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ECHO E-REPORTING

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ECHO E-REPORTING

Thesis submitted in partial fulfillment of the
Requirements for the degree of

Master of Science
M.Sc. (Information Science)

By

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MANIPAL
ACADEMY of HIGHER EDUCATION
(Deemed to be University under Section 3 of the UGC Act, 1956)

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CERTIFICATE

This is to certify that this thesis work titled

Echo E-Reporting

Is a bonafide record of the work done by

Hegde Suma Subray Rukmini

181008005

In partial fulfillment of the requirements for the award of the degree of **Master of Science - M.Sc. (Information Science)** under MAHE, Manipal and the same has not been submitted elsewhere for the award of any other degree. The dissertation does not contain any part / chapter plagiarized from other sources.

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ABSTRACT

The project titled ‘Echo E-Reporting’ is done for Department of Cardiology, KMC Manipal. Echocardiography is the application of ultrasound in cardiac diagnosis. This particular reporting system makes the process of entering and maintaining the vast records of patients easier via online means and database.

Previously cardiologists and medical interns used to enter the patient data in the word document of a certain template and used to record in the doc format. This method used to consume lot of time and storage in the used system.

Echo-ER is a software which allows the cardiologists/interns to add the patient data, view the report and also allows to print the report. The patient data is saved in the database which helps to retrieve the records as and when needed.

1. Introduction

1.1 System Reference

The ECHO ER project is a website to enter, store, retrieve and view the records of the patients with respect to the application of ultrasound in cardiac diagnosis. The new system makes it easier to maintain the comprehensive reporting needed to be done. This GUI-based system is both user friendly and easily extendable.

This system is helpful for the cardiologists and medical interns to:

-enter the records
-view the records (by patient id)
-generate the reports
-print the reports

Also the system enables admin to perform the tasks such as:

-search the records (by patient id, date, disease category)
-manage unit, cardiologist, department, users

1.2 Overall Description

ECHO ER project was already in use by the Echo Room of Cardiology Department. The cardiologists and admin needed certain changes as well as new additions in the existing system such as:

-The records saved in the excel sheet when opened it used to give the format error since it used to get saved with .xls extension which is old excel format. So the solution to remove the error was to save the records with new excel format .xlsx

-The entire records ‘Search by all’ when selected were not getting downloaded, which was solved by increasing the request length in the config file of the project.

-The ECHO ER for fetal was improvised and changed with a new design and values according to the template provided and suggested by cardiologists.

-The ECHO ER for pediatrics was added new with respect to given template by the cardiologists.

2. General Description

2.1 Product functions

The website ECHO ER is basically used for reporting of the application of cardiac diagnosis. It is organized into:

- Login- This page is for admin, cardiologists, faculty and medical interns to gain access to the system by their username and password.

- Patient Entry- This webpage is used to enter the details of the patients according to patient id stored in the PMS which is hospital's database and according to the disease category diagnosed with.

- Fetal Entry- This webpage is for the fetal entry in which the patient id is given and the patient id along with patient's details such as name, mobile no., and other details are fetched from the PMS database.

- Pediatric Entry-This webpage is in which details are entered for children.

- Stats- This webpage is particularly for admin to search through the records by various parameters such as patient's name, date, disease diagnosed with, separate fetal records search, pediatric search and to download the entire records stored or entered so far in the existing system.

- View Report- This tool is used to generate the reports as well as to print the generated reports.

- Master Data- This page is used by admin to manage the users or unit or department i.e. to add user, unit, cardiologist, and department and make them active or inactive.

2.2 Users

Admin	Add a new user / role. Search the records Editing the roles or responsibilities.
Students	Entering, modifying and viewing patient report. Entering viewing fetal report. Viewing the information of the patient in stats by using patient id.
Staff	Entering, modifying and viewing patient report. Entering and viewing fetal report. Entering and viewing pediatric report.
Cardiologist	Modifying and viewing patient report. Entering fetal and pediatric details. Viewing the existing patient's details by entering patient id in view report.

3. Specific Requirements

3.1 Functional Requirements

3.1.1 Fetal Entry and Report

- The page similar to patient's entry was needed for fetal with the values and design suggested by the cardiologist.

- After the page was created for entering the details of the fetal and stored in the database, report had to be generated in pdf format and for print.

- In order to view the details of the existing data of fetal, a search page according to patient id and saving the records in excel sheet has to be done.

3.1.2 Pediatric Entry and Report

- A new page has to be added to the existing system for entering the details of pediatrics i.e. children diagnosed with cardiac disease.

- The template for pediatric page was given by the cardiologist and accordingly has to be created.

- After creating further verification needs to be done with the cardiologists for final approval.

- The details should be stored in the database and report needs to be generated for viewing and printing purpose.

3.1.3 Exporting data to new excel format

- The records saved in the excel sheet in stats in the existing system used to give format error when opened which had to be removed.
- This was because the excel sheet was getting saved in old format with extension .xls

- The library used in existing system was EPPlus.dll

- In order to remove the error, excel sheet has to be stored in new format with .xlsx extension for which ClosedXML and DocumentFormat.OpenXML is to be used.

3.1.4 Displaying number of records in existing database

- The requirement was to display the existing number of total records of patients, fetal and pediatrics in the database.

- The count has to be displayed from the database of the records as they are getting updated.

- This is helpful for the admin to analyze the records as well.

3.1.5 Altering the patient's detailed report

- The detailed report of patient was not displayed correctly and few alignment of the details such as final impression, entered by, consultant doctor/unit was improper.

- Also the URL in print page had to be removed.

3.2 External Interface Requirements

3.2.1 Hardware Requirements

- Processor : Intel core i3 or i5
- RAM : Minimum 4GB
- Hard Disk : Minimum 20GB
- I/O Devices : Keyboard, mouse, monitor

3.2.2 Software Requirements

- Operating System : Windows 8 Pro or higher
- Front End : Visual Studio 2012 Professional
  ASP.Net C#
- Back End : Microsoft SQL Server 2012
- Scripting technologies : JavaScript, Bootstrap

3.3 Attributes

3.3.1 Availability

- The current or the existing ECHO ER website is available on the systems connected to the intranet of MAHE.

- The website is available to the cardiologists, staff and interns provided they have username and password.

3.3.2 Security/Privacy

- The ECHO ER website can only be accessed by verified username and password of cardiologists or staff or interns.

- Username is manipal.edu id/ employee id/learner id and password their respective id's password.

- The database is secured with restriction to access it except the admin.

3.3.3 Portability

- Currently ECHO ER is on a secured test server which is accessible by the systems connected to the intranet of MAHE.

- It is within the MAHE domain accessible through intranet only.

3.4 Other Requirements

In order to understand the project or for future enhancement of the project, certain information related to the language/framework/css/database is needed.
Below mentioned information gives the brief idea about the same.

ASP.NET C#

- ASP.Net is a framework for developing dynamic web applications.
- It supports languages like VB.NET, C#, Jscript.Net, etc.
- ASP stands for Active Server Pages and .NET is Network Enabled Technologies.
- The programming logic and content can be developed separately in Microsoft ASP.Net
- The language used in this project is C#.
- The most recent version of ASP.Net is version 4.6.
- ASP.Net is designed to work with the HTTP protocol.
- .NET framework includes a set of standard class libraries which contains all the necessary components used to develop web-based applications.
- Common Language Runtime (CLR) is used for performing key activities such as Exception Handling and Garbage Collection.
- An important feature is the masterpage which helps to reuse the template for the entire project.
- Also various validation controls for the security purpose of the application.

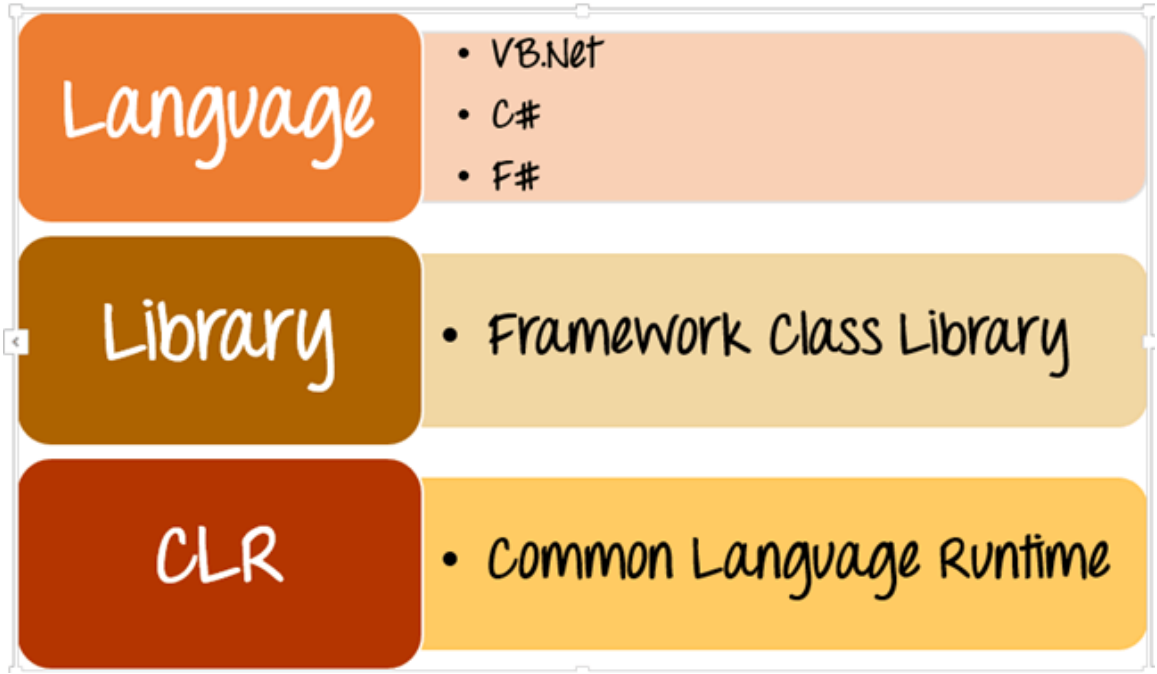


Fig.1 ASP.Net Architecture

JavaScript and Bootstrap

- **JavaScript** is flexible programmable language and is one of the core technologies of web development

  .
- It can be used on both front-end and back-end.
- Versatile and robust, Front-end and Back-end friendly, Enables web applications, Game Development and Mobile Apps are some of the features of JavaScript.
- JavaScript in this project is used for displaying alerts on saving the details and for not entering the patient id.

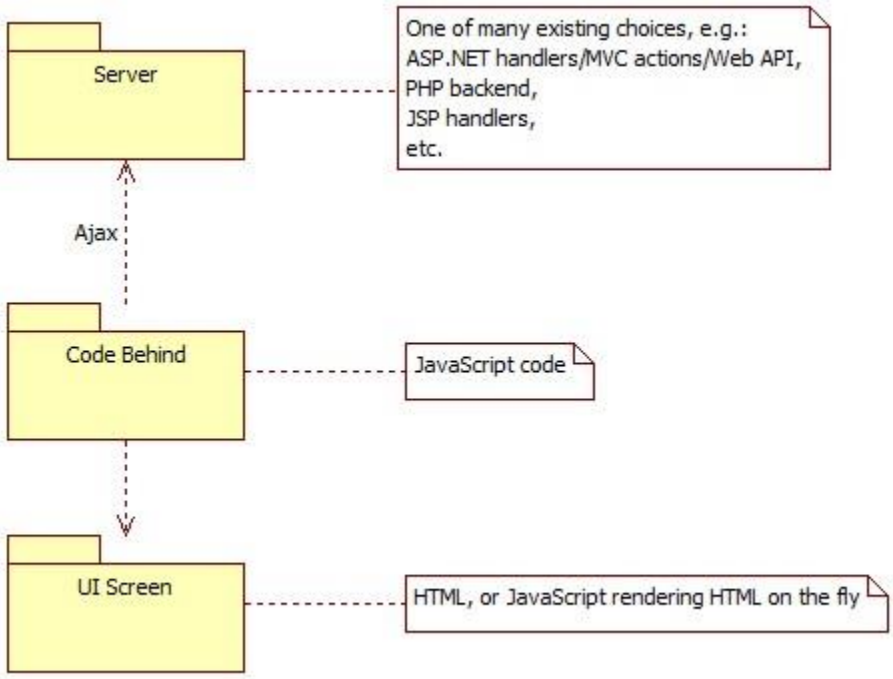


Fig.2 Basic JavaScript Architecture

- **Bootstrap** is a free and open-source CSS framework directed at responsive, mobile-first front-end web development.
- It contains CSS and JavaScript based design templates for forms, buttons, navigation and other interface components.
- Over a dozen reusable components built to provide iconography, dropdowns, input groups, navigation, alerts and much more.

- This project uses Bootstrap for design and look of the masterpage.

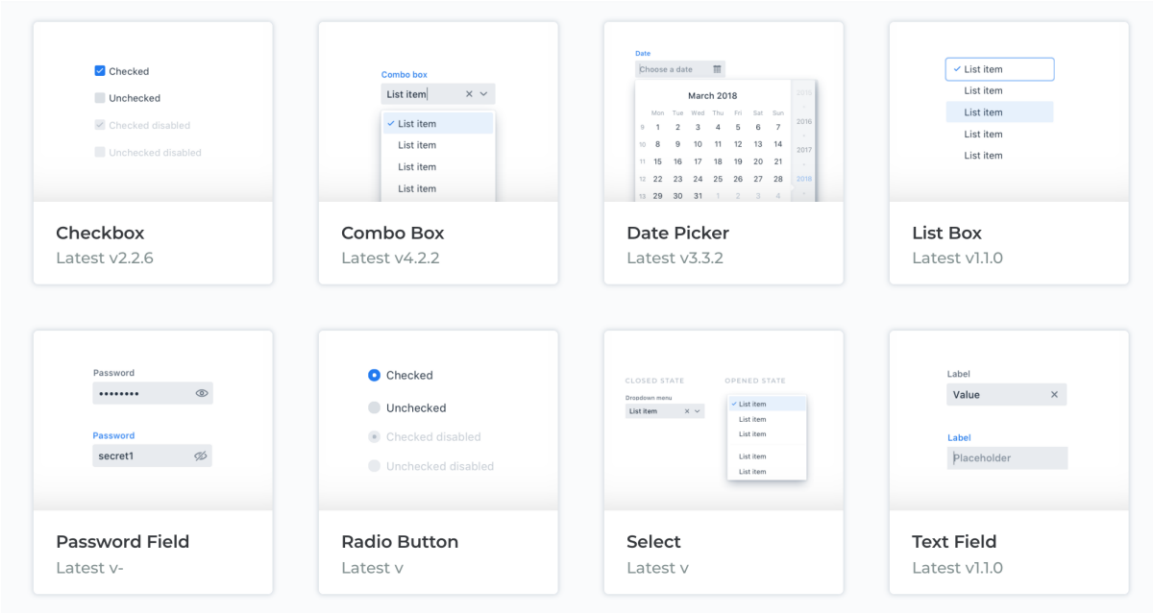


Fig.3 Typical Bootstrap web components

Ajax

- Ajax (Asynchronous JavaScript and XML) is a set of web development techniques using many web technologies on the client side to create asynchronous web applications.

- With Ajax, web applications can send and retrieve data from a server asynchronously without interfering with the display and behavior of the existing page.

SQL

- SQL (Structured Query Language) is a standard language for accessing and manipulating databases.

- It is a domain-specific language used in programming and designed for managing data held in a relational database management system, or for stream processing in a relational data stream management system.

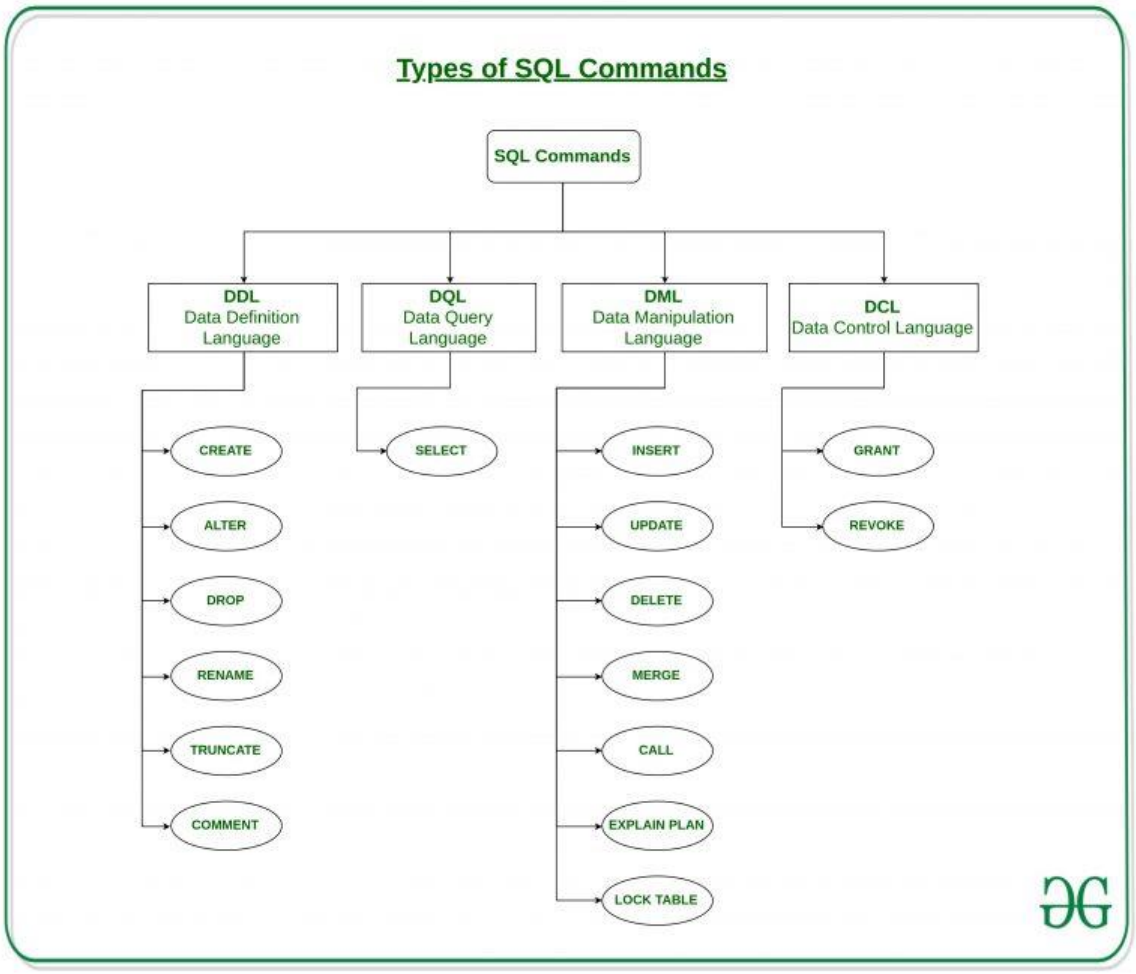


Fig.4 SQL Commands

- A stored procedure is a type of code in SQL that can be stored for later use and can be used for many times.

- Whenever a query is needed to be executed instead of calling it, the stored procedure can be called.

- Parameters can also be passed for the stored procedure to act on.
- Features of stored procedure:

  -Better Performance

  -Higher Productivity

  -Ease of use

  -Scalability

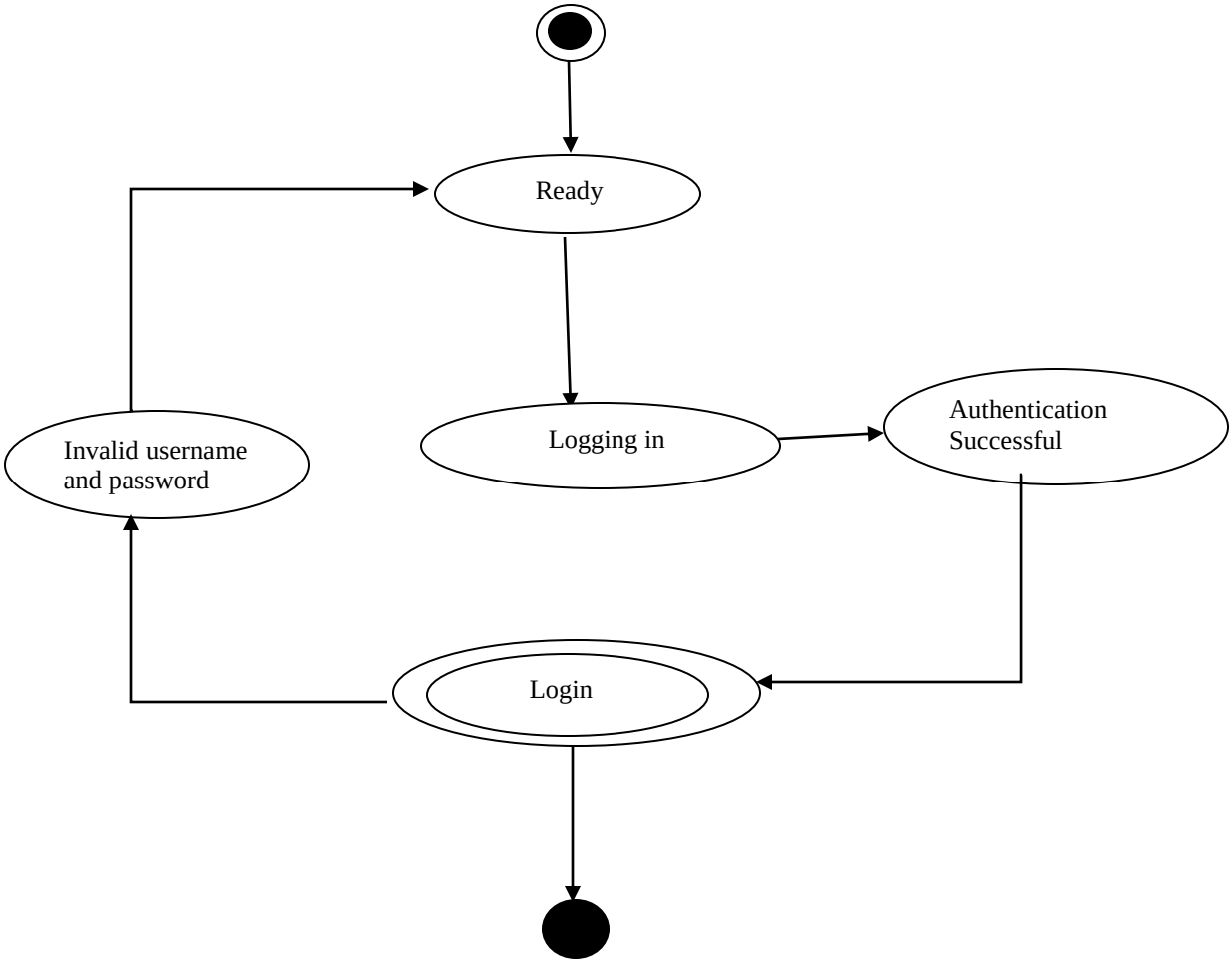
  -Maintainability

  -Security

- Basic Syntax

```
CREATE PROCEDURE procedure_name
AS
Sql_statement
GO;
```

4. Behavioral Description
4.1 System States



5. Data Design

5.1 Database Structures

5.1.1 Database Design

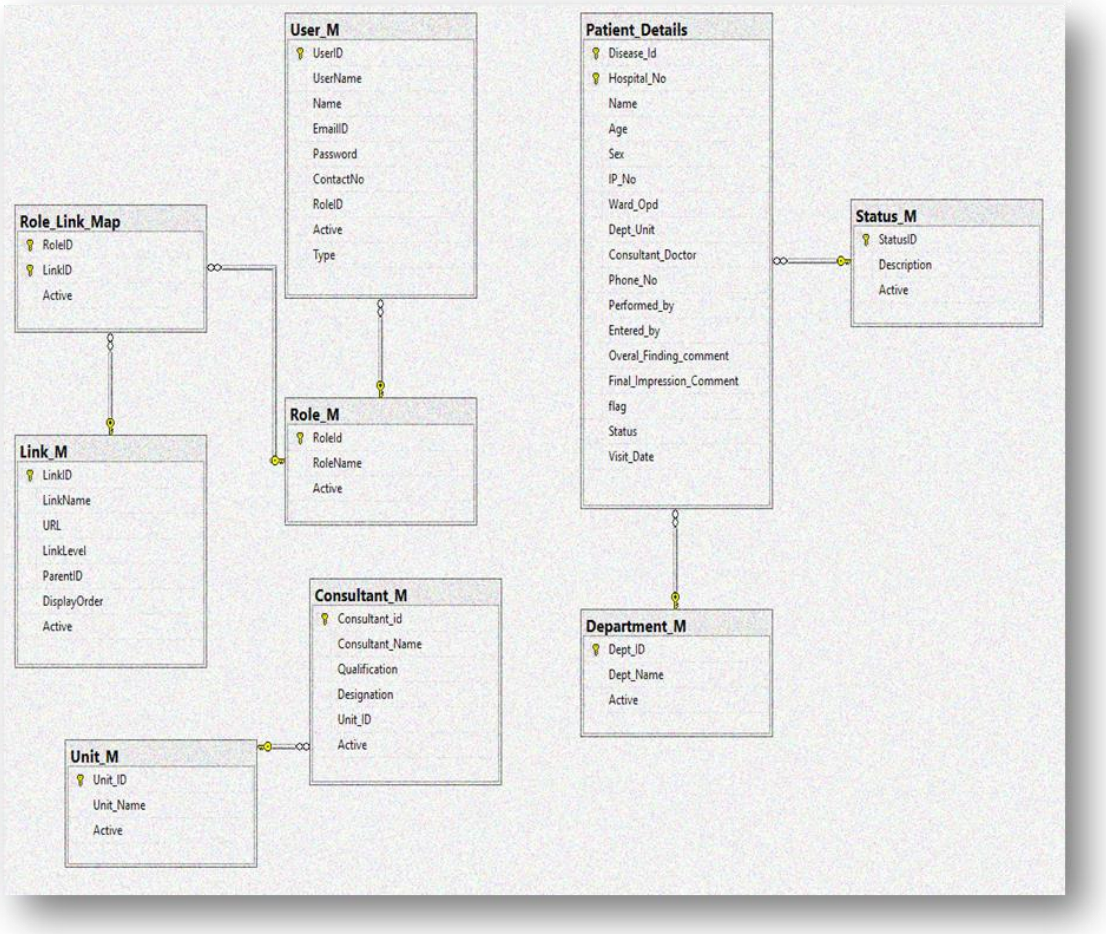


Fig.5 Basic Database Design

5.1.2 Flow Chart

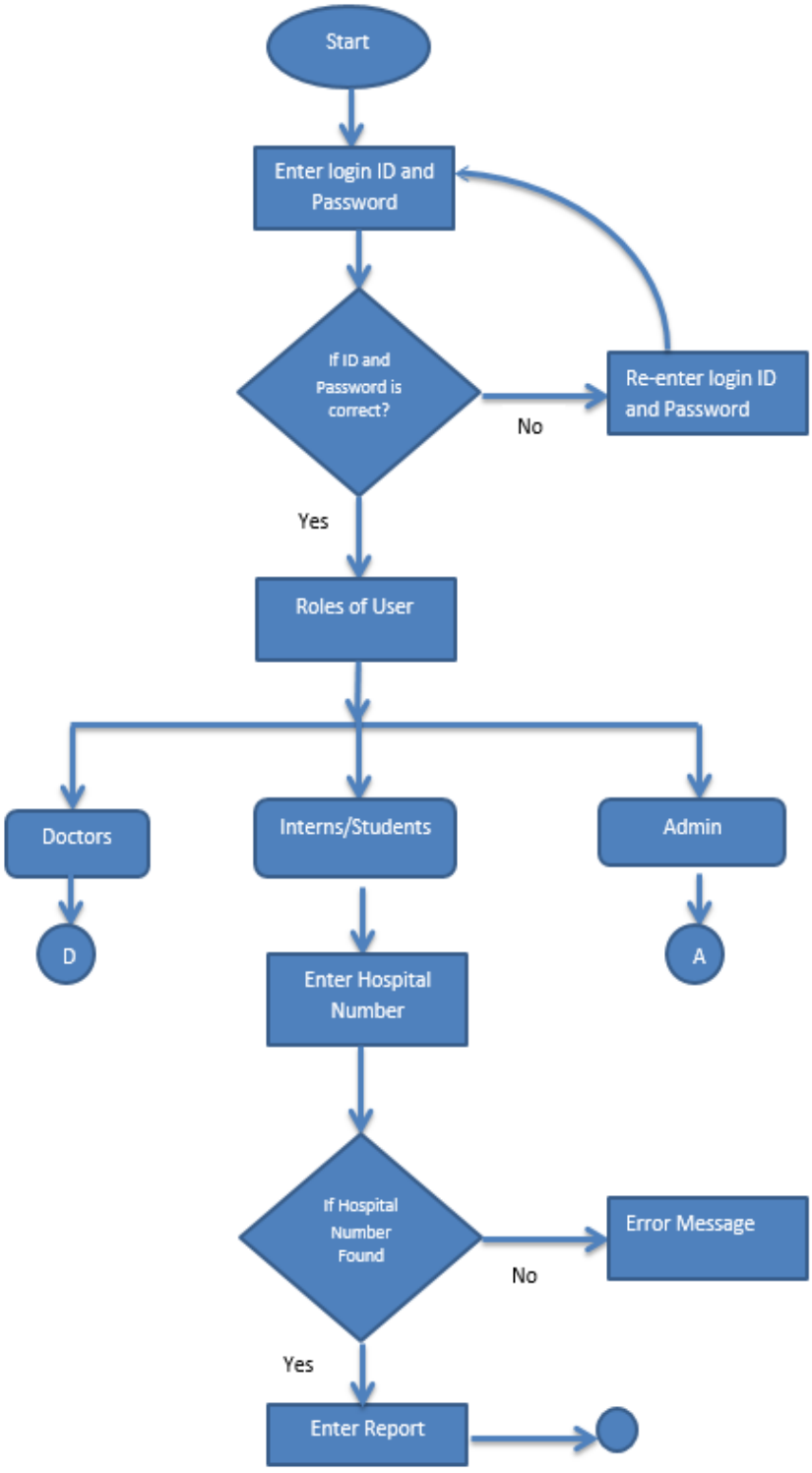
- A flowchart is a diagrammatic representation of a workflow or process.

-The flowchart shows the steps as boxes of various kinds,

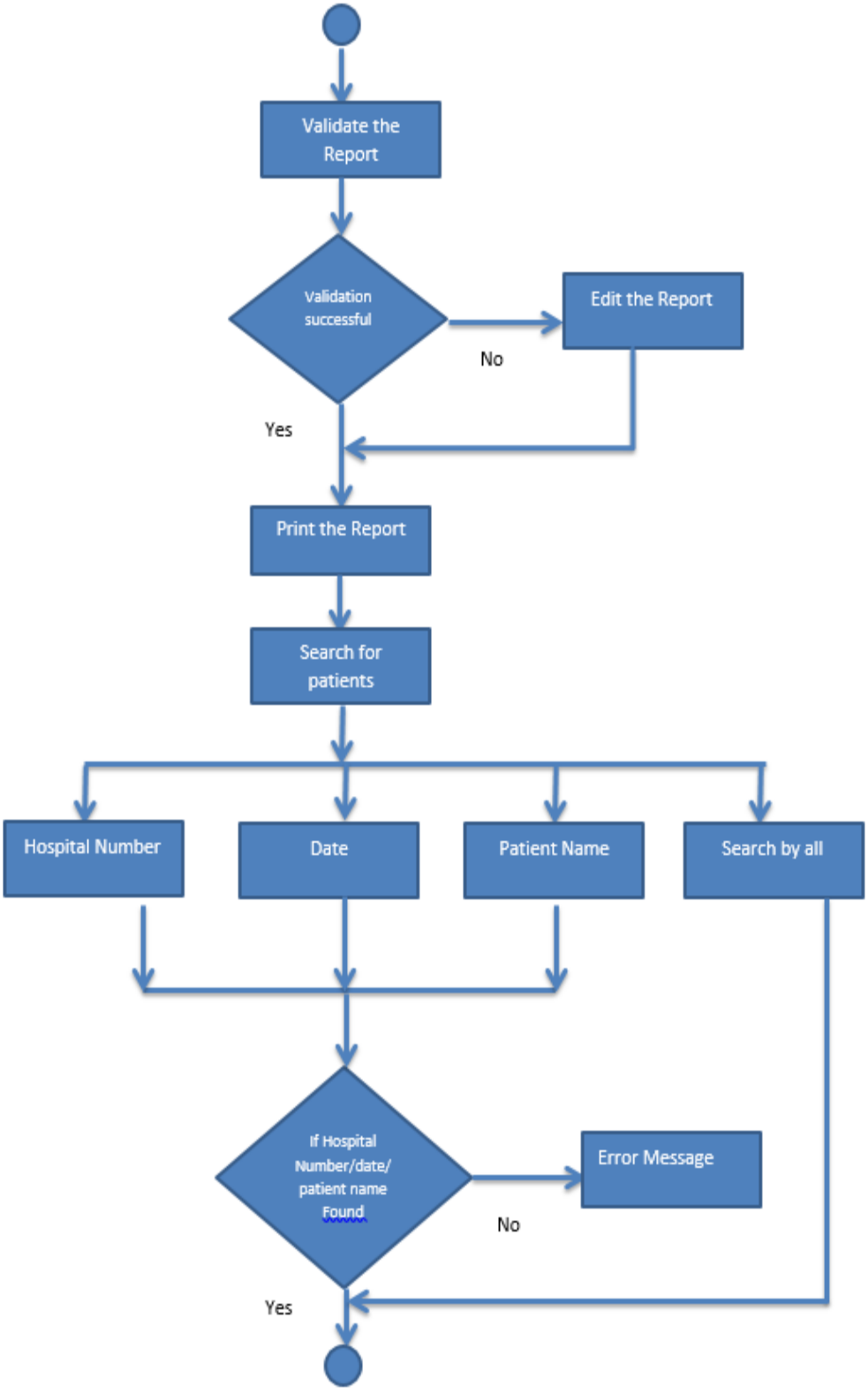
And their order by connecting the boxes with arrows.

-Helps to clarify how things are currently working and how they could be improved.

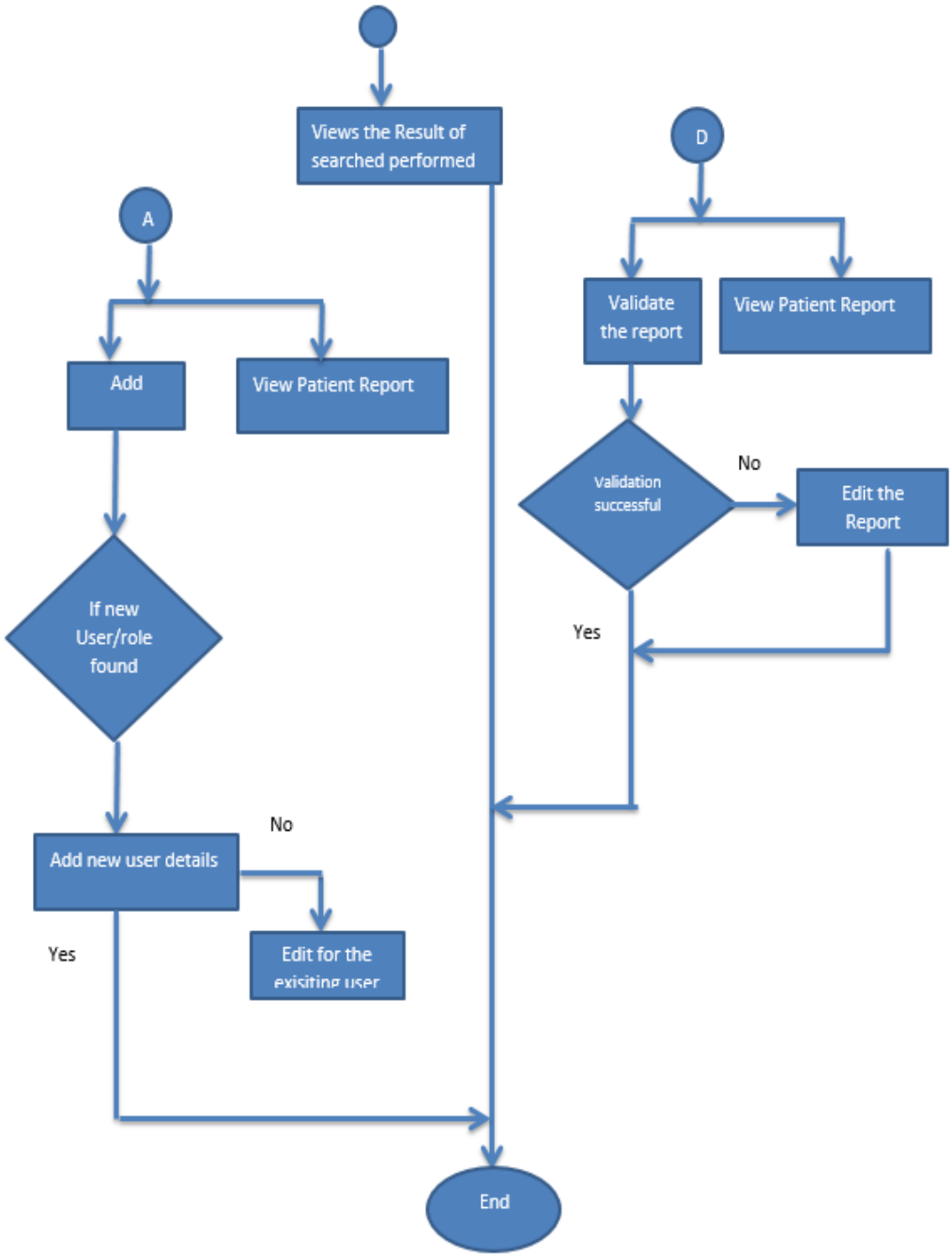
-Assists in finding the key elements of a process, while drawing clear lines between where one process ends and the next one starts.



Flow Chart part-1



Flow Chart part-2



Flow Chart part-3

5.1.3 Table Description

1. User_M

This table contains user details.

Field Name	Data Type	Constraints	Null
UserID	varchar(15)	PK	No
UserName	varchar(50)		No
Name	varchar(50)		No
EmailID	varchar(50)		No
Password	varchar(30)		No
ContactNo	varchar(12)		No
RoleID	varchar(5)	FK[Role_M]	No
Active	varchar(1)		No
Type	varchar(1)		No

2. Role_M

This table contains details regarding the roles of different users.

Field Name	Data Type	Constraints	Null
RoleId	varchar(5)	PK	No
RoleName	varchar(25)		No
Active	varchar(1)		No

3. Link_M

This table contains details regarding the links to be displayed in the navigation bar in user interface.

Field Name	Data Type	Constraints	Null
LinkID	varchar(5)	PK	No
LinkName	varchar(50)		No

URL	varchar(100)		No
LinkLevel	varchar(2)		Yes
ParentID	varchar(10)		Yes
Active	varchar(1)		No
DisplayOrder	int		No

4. Role_Link_Map

This table maps the roles of users and links.

Field Name	Data Type	Constraints	Null
RoleID	varchar(5)	PK,FK[Role_M]	No
LinkID	varchar(5)	PK,FK[Link_M]	No
Active	varchar(1)		No

5. Status_M

This table stores information related to save, submit, rework and other such actions of the system.

Field Name	Data Type	Constraints	Null
StatusID	varchar(3)	PK	No
Description	varchar(10)		No
Active	varchar(1)		No

6. Unit_M

This table contains details regarding the unit's active status in the department.

Field Name	Data Type	Constraints	Null
Unit_ID	varchar(10)	PK	No
Unit_Name	varchar(50)		No

Active	varchar(1)		No

7. Department_M

This table stores the names of the department.

Field Name	Data Type	Constraints	Null
Dept_ID	varchar(10)	PK	No
Dept_Name	varchar(50)		No
Active	Varchar(1)		No

8. Consultant_M

This table stores the information related to cardiologists.

Field Name	Data Type	Constraints	Null
Consultant_id	varchar(10)	PK	No
Consultant_Name	varchar(50)		No
Unit_ID	Varchar(10)	FK[Unit_M]	No
Active	Varchar(1)		No

9. Patient_Details

This table contains details regarding the patients.

Field Name	Data Type	Constraints	Null
Disease_Id	varchar(10)	PK	No
Hospital_No	varchar(10)	PK	No
Name	varchar(50)		Yes
Age	varchar(3)		Yes
Sex	varchar(6)		Yes
IP_No	varchar(10)		Yes
ward_opd	varchar(10)		Yes

dept_unit	varchar(10)	FK[Department_M]	Yes
consultant_doctor	varchar(500)		Yes
Phone_No	varchar(12)		Yes
performed_by	varchar(50)		Yes
entered_by	varchar(50)		Yes
Overal_Finding_comment	varchar(MAX)		Yes
Final_Impression_Comment	varchar(MAX)		Yes
Flag	varchar(1)		Yes
Status	varchar(3)	FK[Status_M]	No
Visit_Date	date		Yes

10. General_Symptoms

This table stores the symptoms entered in the patient entry page.

Field Name	Data Type	Constraints	Null
Disease_Id	varchar(10)	PK	No
Hospital_No	varchar(10)	PK	No
Visit_Date	Datetime		No
quality_of_acoustic_window	varchar(15)		Yes
left_ap_dimension	varchar(5)		Yes
left_is_dimension	varchar(5)		Yes
left_area	varchar(5)		Yes
left_volume	varchar(5)		Yes
right_ap_dimension	varchar(5)		Yes
right_is_dimension	varchar(5)		Yes
right_area	varchar(5)		Yes
right_volume	varchar(5)		Yes
ivs_sd	varchar(5)		Yes
pw_sd	varchar(5)		Yes
Edv	varchar(5)		Yes
Esv	varchar(5)		Yes
Alef	varchar(5)		Yes
Sv	varchar(5)		Yes
Co	varchar(5)		Yes
Edd	varchar(5)		Yes
Esd	varchar(5)		Yes
lv_ef	varchar(5)		Yes

Fs	varchar(5)		Yes
Hr	varchar(5)		Yes
rv_fractional_area	varchar(5)		Yes
rvot_fraction	varchar(5)		Yes
free_wall	varchar(5)		Yes
rv_ef	varchar(5)		Yes
Tapse	varchar(5)		Yes
Root	varchar(5)		Yes
sinotubular_junction	varchar(5)		Yes
ascending_aorta	varchar(5)		Yes
Arch	varchar(5)		Yes
descending_aorta	varchar(5)		Yes
abdominal_aorta	varchar(5)		Yes
Macs	varchar(5)		Yes
aortic_macs	varchar(5)		Yes
mitral_dt	varchar(5)		Yes
mitral_pv	varchar(5)		Yes
mitral_ivrt	varchar(5)		Yes
mitral_ivct	varchar(5)		Yes
mvo_by_pht	varchar(5)		Yes
mvo_by_2d_echo	varchar(5)		Yes
aortic_pv	varchar(5)		Yes
aortic_ppg	varchar(5)		Yes
aortic_mpg	varchar(5)		Yes
aortic_et	varchar(5)		Yes
aortic_vti	varchar(5)		Yes
tricuspid_annulus_dimension	varchar(5)		Yes
tricuspid_valve_area_by_pht	varchar(5)		Yes
tricuspid_dt	varchar(5)		Yes
tricuspid_pv	varchar(5)		Yes
tricuspid_tve	varchar(5)		Yes
tricuspid_tva	varchar(5)		Yes
Rvsp	varchar(5)		Yes
rv_mpi	varchar(5)		Yes
pulmonary_pv	varchar(5)		Yes
pulmonary_annulus	varchar(5)		Yes
pulmonary_at	varchar(5)		Yes
pulmonary_ppg	varchar(5)		Yes
pulmonary_mpg	varchar(5)		Yes
velocity_lpa	varchar(5)		Yes
velocity_rpa	varchar(5)		Yes
pulmonary_dimension	varchar(5)		Yes
Lpa	varchar(5)		Yes

Rpa	varchar(5)		Yes
Mpa	varchar(5)		Yes
ivc_max_min	varchar(5)		Yes
pulmonary_vein_s	varchar(5)		Yes
pulmonary_vein_d	varchar(5)		Yes
pulmonary_vein_Ar	varchar(5)		Yes
pulmonary_vein_Adur	varchar(5)		Yes
hepatic_vein_s	varchar(5)		Yes
hepatic_vein_d	varchar(5)		Yes
reversal_flow_velocity	varchar(5)		Yes
mitral_mve	varchar(5)		Yes
mitral_mva	varchar(5)		Yes
aortic_prosthetic	varchar(5)		Yes
mitral_prosthetic	varchar(5)		Yes
tricuspid_prosthetic	varchar(5)		Yes
pulmonary_prosthetic	varchar(5)		Yes
Mitral_MPG	varchar(5)		Yes
Mitral_PPG	varchar(5)		Yes
Tricuspid_MPG	varchar(5)		Yes
Tricuspid_PPG	varchar(5)		Yes

11. Fetal_Details

This table stores details of the fetal being entered in the fetal entry page.

Column Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
Hospital_No	varchar(10)	PK	No
RefPhy	varchar(50)		Yes
Menstrual	varchar(50)		Yes
Indication	varchar(max)		Yes
bpd	varchar(50)		Yes
fl	varchar(50)		Yes
hr	varchar(50)		Yes
ua	varchar(50)		Yes
cp	varchar(max)		Yes
abd	varchar(max)		Yes
sa	varchar(max)		Yes
plf	varchar(max)		Yes
prf	varchar(max)		Yes
veno	varchar(max)		Yes
avr	varchar(max)		Yes
vga	varchar(max)		Yes
ara	varchar(max)		Yes
ala	varchar(max)		Yes
aas	varchar(max)		Yes

mva	varchar(max)		Yes
tva	varchar(max)		Yes
vrv	varchar(max)		Yes
vlv	varchar(max)		Yes
vvs	varchar(max)		Yes
lvot	varchar(max)		Yes
rvot	varchar(max)		Yes
av	varchar(max)		Yes
pva	varchar(max)		Yes
ca	varchar(max)		Yes
aa	varchar(max)		Yes
pua	varchar(max)		Yes
da	varchar(max)		Yes
cr	varchar(max)		Yes

12. Pediatric_Details

This table stores pediatric details entered in the pediatric entry page.

Field Name	DataType	Constraints	Null
Disease_Id	varchar(10)	PK	No
Hospital_No	varchar(10)	PK	No
indication	varchar(50)		Yes
mva	varchar(5)		Yes
tva	varchar(6)		Yes
ava	varchar(10)		Yes
pva	varchar(10)		Yes
fsef	varchar(10)		Yes
ar	varchar(10)		Yes
aa	varchar(10)		Yes
rpa	varchar(10)		Yes
lpa	varchar(10)		Yes
rvfa	varchar(10)		Yes
cp	varchar(max)		Yes
abdsitus	varchar(max)		Yes
sas	varchar(max)		Yes
svl	varchar(max)		Yes
sga	varchar(max)		Yes
pf	varchar(max)		Yes
plf	varchar(max)		Yes
ra	varchar(max)		Yes
la	varchar(max)		Yes

aas	varchar(max)		Yes
pv	varchar(max)		Yes
sv	varchar(max)		Yes
av	varchar(max)		Yes
rv	varchar(max)		Yes
lv	varchar(max)		Yes
vs	varchar(max)		Yes
sav	varchar(max)		Yes
spv	varchar(max)		Yes
coronaries	varchar(max)		Yes
gaa	varchar(max)		Yes
gpa	varchar(max)		Yes
bpa	varchar(max)		Yes
flv	varchar(max)		Yes
frv	varchar(max)		Yes
final_impression	varchar(max)		Yes
height	varchar(10)		Yes
weight	varchar(10)		Yes

13. AR

Field Name	**Data Type**	**Constraints**	**Null**
Disease_id	varchar(10)	PK	No
ARPHT	varchar(5)		Yes
ROA	varchar(5)		Yes
Regurgitant_Volume	varchar(5)		Yes
Regurgitant_Fraction	varchar(5)		Yes
Vena_Contracta	varchar(5)		Yes
Arjet_Width	varchar(5)		Yes

14. AS

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
Lvot_Velocity	varchar(5)		Yes
Lvot_Diameter	varchar(5)		Yes
Lvot_Vti	varchar(5)		Yes

15. ASD

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
Asd_Type	varchar(20)		Yes
Asd_Types	varchar(20)		Yes
Asd_Shunt	varchar(20)		Yes
Asd_Mitral_Rim	varchar(20)		Yes
Asd_Aortic_Rim	varchar(20)		Yes
Asd_SVC_Rim	varchar(20)		Yes
Asd_IVC_Rim	varchar(20)		Yes
Asd_CS_Rim	varchar(20)		Yes
Asd_PA_Rim	varchar(20)		Yes
Pulmonary_Veins_Connection	varchar(20)		Yes
Pvc_Abnormal	varchar(20)		Yes
TEE_Finding	varchar(20)		Yes

16. Carcinoid_Heart_Disease

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
Comment	varchar(MAX)		Yes

17. Cardiac_Tumors

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
Comment	varchar(MAX)		Yes

18. Cardiomyopathy_Heart_Disease

Field Name	Data Type	Constraints	Null
cardiomyopathy_hd_id	int		Yes
general_disease_id	int		Yes

19. Congenital_Heart_Disease

Field Name	Data Type	Constraints	Null
Disease_Id	varchar(10)	PK	No
Fetal	varchar(10)		Yes
[Others Type]	varchar(100)		Yes
QP	varchar(5)		Yes
QS	varchar(5)		Yes
Aortic_Arch	varchar(15)		Yes
Situs	varchar(15)		Yes
Position	varchar(15)		Yes

Artioventricular_Relation	varchar(15)		Yes
Ventriculo_Great_Arterial_Relation	varchar(15)		Yes
Interatrial_Septum	varchar(15)		Yes
Interventricular_Septum	varchar(15)		Yes

20. Constrictive_Pericarditis

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
pericardium_thickness	varchar(5)		Yes
lv_apex_side	varchar(5)		Yes
mitral_e_maximum	varchar(5)		Yes
mitral_e_minimum	varchar(5)		Yes
tricuspid_e_maximum	varchar(5)		Yes
tricuspid_e_minimum	varchar(5)		Yes
pericardial_effusion anterior_rv	varchar(5)		Yes
pericardial_effusion posterior_lv	varchar(5)		Yes
pericardial_effusion lateral_lv	varchar(5)		Yes
respiratory_variation in_mitral	varchar(5)		Yes
respiratory_variation_in_tricuspid	varchar(5)		Yes

21. DCM

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
ivs_to_pw_delay	varchar(5)		Yes
q_to_pv	varchar(5)		Yes
q_to_av	varchar(5)		Yes
ivs_to_lw_delay	varchar(5)		Yes
ivs_to_pw	varchar(5)		Yes
basal_maximum_delay	varchar(5)		Yes
basal_sd	varchar(5)		Yes
all_segment_maximum_delay	varchar(5)		Yes
all_segment_sd	varchar(5)		Yes

22. DORV

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
comment	varchar(MAX)		No

23. Ebstein_Anomaly

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
celermajer_index	varchar(5)		Yes
Ratio	varchar(50)		Yes

24. HCM

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
ivs_pw_ratio	varchar(5)		Yes
lvot_ppg	varchar(5)		Yes
lv_intracavity_gradient	varchar(5)		Yes
sam_grade	varchar(5)		Yes

25. Ischemic_Heart_Disease

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
Type	varchar(50)		Yes
typecomment	varchar(100)		Yes
right_ventricular_function	varchar(50)		Yes
lv_systolic_disfunction	varchar(50)		Yes
lv_diastolic_dysfunction	varchar(50)		Yes
lv_clot	varchar(50)		Yes
lv_clot_comment	varchar(50)		Yes
pericardial_effusion	varchar(50)		Yes
pericardial_antrv	varchar(50)		Yes
pericardial_postrv	varchar(50)		Yes
Mr	varchar(5)		Yes
lv_clauser_dimension	varchar(50)		Yes
scar_segment	varchar(50)		Yes

26. LV_Non_Compaction

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
comment	varchar(MAX)		Yes

27. MR

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
Roa	varchar(5)		Yes
regurgitant_volume	varchar(5)		Yes
regurgitant_fraction	varchar(5)		Yes
vena_contracta	varchar(5)		Yes

28. MS

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
Gradient	varchar(5)		No
Valvular_by_2DE	varchar(5)		Yes
Valvular_by_PHT	varchar(5)		Yes
SubValvular_Pathology	varchar(15)		Yes
AML_Calcification	varchar(15)		Yes
Pml_Calcification	varchar(15)		Yes
Mr	varchar(15)		Yes
LA_appandage_Clot	varchar(15)		Yes
MR_Jet	varchar(15)		Yes
LA_Spontaneous_echo_contrast	varchar(15)		Yes
LA_Size	varchar(15)		Yes

29. MV

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
Mitral_valve_area_by_2DE	varchar(5)		Yes
Mitral_valve_area_by_PHT	varchar(5)		Yes
Mitral_valve_gradient	varchar(10)		Yes
Mitral_valve	varchar(10)		Yes
Tricuspid_valve_gradient	varchar(5)		Yes
Tricuspid_regurgitation	varchar(10)		Yes
RVSP	varchar(5)		Yes
Aortic_gradient	varchar(5)		Yes
AS	varchar(10)		Yes
AR	varchar(10)		Yes
AVA_by_continuity_equation	varchar(5)		Yes

30. PDA

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
pda_size	varchar(5)		Yes
ampula_size	varchar(5)		Yes
pda_gradient	varchar(5)		Yes
la_lv_dilation	varchar(50)		Yes
ductal_type	varchar(50)		Yes
pulmonary_artery_hypertension	varchar(50)		Yes
Shunt	varchar(50)		Yes
bi_ventricular_systolic_function	varchar(50)		Yes
patent_ductus_arteriosus	varchar(50)		Yes

31. PR

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
PRPHT	varchar(5)		Yes
ROA	varchar(5)		Yes
REGURGITANT_VOLUME	varchar(5)		Yes
REGURGITANT_FRACTION	varchar(5)		Yes
PRPPG	varchar(5)		Yes
PREDPG	varchar(5)		Yes
REDUCTANCE_WAVE	varchar(5)		Yes

32. PS

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
pulmonary_vti	varchar(50)		Yes
rvot_velocity	varchar(50)		Yes
rovt_dimension	varchar(50)		Yes
rvot_vti	varchar(50)		Yes
pulmonary_valve_area_by_continuity	varchar(50)		Yes
rpa_dimension	varchar(50)		Yes
lpa_dimension	varchar(50)		Yes
nakata_index	varchar(50)		Yes
mcgoon_ratio	varchar(50)		Yes

33. RCM

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
ivs_e	varchar(5)		Yes
ivs_a	varchar(5)		Yes
ivs_s	varchar(5)		Yes
lw_e	varchar(5)		Yes
lw_a	varchar(5)		Yes
Lw_s	varchar(5)		Yes
e_e_ivs	varchar(5)		Yes
e_e_lw	varchar(5)		Yes
Rv_s	varchar(5)		Yes

34. TA

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
comment	varchar(MAX)		Yes

35. TGA

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
comment	varchar(MAX)		Yes

36. TOF

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
Nakata_Index	varchar(5)		Yes
Mcgoon_Ratio	varchar(5)		Yes

37. TR

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
comment	varchar(MAX)		Yes

38. TS

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
comment	varchar(MAX)		Yes

39. Valvular_Heart_Disease

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
prosthetic_valve	varchar(5)		Yes

40. VSD

Field Name	Data Type	Constraints	Null
Disease_id	varchar(10)	PK	No
VSD_Type	varchar(20)		Yes
Flow	varchar(20)		Yes
VSD_Gradient	varchar(5)		Yes
LA_LV_Dilation	varchar(10)		Yes
Pulmonary_Artery_Hypertension	varchar(5)		Yes
AR	varchar(50)		Yes
MR	varchar(50)		Yes

41. Staff_Details

This table stores the details of the staff i.e. faculty details.

Field Name	Data Type	Constraints	Null
Staff_ID	varchar(50)	PK	No
Staff_Name	varchar(50)		No
Designation	varchar(MAX)		No
Role	int		Yes
Active	varchar(1)		No

5.2 Access Methods

- The database Echoreporting is accessible only to the administrator with authorization privileges.

-The hospital id i.e. patient id comes from the bridge database PMS which is the hospital's database which is accessible with valid username and password along with the server name; an ip address.

-The patient id along with the patient's name, age, gender, mobile no. , ip no comes from the bridge database PMS.

-This makes the data secure and restricts the access from unauthorized users and to enter incorrect data of the patients.

6. Procedural Design

6.1 Admin Module

Admin has a major role in any application created.

In this system Admin has the following responsibilities:

-To change the design or add new content to the project based on the requirements.

-To add the users: (a) Sonographer
(b) Cardiologists
(c) Students
(d) Faculty

-To add the units and department details.

-To edit the users, units and department details.

-To view or generate the results in the form of pdf or excel sheet.

-To search through the records by date, name, id, disease category.

6.2 Staff Module

Staff i.e. sonographers or faculty have the following responsibilities:

-To enter the details for patients, fetal or paediatric.

-To view or generate the reports.

6.3 Doctors Module

Doctors i.e. cardiologists have the following roles:

-To enter the details for fetal or paediatric.

-To view the reports.

-To generate the reports.

-To verify the work.

6.4 Students Module

Students/Interns have the following roles:

-Interns can enter the details provided by cardiologists or sonographers for patients, fetal, paediatric.

-They can view the reports and generate the reports.

7. Interface Design

1. Login

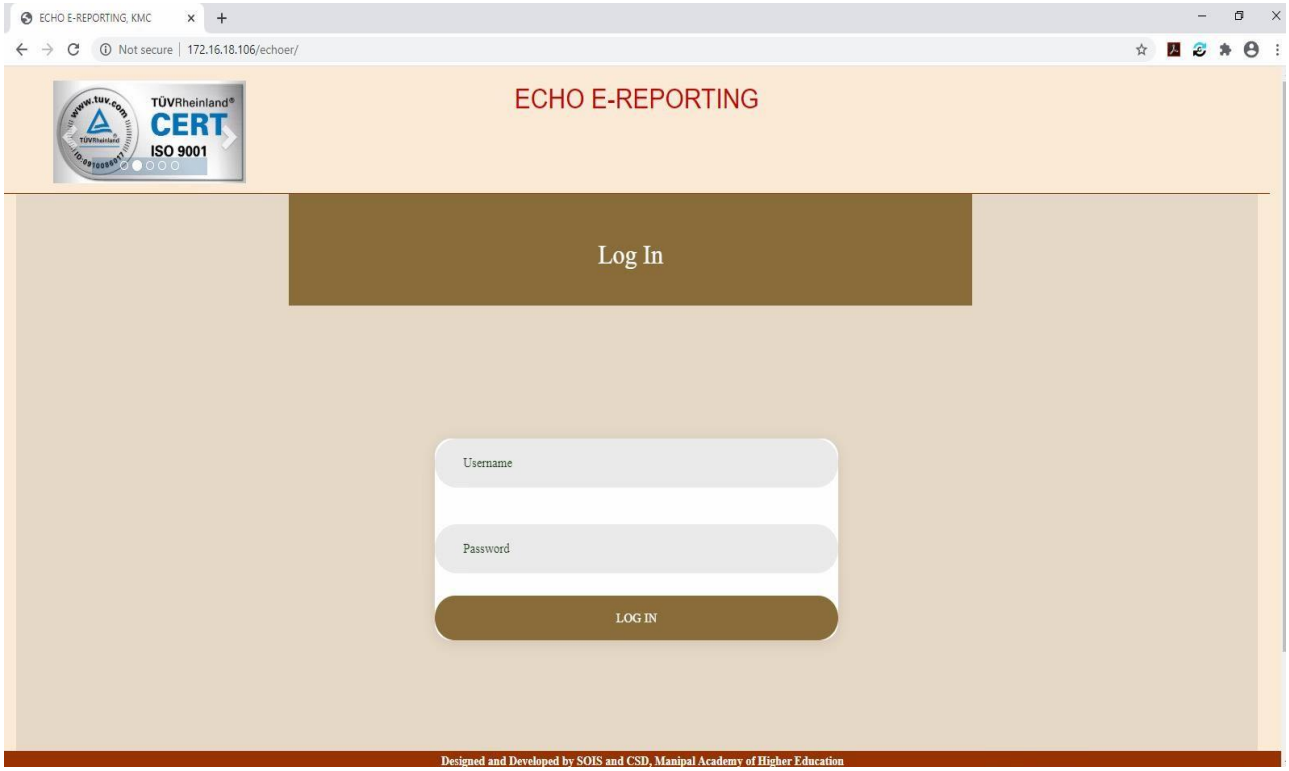


Fig. 6(a)

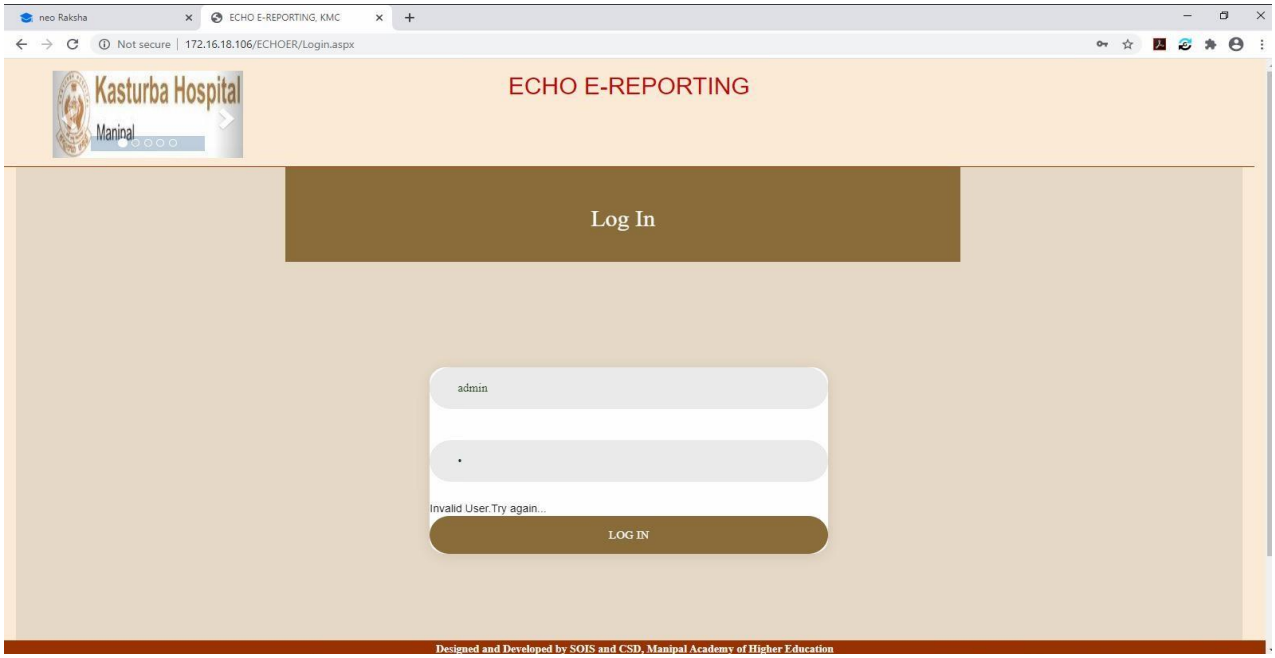


Fig. 6(b)

- If entered wrong username or password the system will give error.

2. Homepage

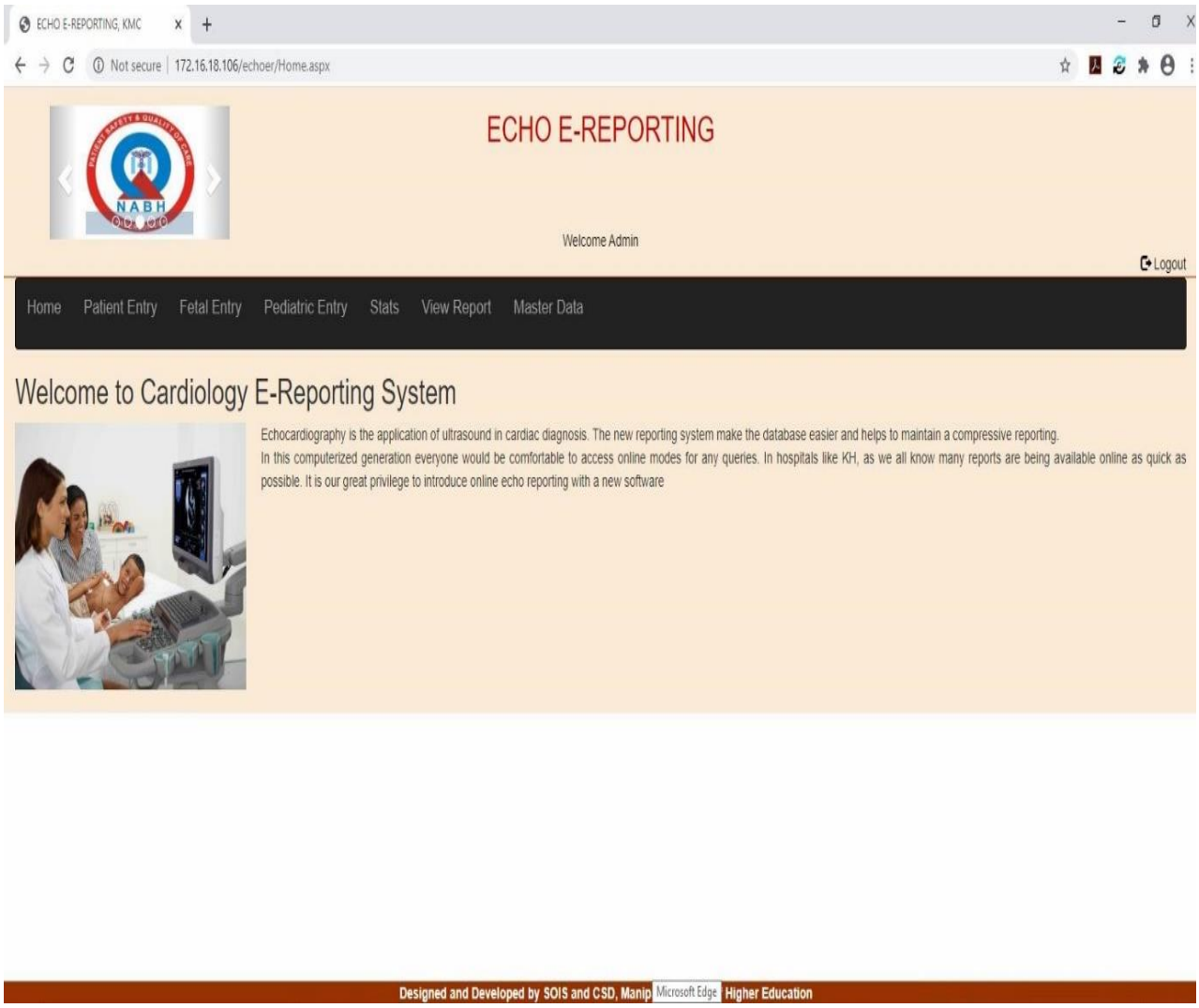


Fig. 7

3. Patient Entry

-Hospital No if entered correctly it will fetch the details from the PMS database of the patient.

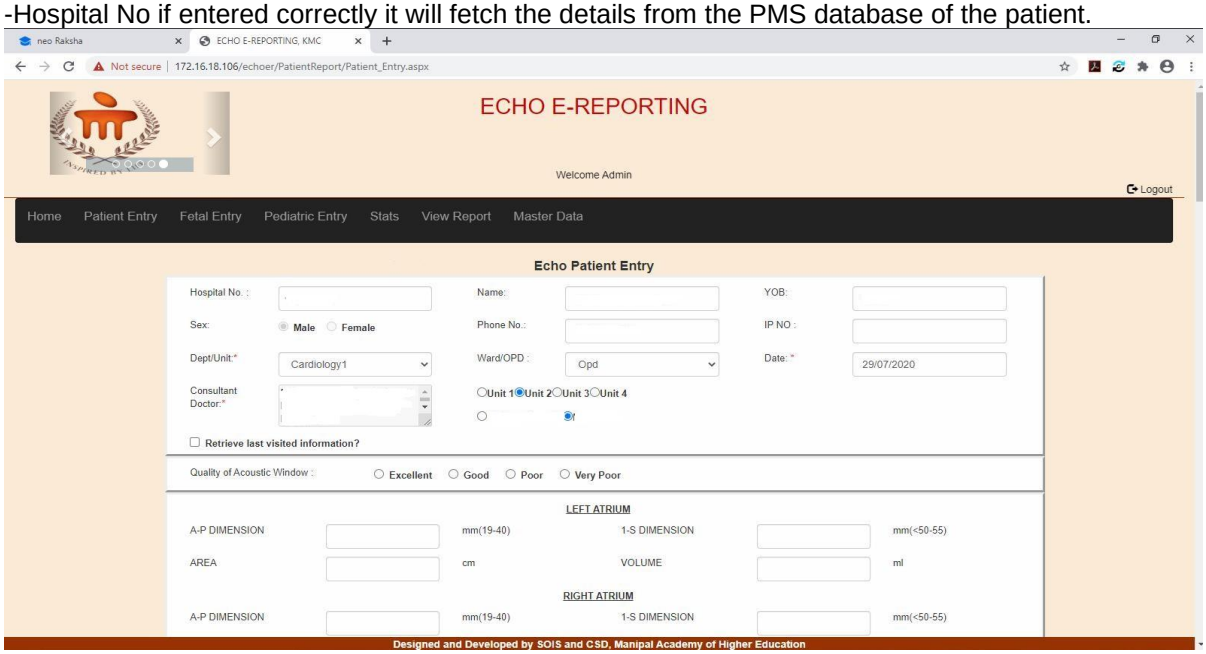


Fig. 8(a)

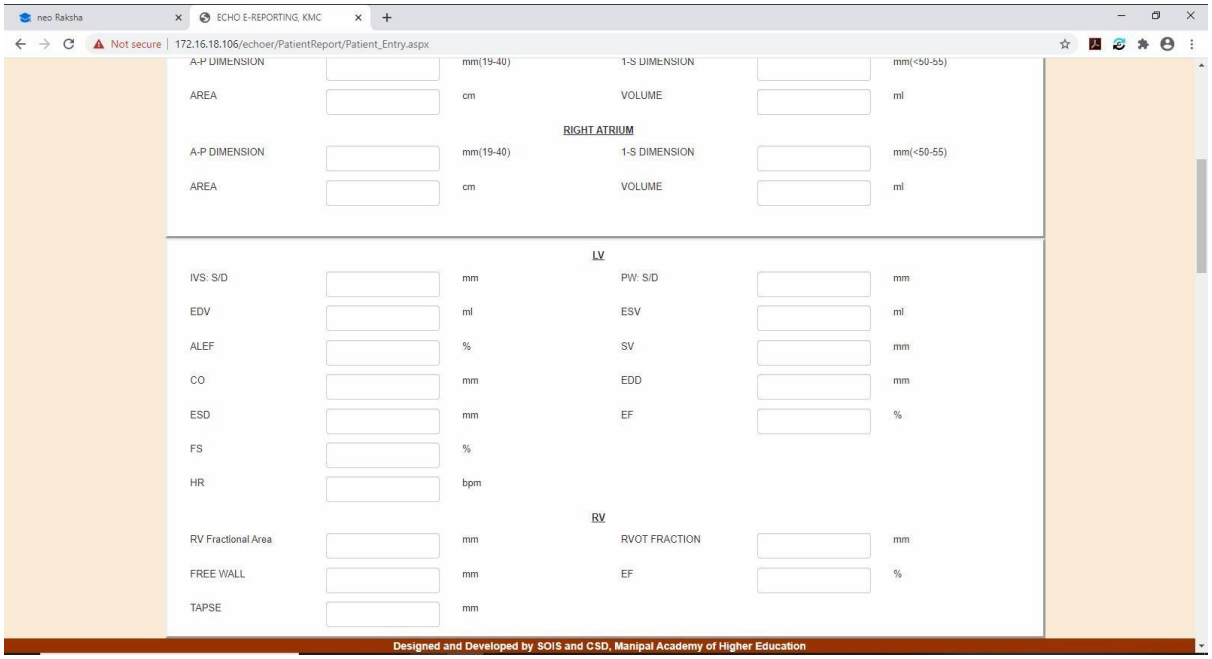


Fig. 8(b)

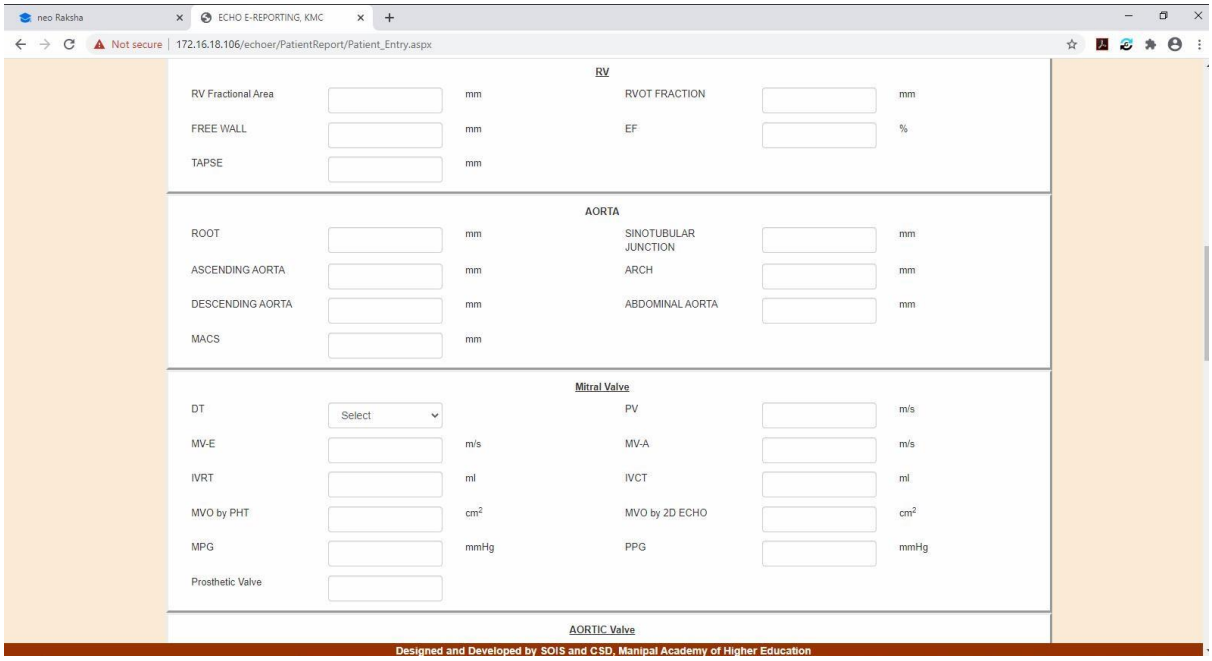

neo Raksha
ECHO E-REPORTING, KMC
Not secure | 172.16.18.106/echoer/PatientReport/Patient_Entry.aspx
RV
RV Fractional Area
mm
RVOT FRACTION
mm
FREE WALL
mm
EF
%
TAPSE
mm
AORTA
ROOT
mm
SINOTUBULAR JUNCTION
mm
ASCENDING AORTA
mm
ARCH
mm
DESCENDING AORTA
mm
ABDOMINAL AORTA
mm
MACS
mm
Mitral Valve
DT
Select
PV
m/s
MV-E
m/s
MV-A
m/s
IVRT
ml
IVCT
ml
MVO by PHT
cm2
MVO by 2D ECHO
cm2
MPG
mmHg
PPG
mmHg
Prosthetic Valve
AORTIC Valve
Designed and Developed by SOIS and CSD, Manipal Academy of Higher Education

Fig.8(c)

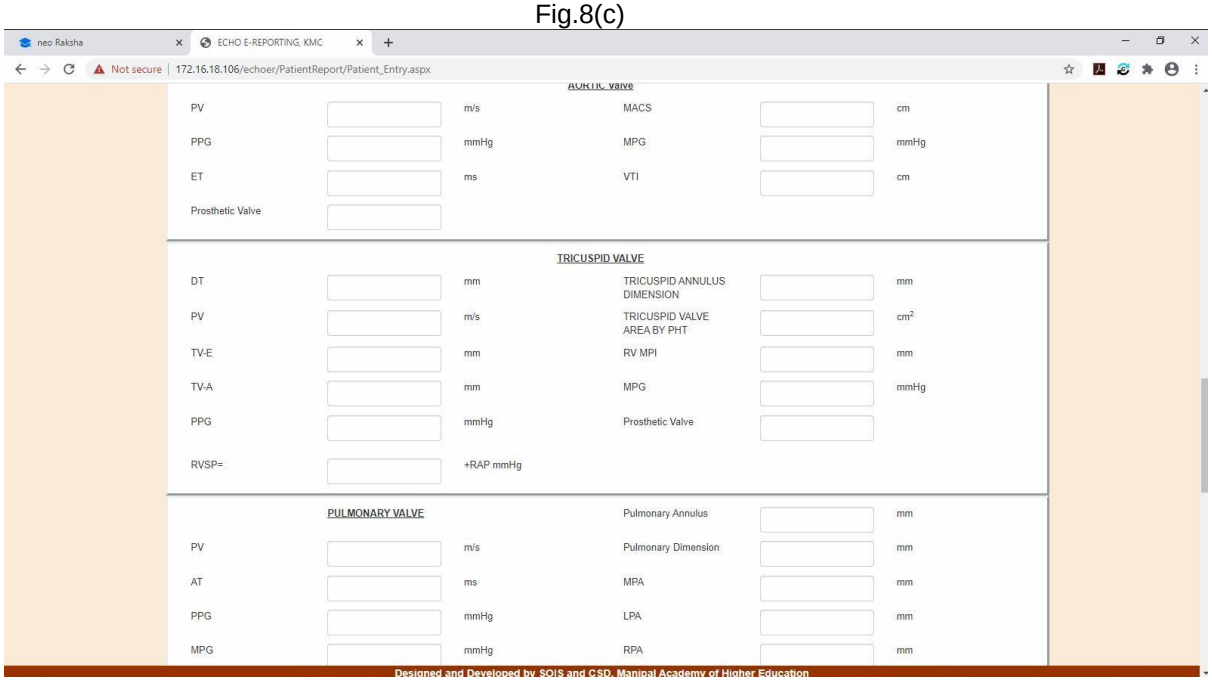

neo Raksha
ECHO E-REPORTING, KMC
Not secure | 172.16.18.106/echoer/PatientReport/Patient_Entry.aspx
AORTIC Valve
PV
m/s
MACS
cm
PPG
mmHg
MPG
mmHg
ET
ms
VTI
cm
Prosthetic Valve
TRICUSPID VALVE
DT
mm
TRICUSPID ANNULUS DIMENSION
mm
PV
m/s
TRICUSPID VALVE AREA BY PHT
cm2
TV-E
mm
RV MPI
mm
TV-A
mm
MPG
mmHg
PPG
mmHg
Prosthetic Valve
RVSP=
+RAP mmHg
PULMONARY VALVE
Pulmonary Annulus
mm
PV
m/s
Pulmonary Dimension
mm
AT
ms
MPA
mm
PPG
mmHg
LPA
mm
MPG
mmHg
RPA
mm
Designed and Developed by SOIS and CSD, Manipal Academy of Higher Education

Fig. 8(d)

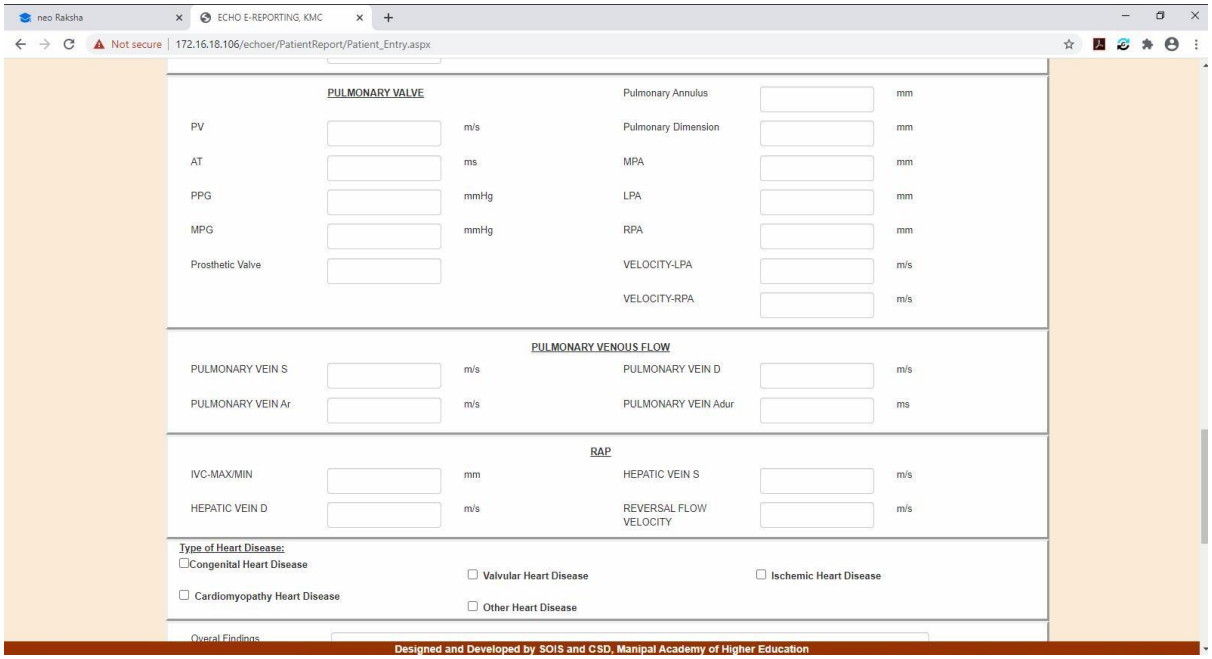

neo Raksha
ECHO E-REPORTING, KMC
Not secure | 172.16.18.106/echoer/PatientReport/Patient_Entry.aspx
PULMONARY VALVE
PV
m/s
AT
ms
PPG
mmHg
MPG
mmHg
Prosthetic Valve
Pulmonary Annulus
mm
Pulmonary Dimension
mm
MPA
mm
LPA
mm
RPA
mm
VELOCITY-LPA
m/s
VELOCITY-RPA
m/s
PULMONARY VENOUS FLOW
PULMONARY VEIN S
m/s
PULMONARY VEIN D
m/s
PULMONARY VEIN Ar
m/s
PULMONARY VEIN Adur
ms
RAP
IVC-MAX/MIN
mm
HEPATIC VEIN S
m/s
HEPATIC VEIN D
m/s
REVERSAL FLOW VELOCITY
m/s
Type of Heart Disease:
Congenital Heart Disease
Valvular Heart Disease
Ischemic Heart Disease
Cardiomyopathy Heart Disease
Other Heart Disease
Overal Findings
Designed and Developed by SOIS and CSD, Manipal Academy of Higher Education

Fig. 8(e)

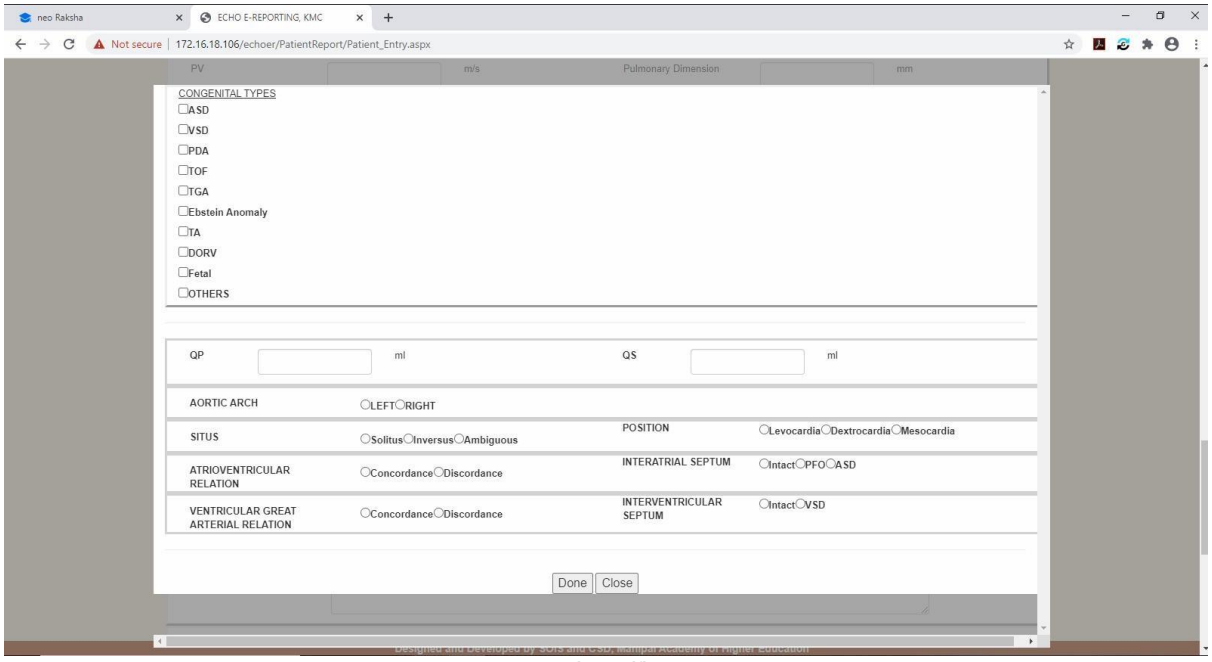

neo Raksha
ECHO E-REPORTING, KMC
Not secure | 172.16.18.106/echoer/PatientReport/Patient_Entry.aspx
PV
m/s
Pulmonary Dimension
mm
CONGENITAL TYPES
ASD
VSD
PDA
TOF
TGA
Ebstein Anomaly
TA
DORV
Fetal
OTHERS
QP
ml
QS
ml
AORTIC ARCH
LEFT RIGHT
SITUS
Solitus Inversus Ambiguous
POSITION
Levocardia Dextrocardia Mesocardia
ATRIOVENTRICULAR RELATION
Concordance Discordance
INTERATRIAL SEPTUM
Intact PFO ASD
VENTRICULAR GREAT ARTERIAL RELATION
Concordance Discordance
INTERVENTRICULAR SEPTUM
Intact VSD
Done
Close

Fig. 8(f)

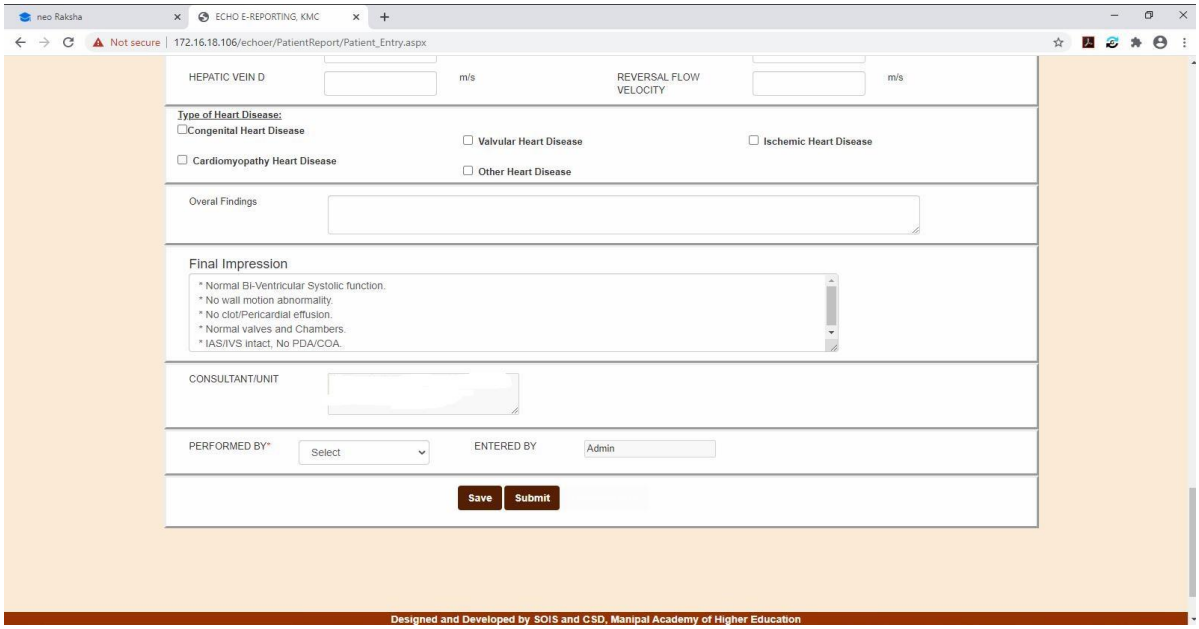


Fig. 8 (g)

4. Patient Report

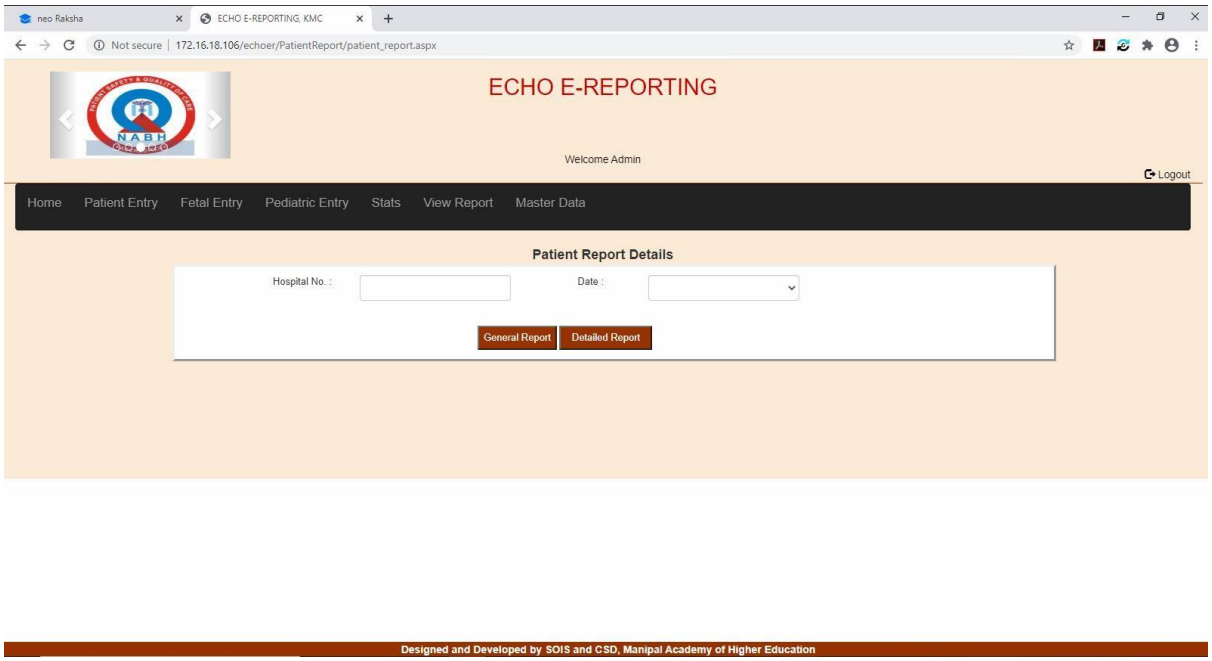


Fig. 9(a)

-Enter the Hospital No and corresponding date of visit by the patient will be populated in the dropdown from which selected date's report will be generated.

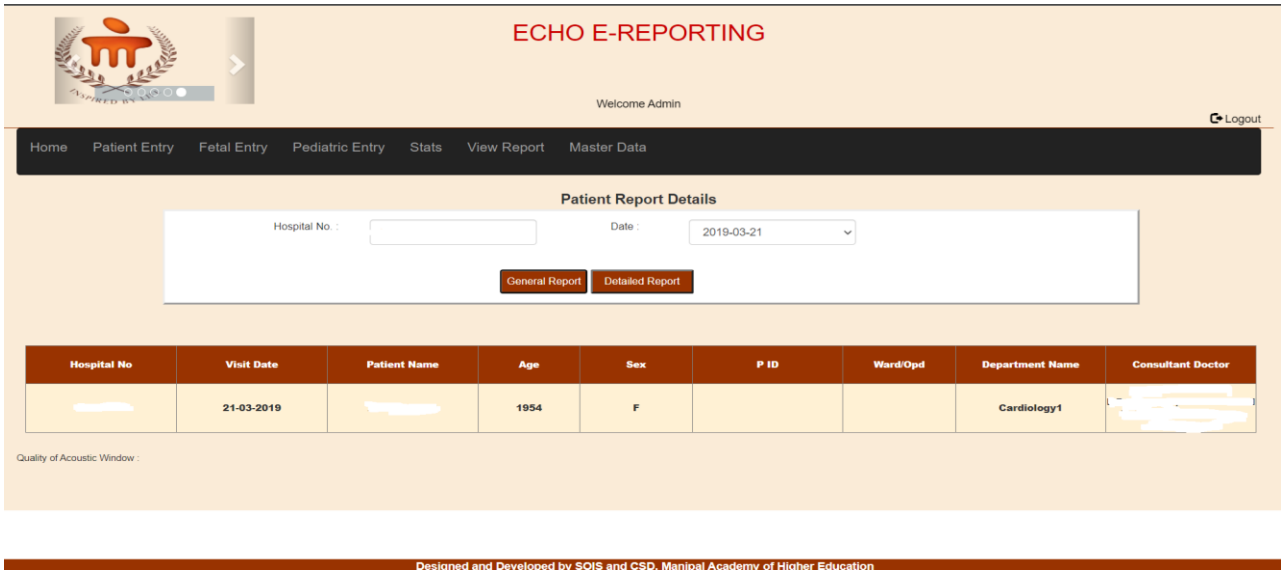


Fig. 9(b)

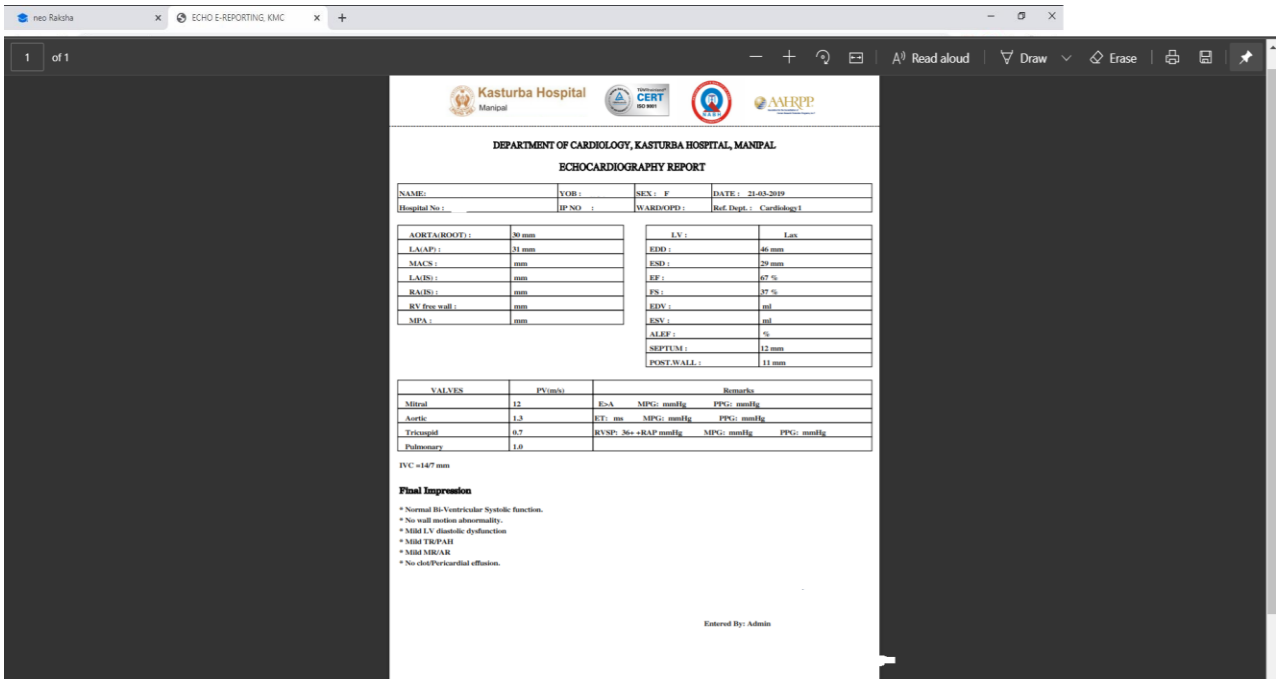
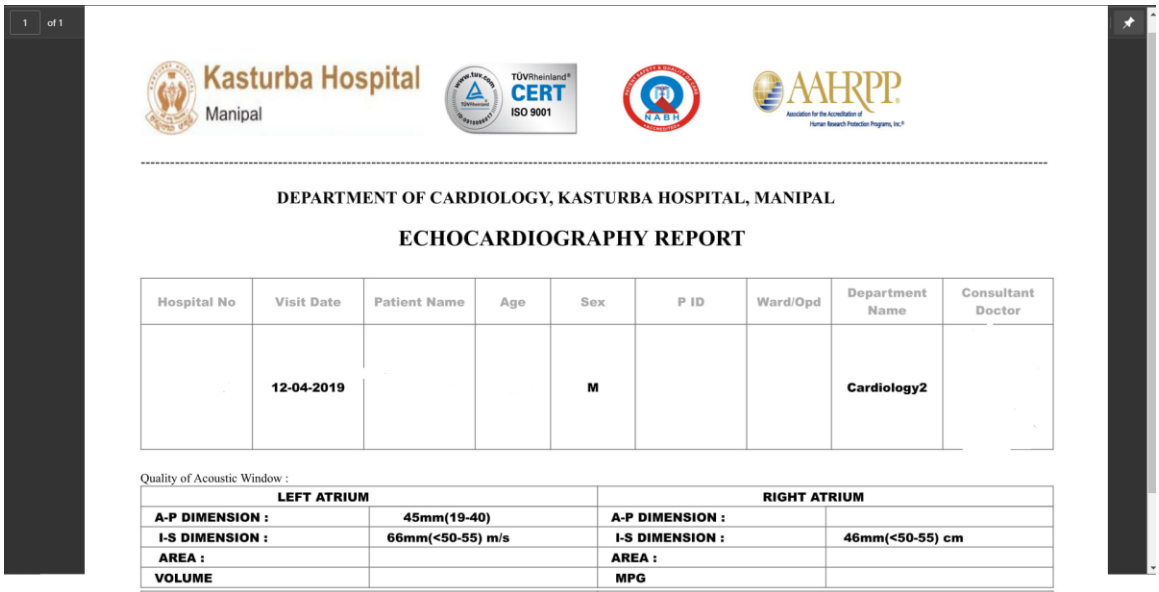


Fig. 9(c)

-This is the general report with the few details for the patient.



Kasturba Hospital
Manipal

DEPARTMENT OF CARDIOLOGY, KASTURBA HOSPITAL, MANIPAL

ECHOCARDIOGRAPHY REPORT

Hospital No	Visit Date	Patient Name	Age	Sex	P ID	Ward/Opd	Department Name	Consultant Doctor
	12-04-2019			M			Cardiology2	

Quality of Acoustic Window :

LEFT ATRIUM		RIGHT ATRIUM	
A-P DIMENSION :	45mm(19-40)	A-P DIMENSION :	
I-S DIMENSION :	66mm(<50-55) m/s	I-S DIMENSION :	46mm(<50-55) cm
AREA :		AREA :	
VOLUME		MPG	

LV		RV	
IVS: S/D	13mm		
PW: S/D	12mm		
		TAPSE	15mm
		AORTA	
EDD	42mm	ROOT	26mm
ESD	27mm		
EF	65%	ASCENDING AORTA	31mm
FS	35%		

Mitral Valve		AORTIC Valve	
		PV	1.4m/s
PV	2.9 m/s	MACS	cm
MVO by PHT	1.2 cm^2	Prosthetic Valve	
MVO by 2D ECHO	1.2 cm^2		
Prosthetic Valve			

TRICUSPID VALVE			
PV	0.6mm		
TV-E	mm	Prosthetic Valve	
RVSP	54+RAP mmHg		

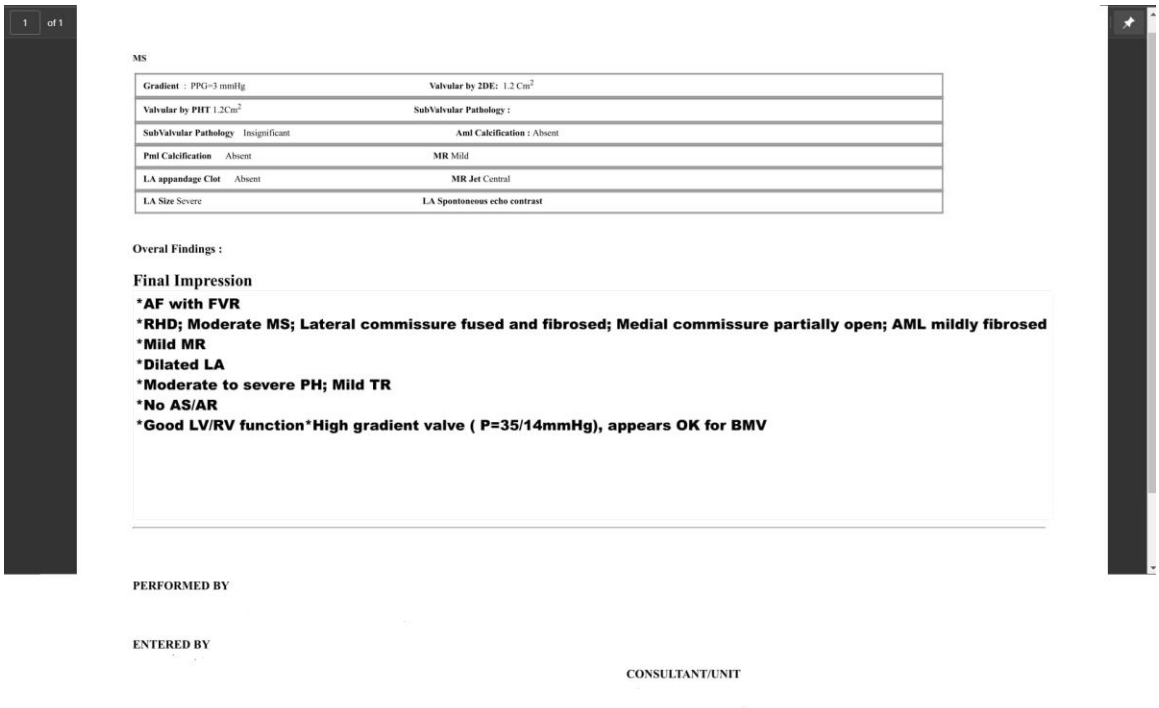
PULMONARY VALVE			
PV	0.8m/s		
Prosthetic Valve		VELOCITY-LPA	m/s

PULMONARY VENOUS FLOW		RAP	
		IVC-MAX/MIN	17/10mm

VALVULAR TYPES

Prosthetic Valve :

Fig. 9(d) Detailed Report-1



MS

Gradient : PPG=3 mmHg	**Valvular by 2DE:** 1.2 Cm^2
Valvular by PHT 1.2Cm^2	**SubValvular Pathology :**
SubValvular Pathology Insignificant	**Aml Calcification :** Absent
Pml Calcification Absent	**MR** Mild
LA appandage Clot Absent	**MR Jet** Central
LA Size Severe	**LA Spontoneous echo contrast**

Overal Findings :

Final Impression

***AF with FVR**
***RHD; Moderate MS; Lateral commissure fused and fibrosed; Medial commissure partially open; AML mildly fibrosed**
***Mild MR**
***Dilated LA**
***Moderate to severe PH; Mild TR**
***No AS/AR**
***Good LV/RV function*High gradient valve (P=35/14mmHg), appears OK for BMV**

PERFORMED BY

ENTERED BY

CONSULTANT/UNIT

Fig.9(e) Detailed Report-2

-This is the detailed report for the patient with all the details entered in the entry form.

5. Fetal Entry

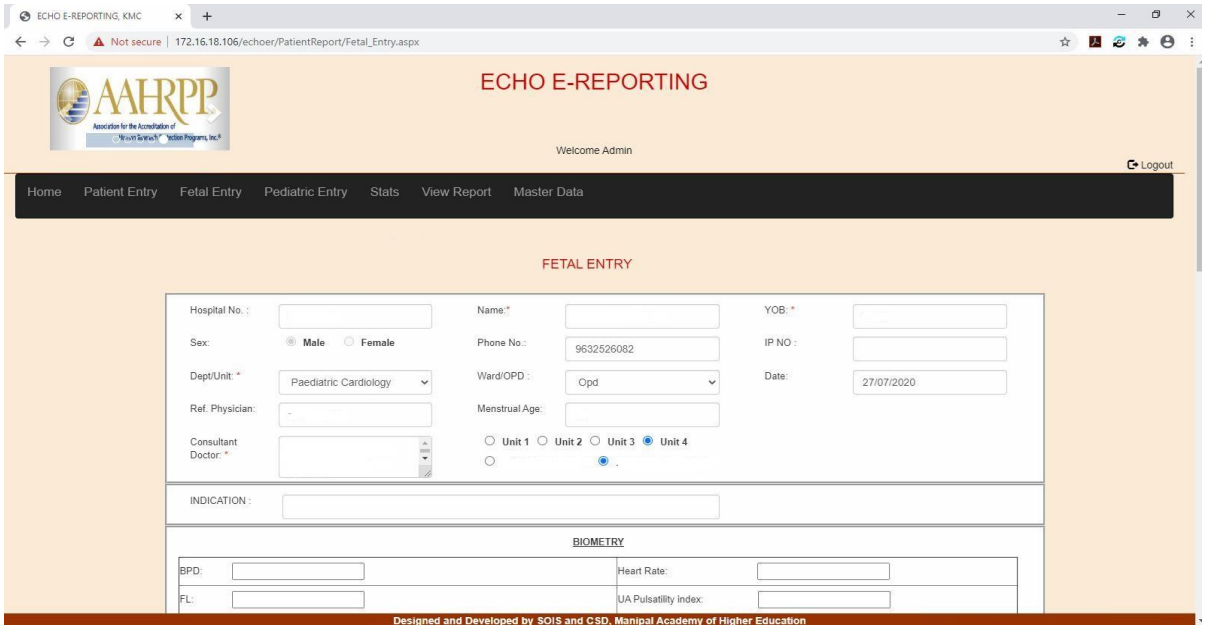


Fig. 10(a)

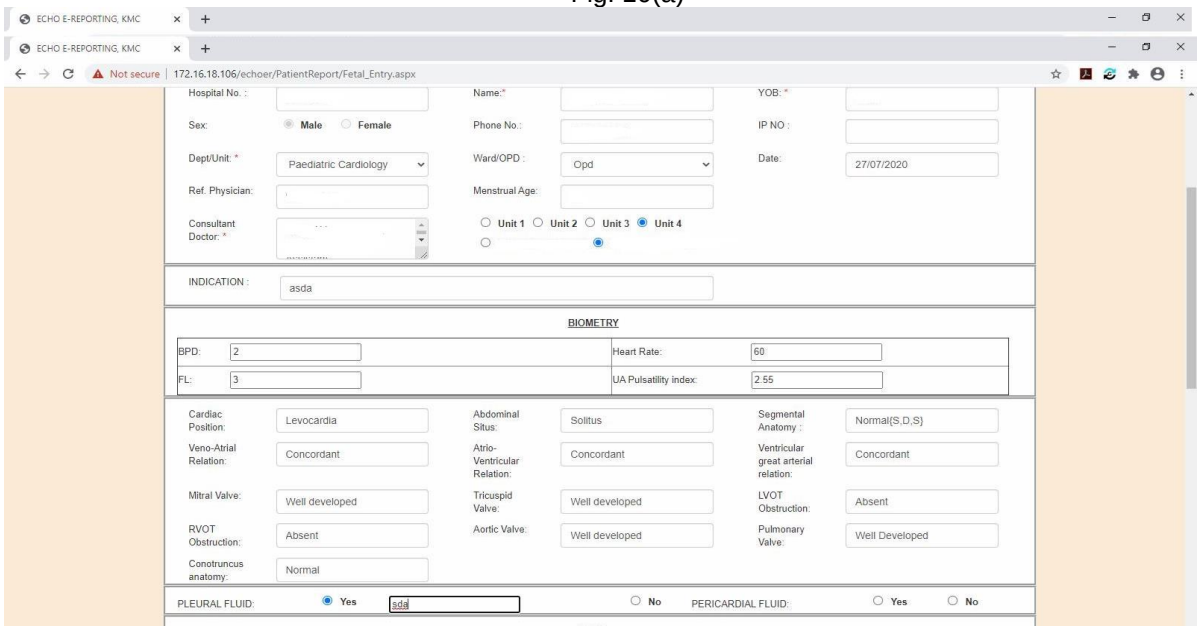


Fig. 10(b)

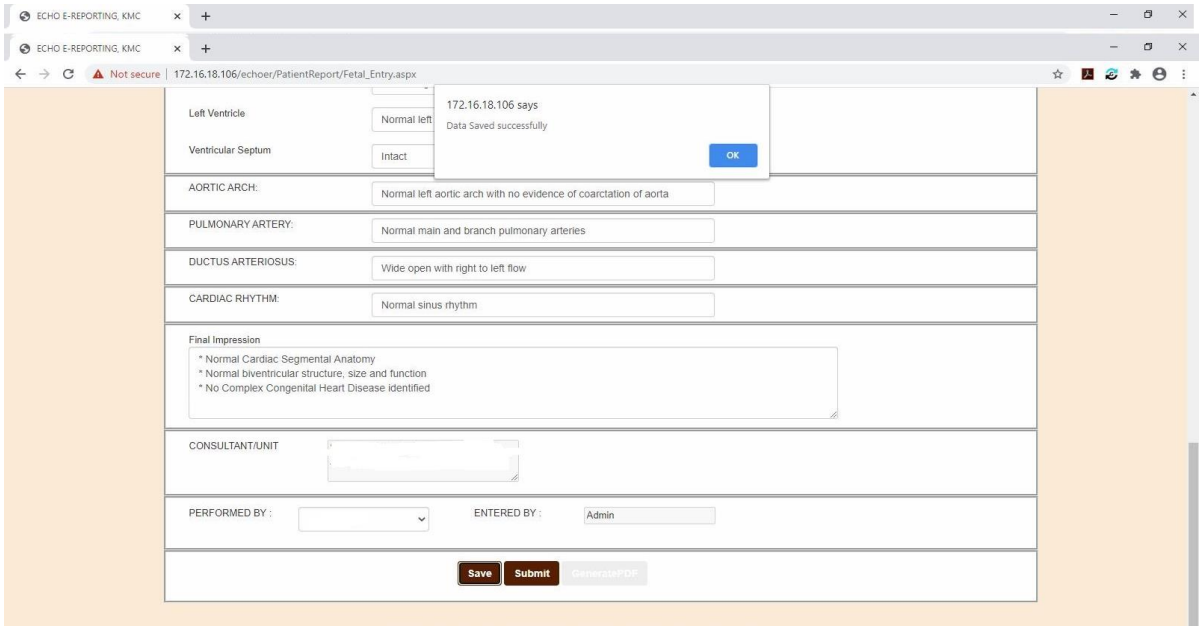


Fig. 10(c)

-The system will give alert message after the successful saving of data entered.

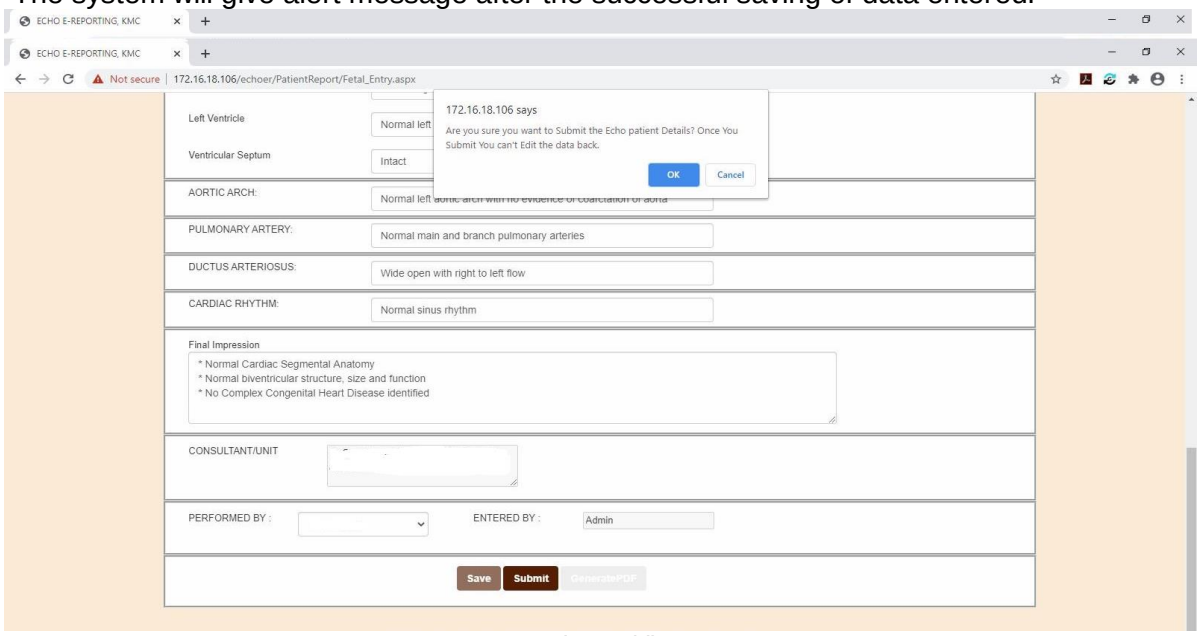


Fig. 10(d)

-After save button next step is to click submit button, when clicked the system will ask for confirmation.

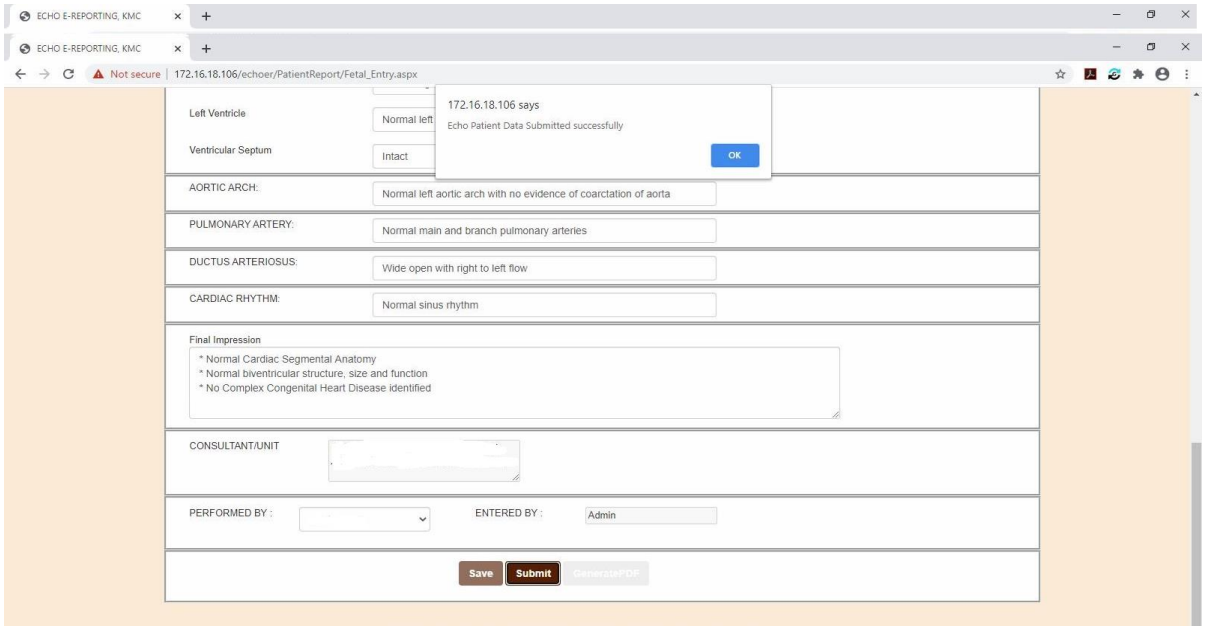


Fig.10(e)

-After clicking on ok button of alert message for submit button, next step is to confirm the data. On successful submission of data the system will give the alert message of successful submission.

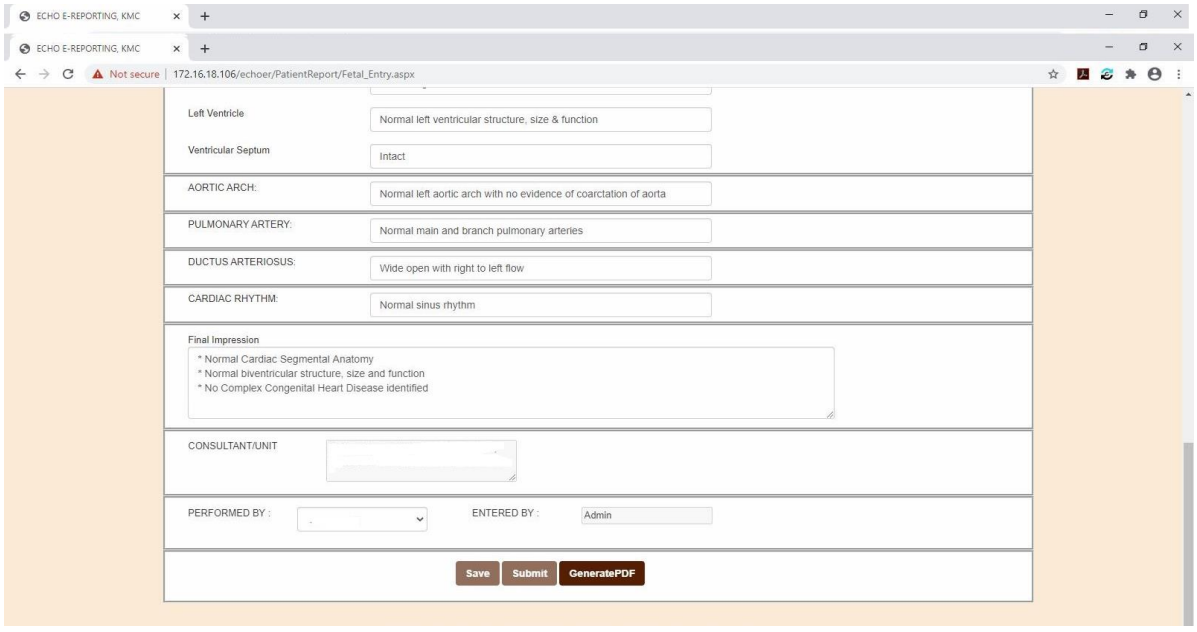


Fig. 10(f)

-GeneratePDF button will get enabled after successful submission of data for generating the reports.

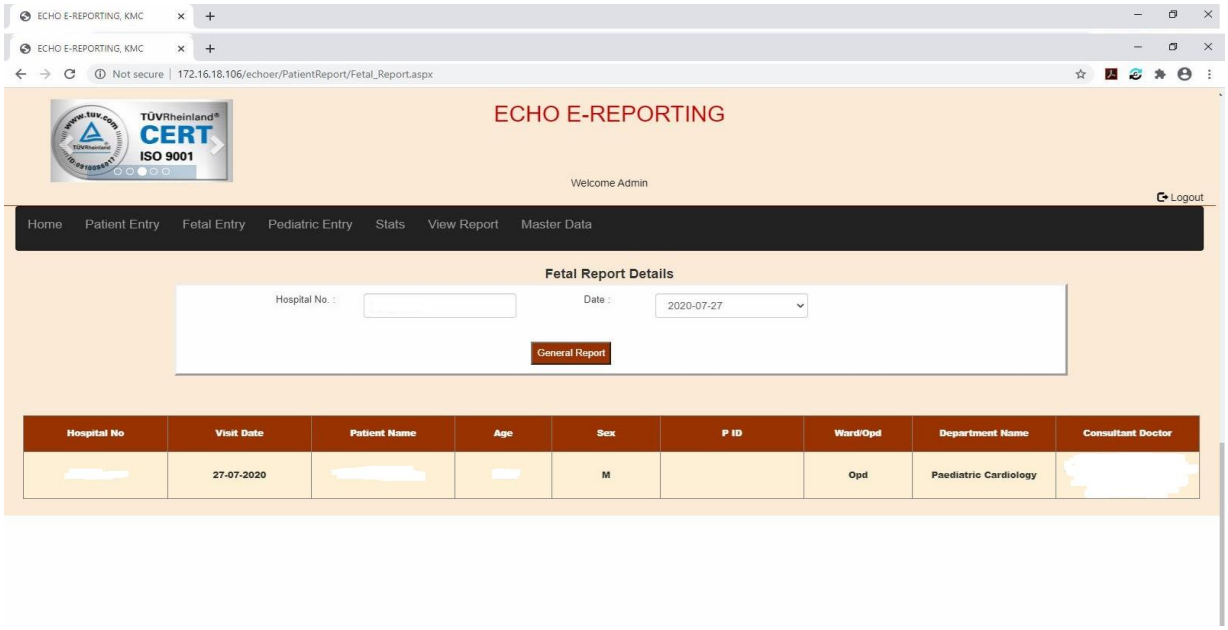


Fig.10(g)

-The report page will open with the hospital no and date entered in the fetal entry page.

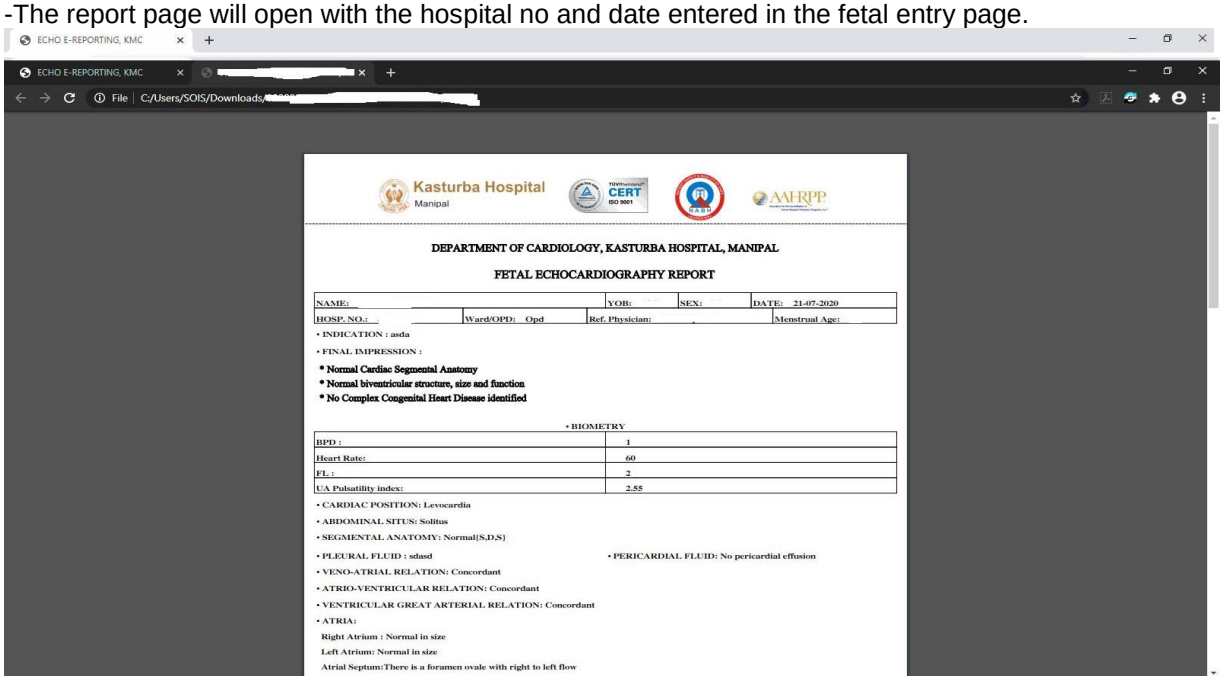


Fig. 10(h)

• ATRIA:

Right Atrium : Normal in size

Left Atrium: Normal in size

Atrial Septum:There is a foramen ovale with right to left flow

• MITRAL VALVE: Well developed

• TRICUSPID VALVE: Well developed

• VENTRICLES:

Right Ventricle : Normal right ventricular structure, size & function

Left Ventricle: Normal left ventricular structure, size & function

Ventricle Septum: Intact

• LVOT OBSTRUCTION: Absent

• RVOT OBSTRUCTION: Absent

• AORTIC VALVE: Well developed

• PULMONARY VALVE: Well Developed

• CONOTRUNCUS ANATOMY: Normal

• AORTIC ARCH: Normal left aortic arch with no evidence of coarctation of aorta

• PULMONARY ARTERY: Normal main and branch pulmonary arteries

• DUCTUS ARTERIOSUS: Wide open with right to left flow

• CARDIAC RHYTHM: Normal sinus rhythm

*We have neither detected nor disclosed the sex of fetus to anybody.

STUDY LIMITATIONS: Fetal echocardiography may not be able to detect abnormalities such as small ventricular septal defects, subtle valve abnormalities or coarctation of aorta, nor can it predict postnatal persistence of fetal structures such as patent foramen ovale or patent ductus arteriosus

Fig. 10(i)

-This is the report generated when clicked on the general report button.

6. Fetal Report

Kasturba Hospital
Manipal

DEPARTMENT OF CARDIOLOGY, KASTURBA HOSPITAL, MANIPAL

FETAL ECHOCARDIOGRAPHY REPORT

NAME:		YOB:	SEX:	DATE: 27-07-2020
HOSP. NO.:	Ward/OPD: Opd	Ref. Physician:		Menstrual Age:

• INDICATION : asda

• FINAL IMPRESSION :

* Normal Cardiac Segmental Anatomy
* Normal biventricular structure, size and function
* No Complex Congenital Heart Disease identified

• BIOMETRY

BPD :	2
Heart Rate:	60
FL :	3
UA Pulsatility index:	2.55

• CARDIAC POSITION: Levocardia

• ABDOMINAL SITUS: Solitus

• SEGMENTAL ANATOMY: Normal{S,D,S}

• PLEURAL FLUID : sda

• PERICARDIAL FLUID: No pericardial effusion

• VENO-ATRIAL RELATION: Concordant

• ATRIO-VENTRICULAR RELATION: Concordant

• VENTRICULAR GREAT ARTERIAL RELATION: Concordant

• ATRIA:

Right Atrium : Normal in size

Left Atrium: Normal in size

Atrial Septum:There is a foramen ovale with right to left flow

• MITRAL VALVE: Well developed

• TRICUSPID VALVE: Well developed

• VENTRICLES:

Right Ventricle : Normal right ventricular structure, size & function

Left Ventricle: Normal left ventricular structure, size & function

Ventricle Septum: Intact

• LVOT OBSTRUCTION: Absent

• RVOT OBSTRUCTION: Absent

• AORTIC VALVE: Well developed

• PULMONARY VALVE: Well Developed

• CONOTRUNCUS ANATOMY: Normal

• AORTIC ARCH: Normal left aortic arch with no evidence of coarctation of aorta

• PULMONARY ARTERY: Normal main and branch pulmonary arteries

• DUCTUS ARTERIOSUS: Wide open with right to left flow

• CARDIAC RHYTHM: Normal sinus rhythm

We have neither detected nor disclosed the sex of fetus to anybody.

STUDY LIMITATIONS: Fetal echocardiography may not be able to detect abnormalities such as small ventricular septal defects, subtle valve abnormalities or coarctation of

Fig. 11(a)

aorta, nor can it predict postnatal persistence of fetal structures such as patent foramen ovale or patent ductus arteriosus

Fig. 11(b)

7. Paediatric Entry

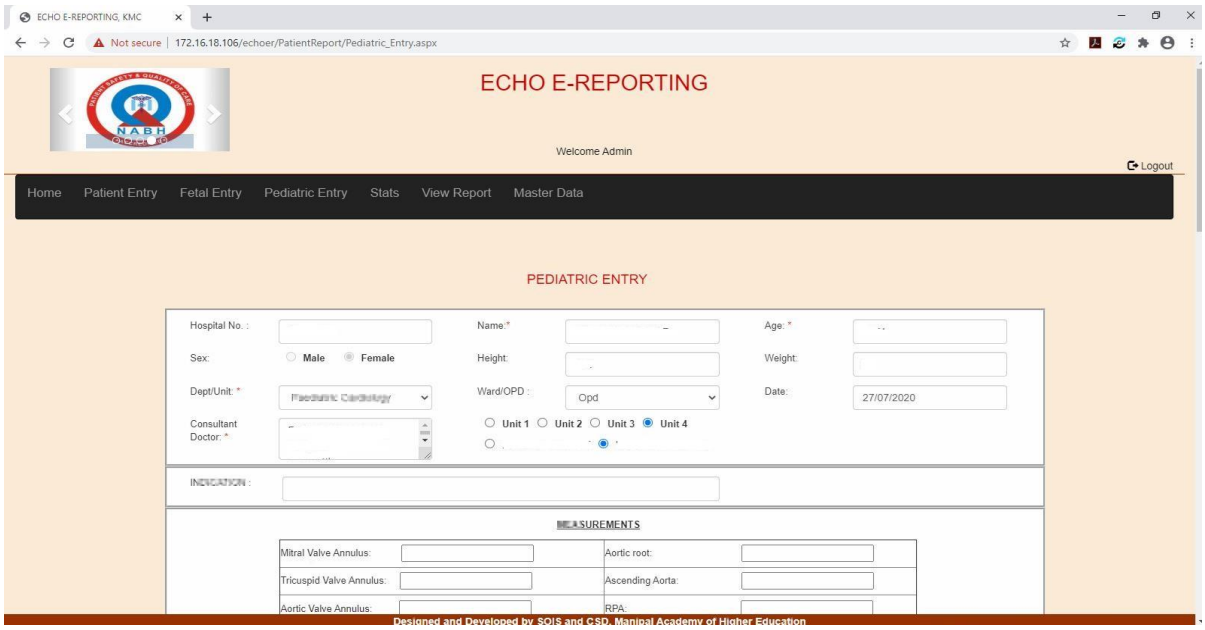


Fig. 12(a)

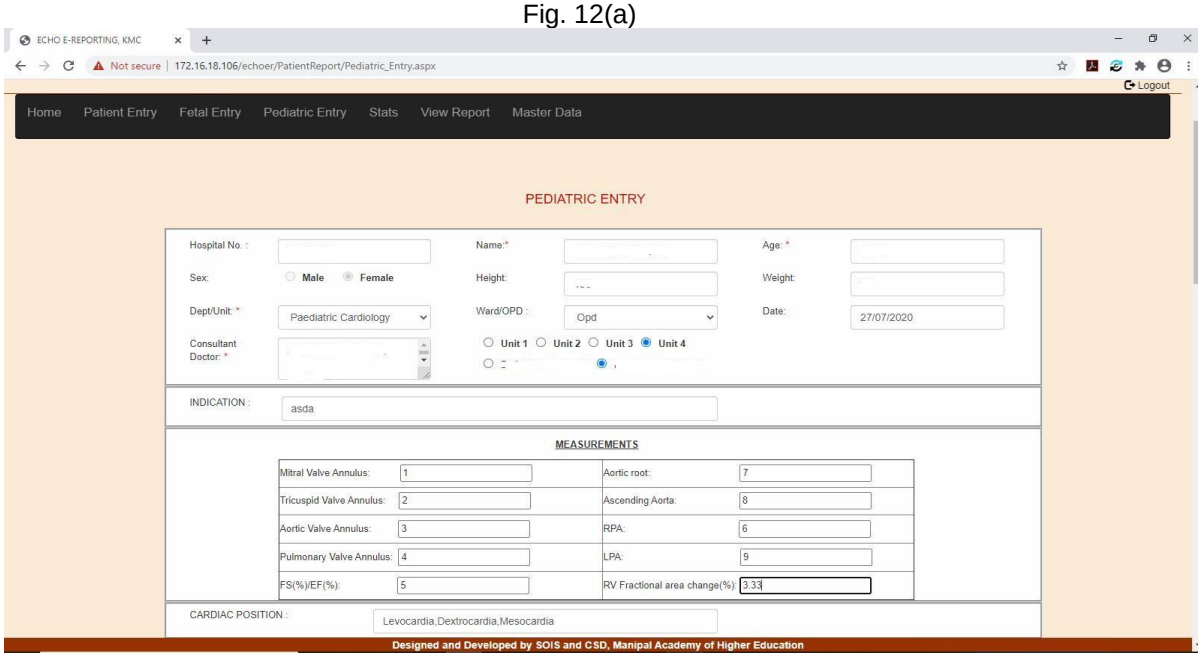


Fig. 12(b)

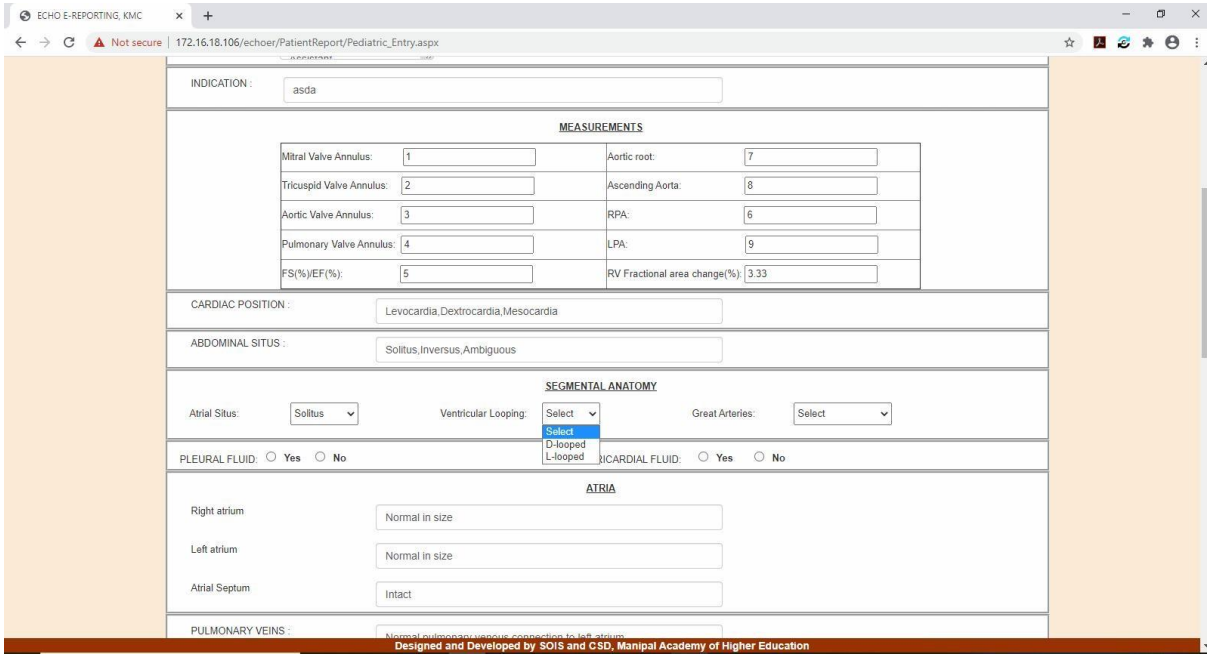


Fig. 12(c)

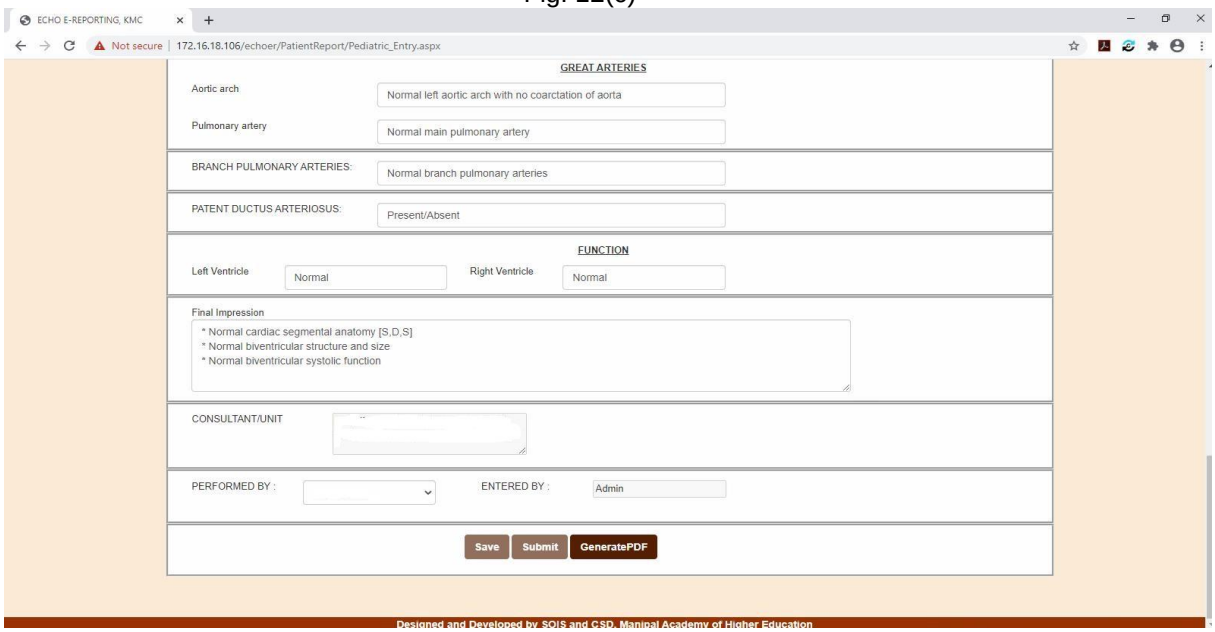


Fig. 12(d)

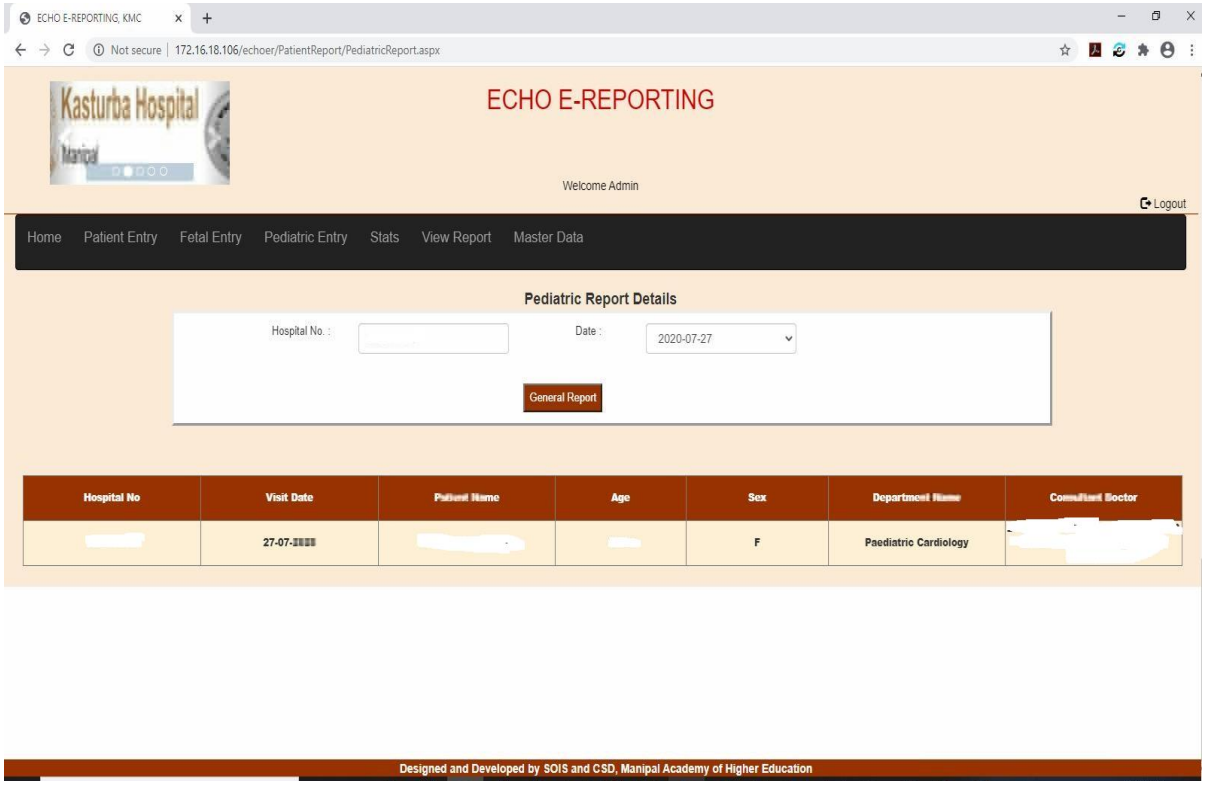
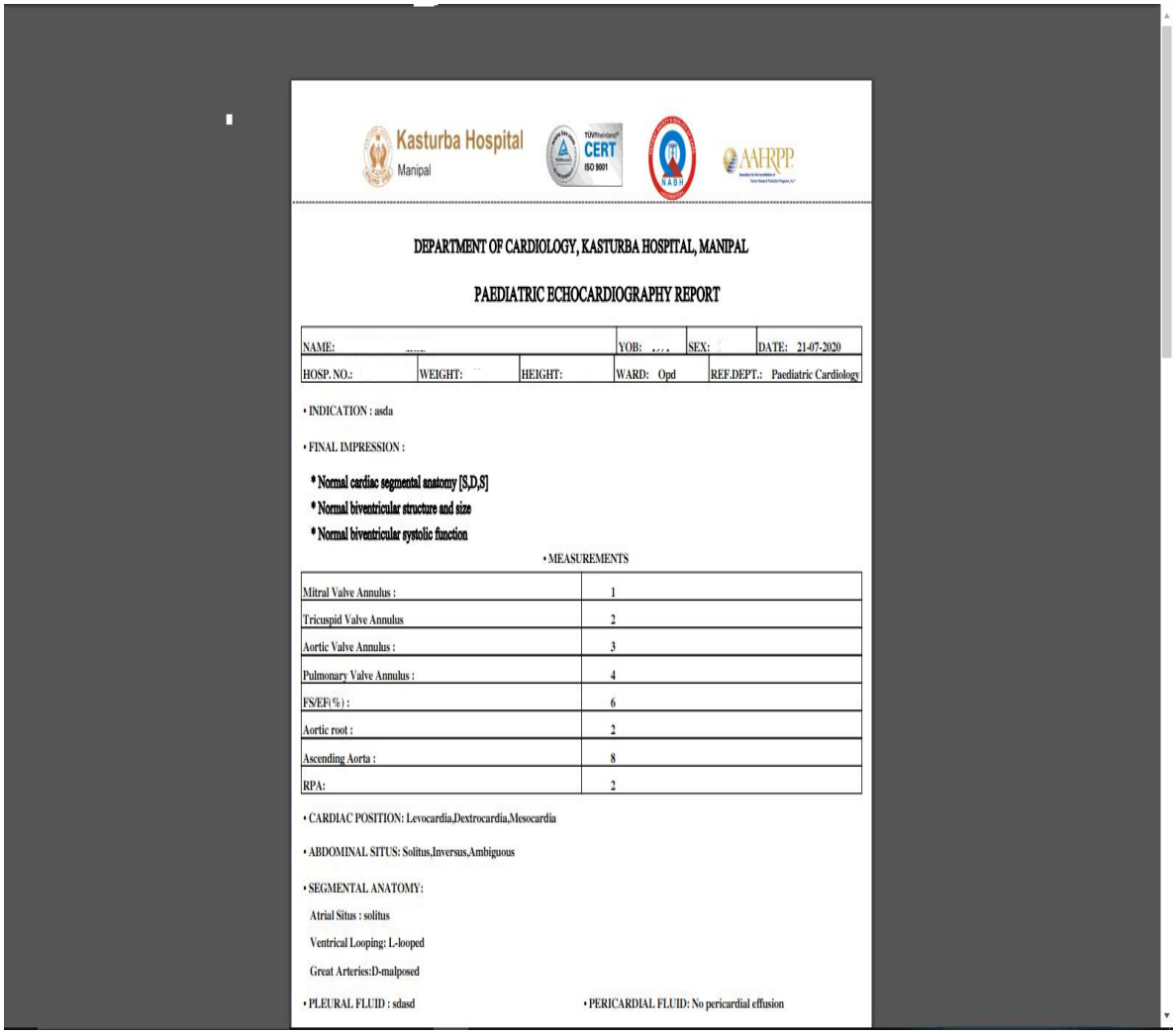

ECHO E-REPORTING, KMC
Not secure | 172.16.18.106/echoer/PatientReport/PediatricReport.aspx
Kasturba Hospital
Manipal
ECHO E-REPORTING
Welcome Admin
Logout
Home
Patient Entry
Fetal Entry
Pediatric Entry
Stats
View Report
Master Data
Pediatric Report Details
Hospital No. :
Date :
2020-07-27
General Report
Hospital No
Visit Date
Patient Name
Age
Sex
Department Name
Consultant Doctor
27-07-
F
Paediatric Cardiology
Designed and Developed by SOIS and CSD, Manipal Academy of Higher Education

Fig. 12(e)



Kasturba Hospital
Manipal

DEPARTMENT OF CARDIOLOGY, KASTURBA HOSPITAL, MANIPAL

PAEDIATRIC ECHOCARDIOGRAPHY REPORT

NAME:			YOB:	SEX:	DATE: 21-07-2020
HOSP. NO.:	WEIGHT:	HEIGHT:	WARD: Opd	REF.DEPT.: Paediatric Cardiology	

• INDICATION : asda

• FINAL IMPRESSION :

* Normal cardiac segmental anatomy [S,D,S]
* Normal biventricular structure and size
* Normal biventricular systolic function

• MEASUREMENTS

Mitral Valve Annulus :	1
Tricuspid Valve Annulus	2
Aortic Valve Annulus :	3
Pulmonary Valve Annulus :	4
FS/EF(%) :	6
Aortic root :	2
Ascending Aorta :	8
RPA:	2

• CARDIAC POSITION: Levocardia,Dextrocardia,Mesocardia

• ABDOMINAL SITUS: Solitus,Inversus,Ambiguous

• SEGMENTAL ANATOMY:

Atrial Situs : solitus

Ventrical Looping: L-looped

Great Arteries:D-malposed

• PLEURAL FLUID : sdasd

• PERICARDIAL FLUID: No pericardial effusion

Fig. 12(f)

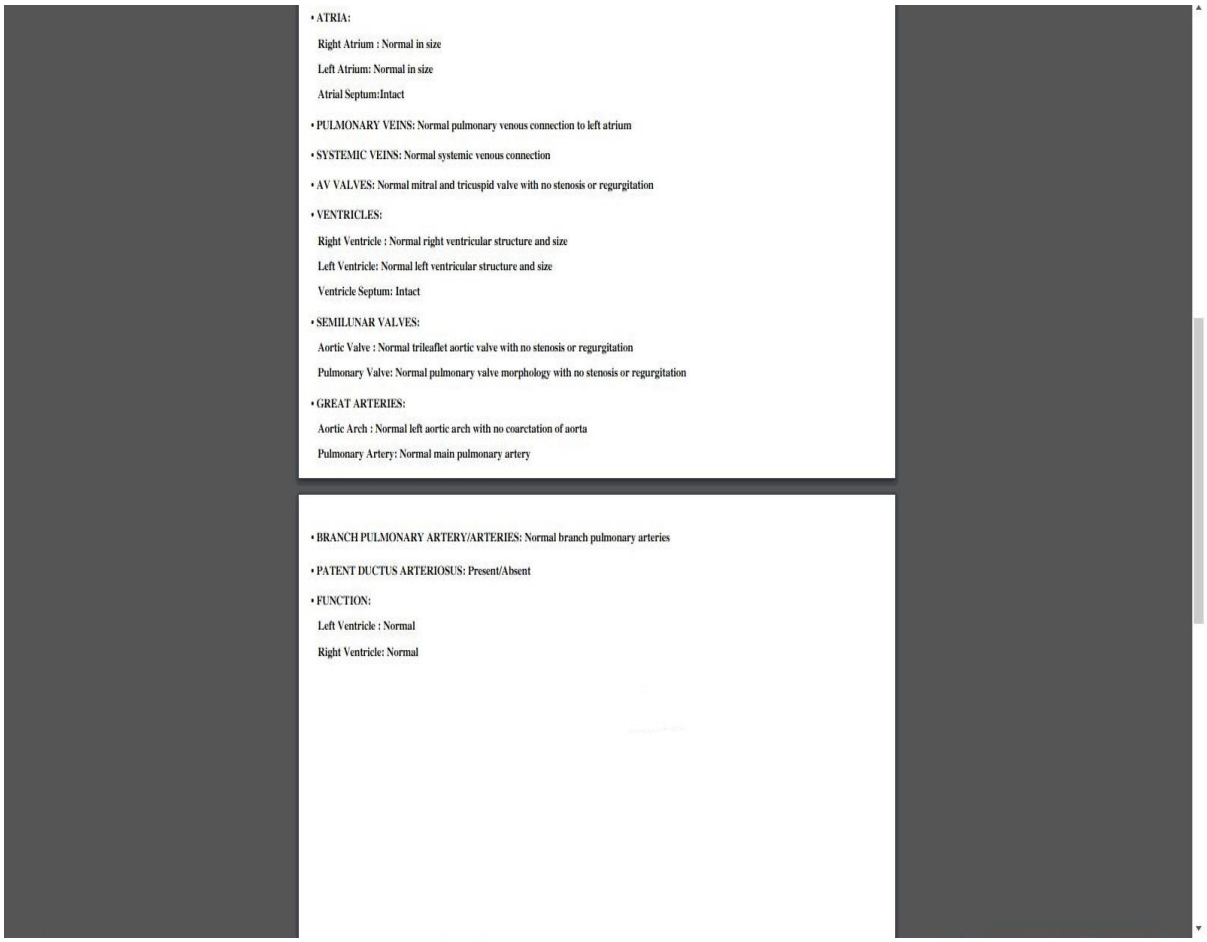

• ATRIA:
Right Atrium : Normal in size
Left Atrium: Normal in size
Atrial Septum:Intact
• PULMONARY VEINS: Normal pulmonary venous connection to left atrium
• SYSTEMIC VEINS: Normal systemic venous connection
• AV VALVES: Normal mitral and tricuspid valve with no stenosis or regurgitation
• VENTRICLES:
Right Ventricle : Normal right ventricular structure and size
Left Ventricle: Normal left ventricular structure and size
Ventricle Septum: Intact
• SEMILUNAR VALVES:
Aortic Valve : Normal trileaflet aortic valve with no stenosis or regurgitation
Pulmonary Valve: Normal pulmonary valve morphology with no stenosis or regurgitation
• GREAT ARTERIES:
Aortic Arch : Normal left aortic arch with no coarctation of aorta
Pulmonary Artery: Normal main pulmonary artery
• BRANCH PULMONARY ARTERY/ARTERIES: Normal branch pulmonary arteries
• PATENT DUCTUS ARTERIOSUS: Present/Absent
• FUNCTION:
Left Ventricle : Normal
Right Ventricle: Normal

Fig. 12(g)

8. Paediatric Report

Kasturba Hospital
Manipal

DEPARTMENT OF CARDIOLOGY, KASTURBA HOSPITAL, MANIPAL

PAEDIATRIC ECHOCARDIOGRAPHY REPORT

NAME:			YOB:	SEX:	DATE: 30-06-2020
HOSP. NO.:	WEIGHT:	HEIGHT:	WARD: Opd	REF.DEPT.:	Paediatric Cardiology

• INDICATION : Post Op Coarctation of aorta (s/p resection and abstantial heart disease found aortic arch

• FINAL IMPRESSION :

* Normal cardiac segmental anatomy [S,D,S]
* Normal biventricular structure and size
* Normal biventricular systolic function

• MEASUREMENTS

Mitral Valve Annulus :	1
Tricuspid Valve Annulus	2
Aortic Valve Annulus :	3
Pulmonary Valve Annulus :	4
FS/EF(%) :	5
Aortic root :	6
Ascending Aorta :	8
RPA:	7
LPA :	9
RV Fractional area change(%) :	10

• CARDIAC POSITION: Levocardia,Dextrocardia,Mesocardia

• ABDOMINAL SITUS: Normal

• SEGMENTAL ANATOMY:
Great Arteries:I-inverted,L-malposed

• PLEURAL FLUID : safsdfsdgsdg

• PERICARDIAL FLUID: No pericardial effusion

• ATRIA:
Right Atrium : Normal in size
Left Atrium: Normal in size
Atrial Septum:Intact

• PULMONARY VEINS: Normal pulmonary venous connection to left atrium

• SYSTEMIC VEINS: Normal systemic venous connection

• AV VALVES: Normal mitral and tricuspid valve with no stenosis or regurgitation

• VENTRICLES:
Right Ventricle : Normal right ventricular structure and size
Left Ventricle: Normal left ventricular structure and size
Ventricle Septum: Intact

• SEMILUNAR VALVES:
Aortic Valve : Normal trileaflet aortic valve with no stenosis or regurgitation
Pulmonary Valve: Normal pulmonary valve morphology with no stenosis or regurgitation

• GREAT ARTERIES:
Aortic Arch : Normal left aortic arch with no coarctation of aorta
Pulmonary Artery: Normal main pulmonary artery

Fig. 13(a)

- **BRANCH PULMONARY ARTERY/ARTERIES: Normal branch pulmonary arteries**
- **PATENT DUCTUS ARTERIOSUS: Present/Absent**
- **FUNCTION:**

  Left Ventricle : Normal

  Right Ventricle: Normal

Fig. 13(b)

9. Search

-Search Page is available under Stats navigation menu option and this tool is accessible only to Admin.

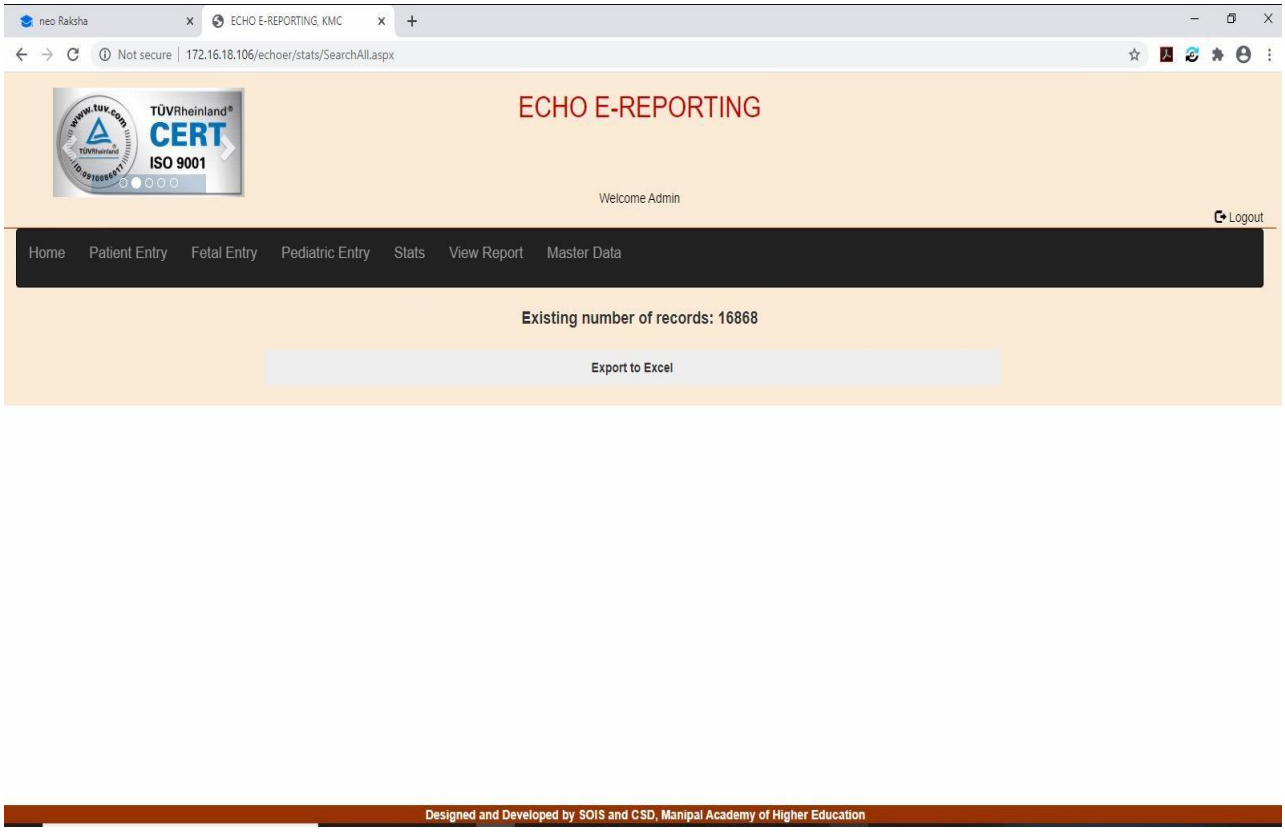


Fig. 14(a)

-This page displays the number of records and the option to export the details to excel.

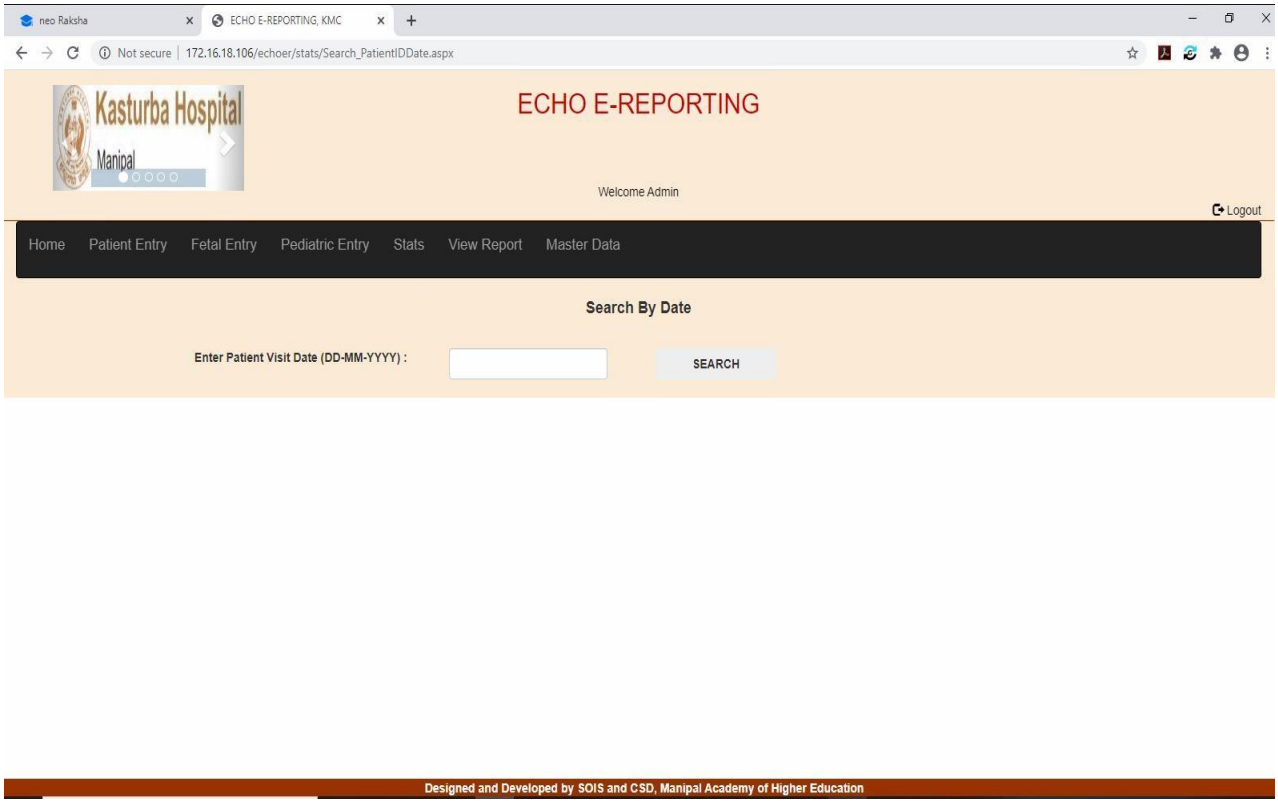


Fig. 14(b)

-This page gives the option to enter the date and search for that particular day's patients records.

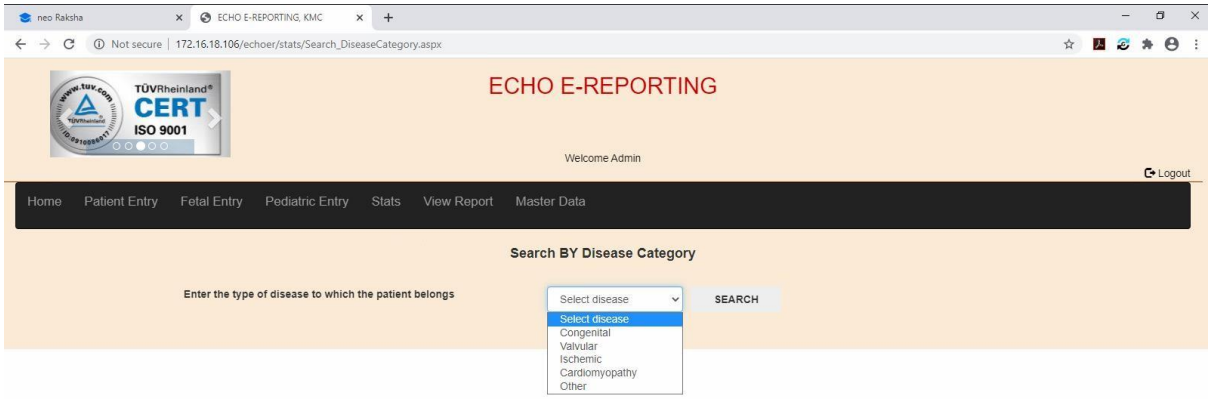


Fig. 14(c)

- This page allows to search according to the disease cateogry as well as the subcategories if present in a particular selected disease category.

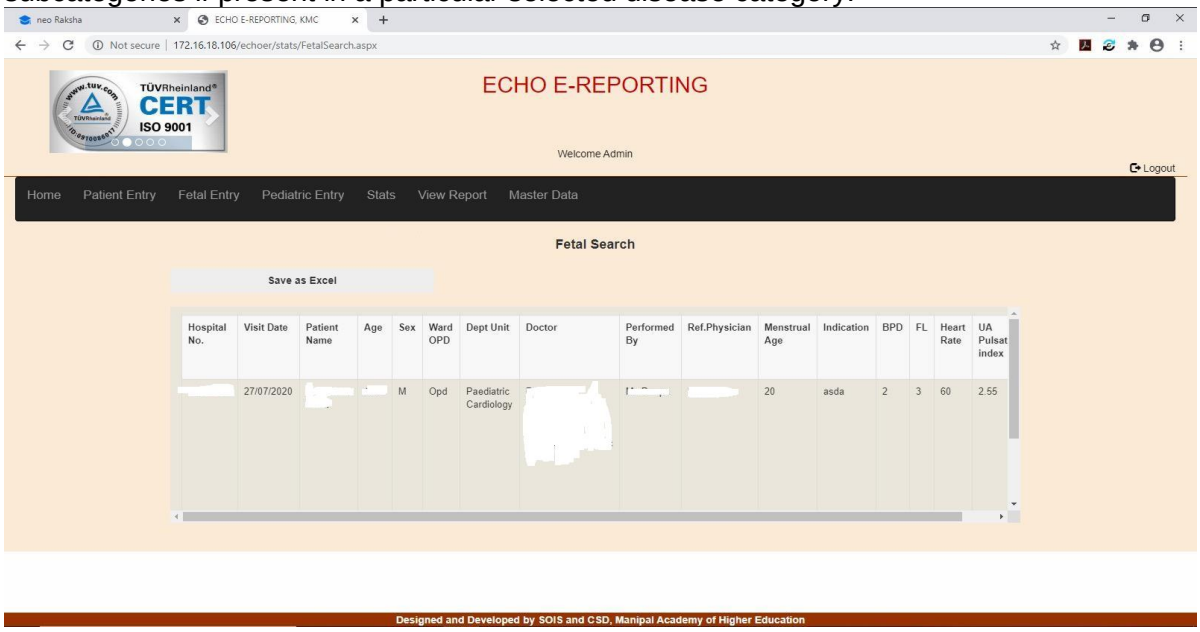


Fig. 14(d)

-This search page displays all the fetal records available which can be exported to excel.

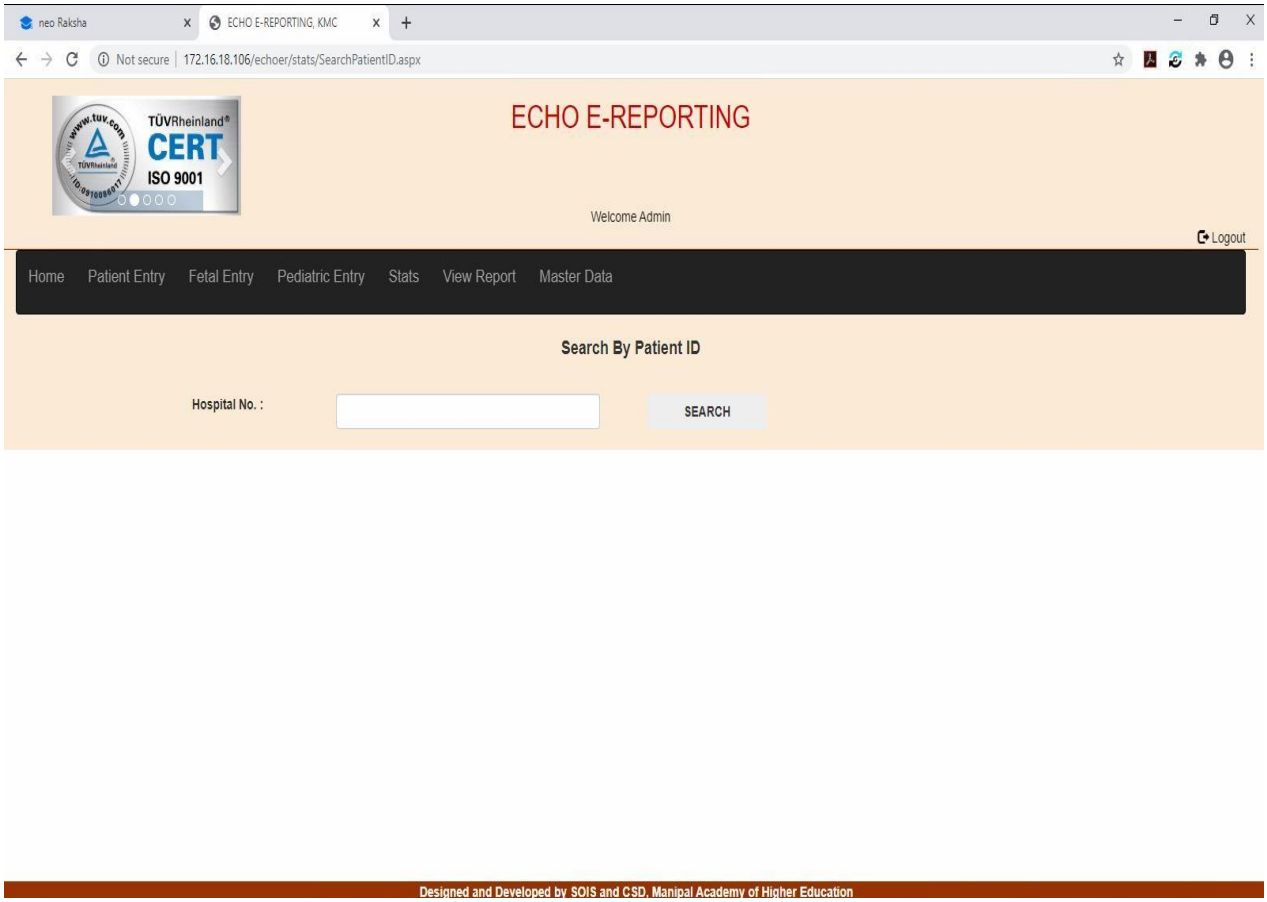


Fig. 14(e)

-This page displays the paediatric details of the patient id entered.

10. Adding user, cardiologist, unit, department

-This navigation menu Master data is visible only to Admin.

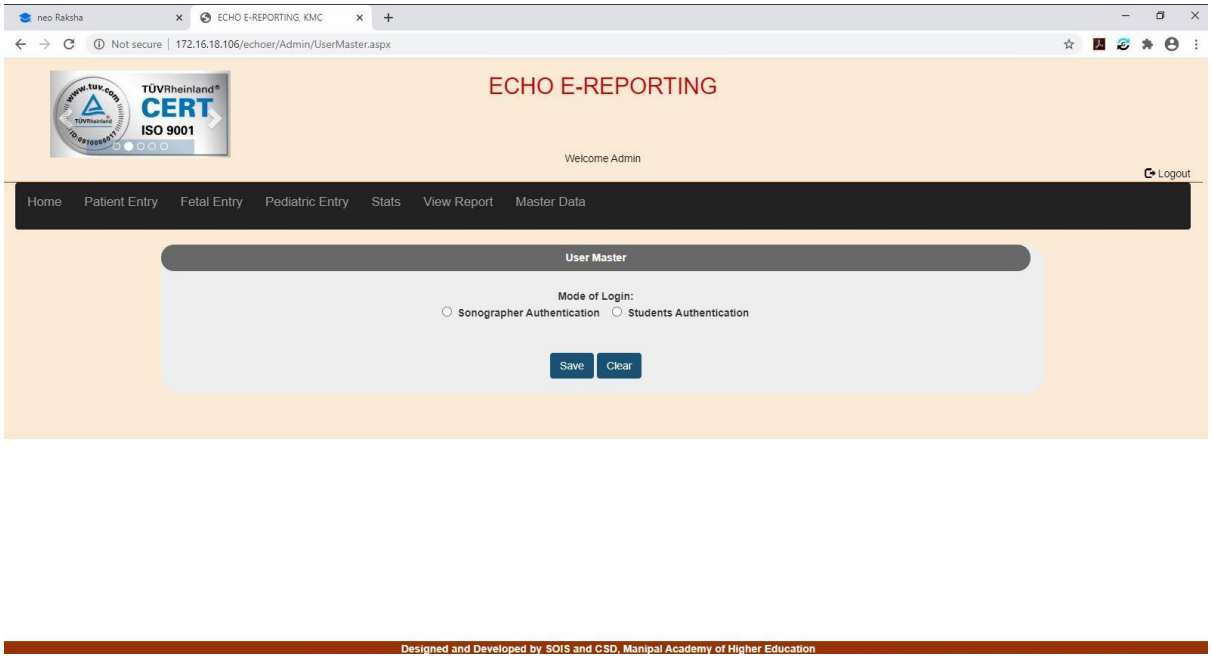


Fig. 15(a)

-This page allows the admin add either sonographer or student.

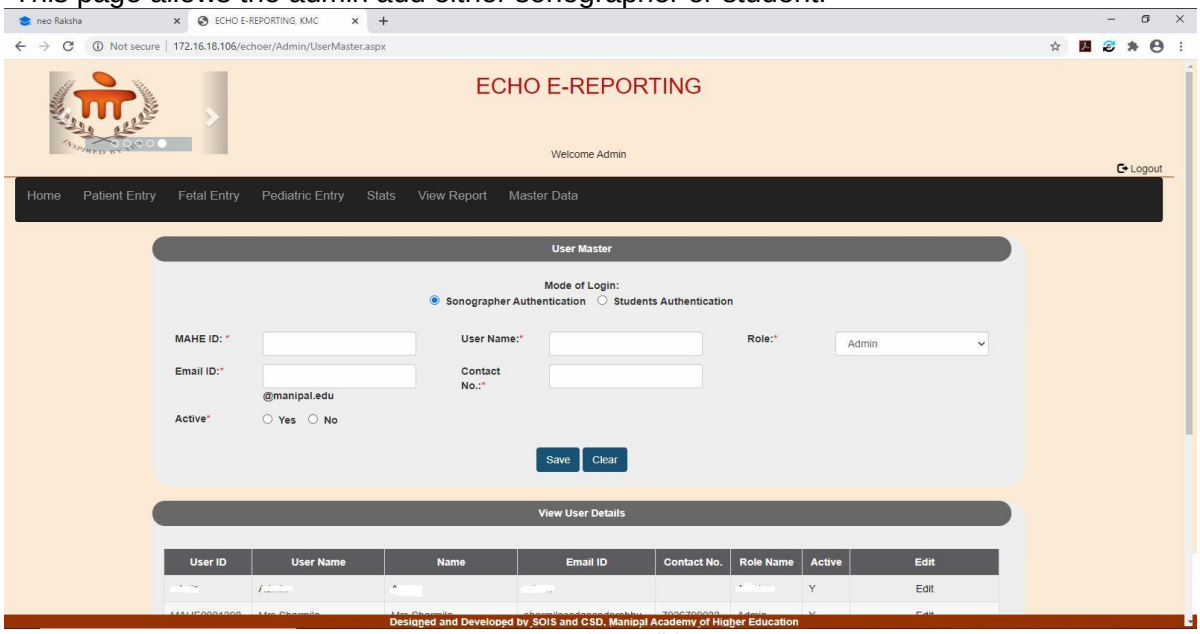


Fig. 15(b)

-This page allows to edit or add new sonographer for the admin.

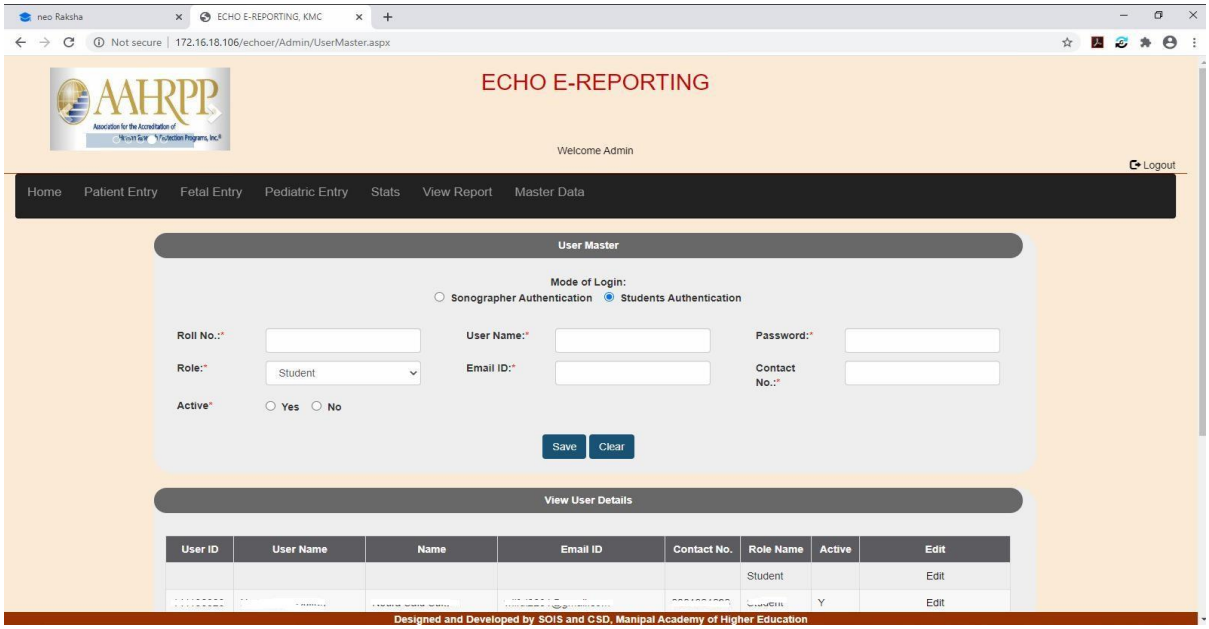


Fig. 15(c)

-This page allows to edit or add new student intern for the admin.

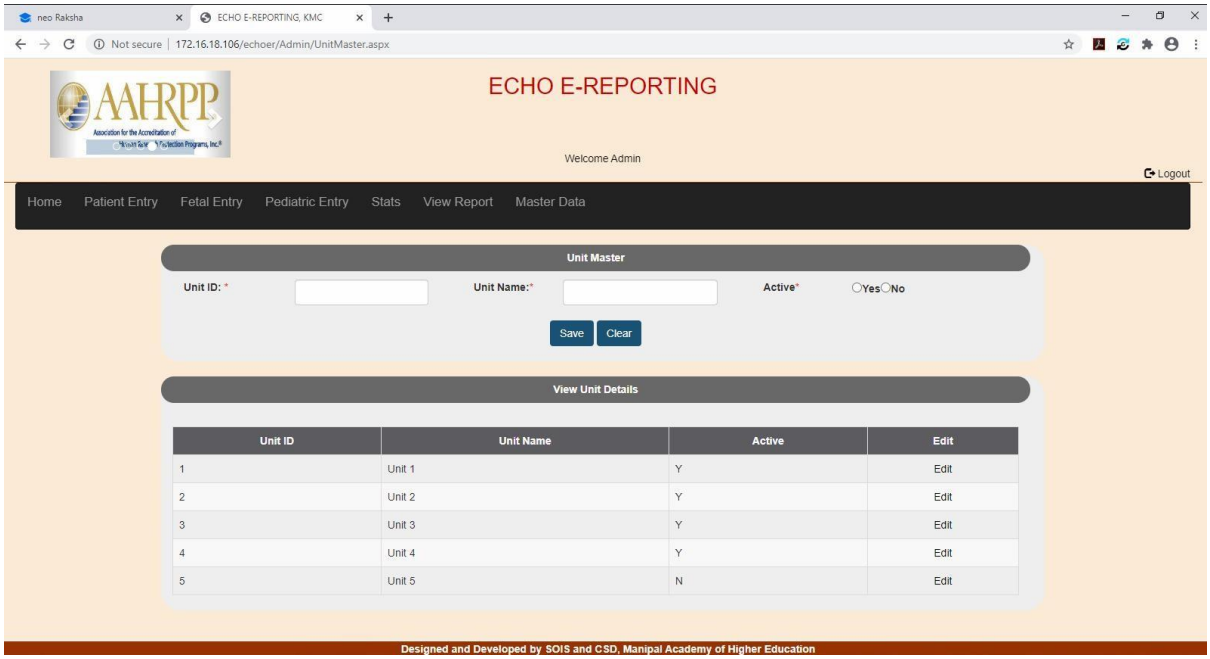


Fig. 15(d)

-This page allows to edit or add new unit for the admin.

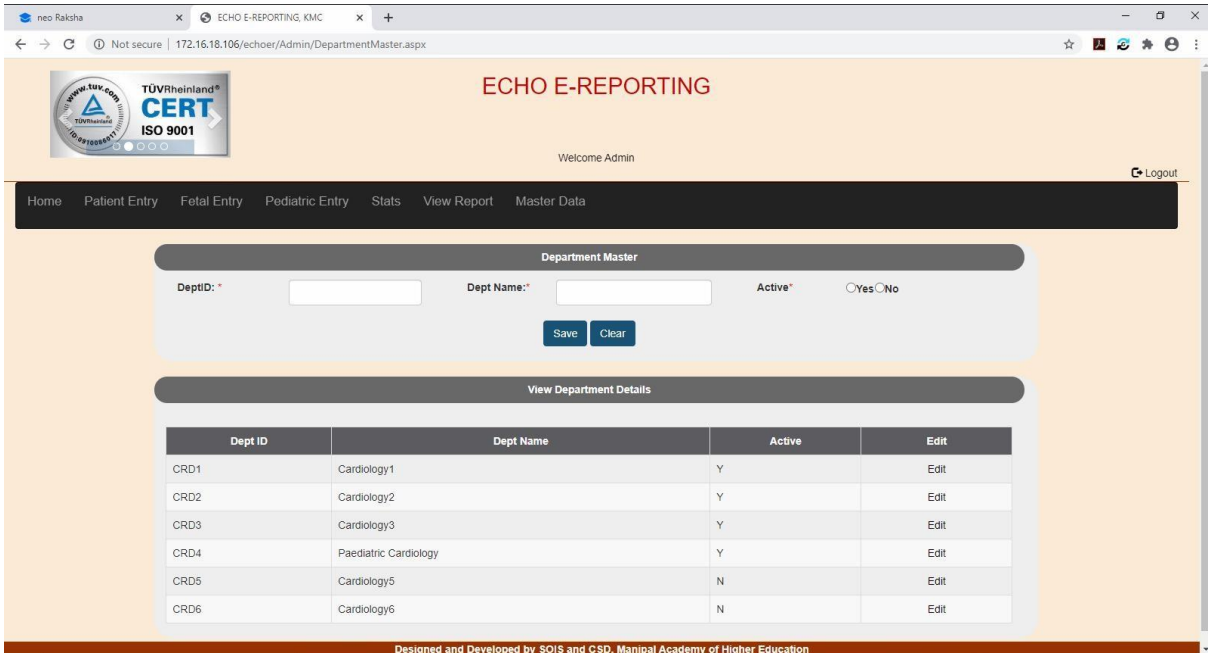


Fig. 15(e)

-This page allows to edit or add new department for the admin.

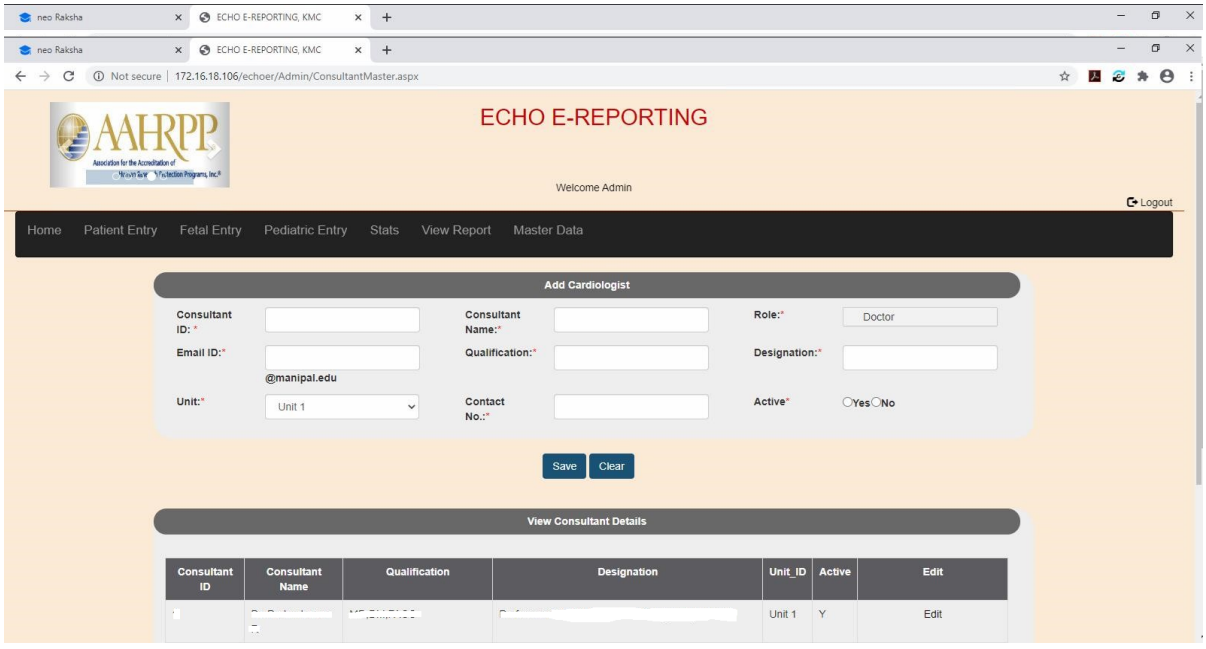


Fig. 15(f)

-This page allows to edit or add new cardiologist for the admin.

8. Test Provision

8.1 Login Module

Use case test: Login	
Test Procedure	
Step 1: Open the url 172.16.18.106/echoer	The system will display the login form.
Step 2: Enter all the fields	System will display error if username and password is left empty or not entered.
Step 3: Wrong username or password	System will display the error if the entered username or password are invalid.
Step 4: Click on login button	System will redirect the users according to their roles and responsibilities after authentication.

8.2 Patient/Fetal/Paediatric Entry module

Use case test: Patient_Fetal_Paediatric_Entry	
Test Procedure	
Step 1: Select Patient/Fetal/Paediatric Entry from the navigation menu	The system will display the selected entry form.
Step 2: Enter the hospital number	System will display error if hospital number i.e. patient id is not entered.
Step 3: Wrong hospital number	System will display the error if the entered hospital number i.e. patient id does not exist in the PMS database.
Step 4: Click on Save button	After entering all the required details in the entry page when clicked on save it will give message of successful saving of data.
Step 5: Click on Submit button	After saving the data, when clicked on submit button the system will display alert that whether this is final because no editing will be allowed after clicking on submit.

Step 6: Generate Report	Once clicked on submit button and confirmed, the Generate Report will be enabled and system will redirect to the report page. If the details entered are not submitted or saved then the system will disable the Generate Report button.

8.3 Admin module

Use case test: Add Unit	
Test Procedure	
Step 1: Select Manage Unit from the navigation menu	The system will display the Unit Master page with two fields to be entered and one of the two options to be selected.
Step 2: Enter all the fields	System will display error if either of three details not entered.
Step 3: Enter wrong input	System will display the error if the entered unit id already exists.
Step 4: Click on save button	System will save the details which will be displayed in the table on the same page that can be edited as well.

Use case test: Add Department	
Test Procedure	
Step 1: Select Manage Department from the navigation menu	The system will display the Department Master page with two fields to be entered and one of the two options to be selected.
Step 2: Enter all the fields	System will display error if either of three details not entered.
Step 3: Enter wrong input	System will display the error if the entered dept id already exists.
Step 4: Click on save button	System will save the details which will be displayed in the table on the same page that can be edited as well.

Use case test: Add Cardiologist	
Test Procedure	
Step 1: Select Manage Cardiologist from the navigation menu	The system will display the Add Cardiologist page with seven fields to be entered and two of the four options to be selected.
Step 2: Enter all the fields	System will display error if either of nine details not entered. All the fields are mandatory.
Step 3: Enter wrong input	System will display the error if the entered consultant id or name already exists or unit is not selected.
Step 4: Click on save button	System will save the details which will be displayed in the table on the same page that can be edited as well.

Use case test: Add User	
Test Procedure	
Step 1: Select Manage User from the navigation menu	The system will display the User Master page with two mode of login: (a) Sonographer Authentication (b) Students Authentication.
Step 2: Enter all the fields in Sonographer Authentication	System will display error if either of details not entered or if mahe id already exists and role has to be selected. All the fields are mandatory.
Step 3: Enter all the fields in Student Authentication	System will display error if either of details not entered or if roll no. already exists and role has to be selected. All the fields are mandatory.
Step 4: Click on save button	System will save the details which will be displayed in the table on the same page that can be edited as well.

9. Conclusion and scope for future work

9.1 Conclusion:

In order for medical professionals to know a patient's progress or medical status, creating medical reports are what they need. A medical report is an updated detail of a medical examination of a certain patient.

ECHO-ER system will help hospital personnel to add the patient report, view the report and also allows to print the report, the historical reports will be converted into this existing software so that it is easy to view the patient report by name, date.

ECHO_ER is software where report is entered in the ASP.net web base application; ECHO report data extraction and archiving application saves the data with the present report collected by the ECHO_ER software. This then can be saved as excel format for the purpose of the data analyzing.

9.2 Scope for future work:

Since no system is really ever complete, it will be maintained as changes are required because of internal developments, such as new users or adding new diseases.

The retrieval of previously entered data for a particular patient that displays when revisited the entry page; the feature which is available for patient entry has to be implemented for paediatric and fetal.

As the system developed is based on a modular approach and each module is prepared independently of the other module, each and every module can be modified to meet the requirements without affecting the other module in any respect.

As it is rightly said that any packages are complete only if it is flexible enough and capable to inherit any future modification. As no software package is ever complete because with the passage of time it requires modifications accordingly.

10. Bibliography

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- **https://www.findbestopensource.com/product/closedxml**
- **https://www.nuget.org/packages/DocumentFormat.OpenXml/**
- **Murach's ASP. NET 4. 6 Web Programming with C# 2015: Training and Reference Anne Boehm**