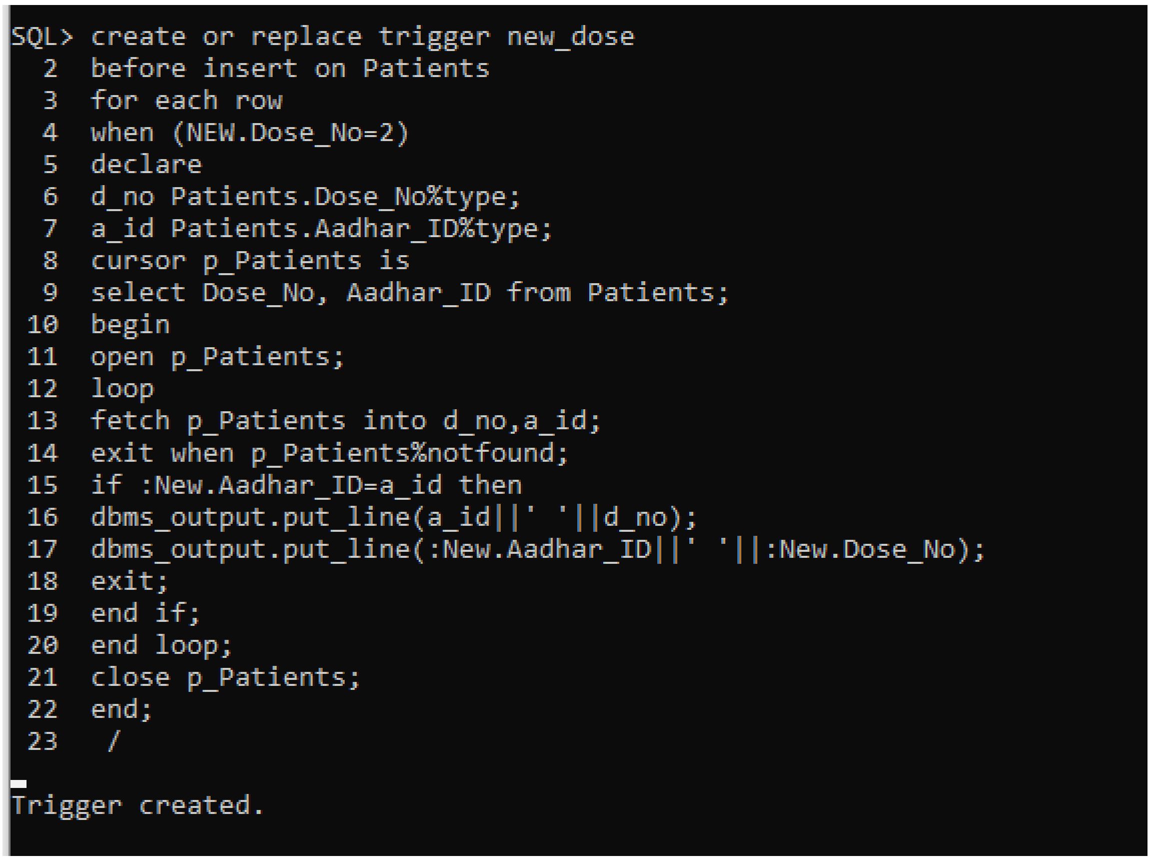
```
declare
 v_id Patients.Vaccine_ID%type;
 p_name Patients.Patient_Name%type;
 v_name Patients.Vaccine_Name%type;
 d_no Patients.Dose_No%type;
 cursor p_Patients is
 select Vaccine_ID, Patient_Name, Vaccine_Name, Dose_No from Patients;
 begin
 open p_Patients;
 loop
 fetch p_Patients into v_id, p_name, v_name, d_no;
 exit when p_Patients%notfound;
 if d_no=1 then
 dbms_output.put_line(v_id||' '||p_name||' '||v_name);
 end if;
 end loop;
 close p_Patients;
 end;
 /
```



```
SQL> declare
v_id Patients.Vaccine_ID%type;
p_name Patients.Patient_Name%type;
v_name Patients.Vaccine_Name%type;
d_no Patients.Dose_No%type;
cursor p_Patients is
select Vaccine_ID, Patient_Name, Vaccine_Name, Dose_No from Patients;
begin
open p_Patients;
loop
fetch p_Patients into v_id, p_name, v_name, d_no;
exit when p_Patients%notfound;
if d_no=1 then
dbms_output.put_line(v_id||' '||p_name||' '||v_name);
end if;
end loop;
close p_Patients;
end;
/
4502 Sanjay Dutt Johnson and Johnson
5502 Akshay Kumar Sputnik
1580 Amit Shah Covaxin
3833 Rahul Gandhi Pfizer

PL/SQL procedure successfully completed.
```

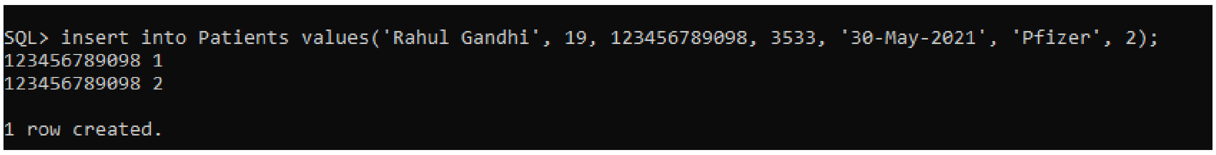
Trigger

```
create or replace trigger new_dose
before insert on Patients
for each row
when (NEW.Dose_No=2)
declare
d_no Patients.Dose_No%type;
a_id Patients.Aadhar_ID%type;
cursor p_Patients is
select Dose_No, Aadhar_ID from Patients;
begin
open p_Patients;
loop
fetch p_Patients into d_no,a_id;
exit when p_Patients%notfound;
if :New.Aadhar_ID=a_id then
dbms_output.put_line(a_id||' '||d_no);
dbms_output.put_line(:New.Aadhar_ID||' '||:New.Dose_No);
exit;
end if;
end loop;
close p_Patients;
end;
 /
```



```
SQL> create or replace trigger new_dose
  before insert on Patients
  for each row
  when (NEW.Dose_No=2)
  declare
  d_no Patients.Dose_No%type;
  a_id Patients.Aadhar_ID%type;
  cursor p_Patients is
  select Dose_No, Aadhar_ID from Patients;
  begin
  open p_Patients;
  loop
  fetch p_Patients into d_no,a_id;
  exit when p_Patients%notfound;
  if :New.Aadhar_ID=a_id then
  dbms_output.put_line(a_id||' '||d_no);
  dbms_output.put_line(:New.Aadhar_ID||' '||:New.Dose_No);
  exit;
  end if;
  end loop;
  close p_Patients;
  end;
   /

Trigger created.
```

insert into Patients values('Rahul Gandhi', 19, 123456789098, 3533, '30-May-2021', 'Pfizer', 2);



```
SQL> insert into Patients values('Rahul Gandhi', 19, 123456789098, 3533, '30-May-2021', 'Pfizer', 2);
123456789098 1
123456789098 2

1 row created.
```

CHAPTER 6

CONCLUSION

Covid-19 has reminded the need of a centralized and proper management system in-order to efficiently utilize the resources available. A transparent system divided into stages of-Manufacturer, warehouse, state authority, medical institute and patient tables provides a neat, transparent and easy to track system where the whole data can be queried with minimum effort. The use of concepts like single-row functions, triggers etc. provide an interface for analytics which is quite crucial. The system's implementation can allow the general public to also track the vaccine jabs and avoid uncertainty among common masses. Thus, also preventing panic.

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