We begin with this module

under subject zoology.

Course title, diversity of

Chordates and genetics,

module name Pedigree analysis,

which belongs to the unit titled

Inheritance of Human Traits.

I miss Kavitha Nair from GANPAT

Parsekar College of education.

Outline of this module

Introduction to pedigree analysis.

Pedigree chart nomenclature,

pedigree

charts for human trait inheritance,

Pedigree analysis in human use,

Sample pedigree chart and its

analysis .

At the end of this module,

the student shall be able to identify

a pedigree chart and its nomenclature.

Describe patterns of human trait

inheritance using pedigree chart.

Enumerate applications of pedigree

Analysis.

To begin with the module proper.

A pedigree chart is a diagram that shows the

occurrence and appearance of phenotypes

Of a particular gene and its ancestor

from one generation to the next.

A pedigree is a chart of the genetic

history of family over several generations.

It can simply be called as a family tree.

It's a very important tool for studying

inherited diseases and genetic counseling.

Pedigree chart makes it easier to

visualize relationships within

families and inheritance of a trait.

Pedigree chart is commonly

prepared for human

Show dogs and race horses.

This is an example of a human pedigree

chart or typical pedigree chart.

Pedigree nomenclature-

pedigrees are drawn using

standard symbols and formatting

as in the illustration given.

Common pedigree symbols are represented

where in squares represent males

and circles represent females.

Pedigree symbols were proposed

by the Pedigree Standardization

Task force of National Society

of Genetic Counselors,

New York, in 1955.

Types of pedigree charts.

One ) autosomal dominant inheritance.

Gene for the trait or disorder is a dominant

gene on one of the autosomal chromosome.

That affected individual has one normal

copy of the gene and one affected

that is, with disease or the trait concern.

The disease of the trait is passed from

one parent to 50% of the children.

Both sons and daughters are equally affected.

Condition following this particular

inheritance are Huntington disease,

polycystic kidney disorder, polydactyly.

Two) autosomal recessive inheritance.

Both copies of the gene have genetic

Condition. The trait is found in siblings,

but not in the parents of the affected.

Parents would be carriers and

as recessive conditions do not

manifest in heterozygous conditions,

it does not appear in parents.

When two carriers mate,

each child has 25% chance

of being unaffected,

25% chance of being homozygous

mutant that is affected,

or a 50% chance of being heterozygous

or carrier .

Conditions are cystic

fibrosis and Tay sach’s disease.

Third) Y linked inheritance.

The gene for the trait is on Y

chromosome in a Y trait or disorder.

Only males can be affected.

If Father is affected,

all sons will be affected

without skipping a generation.

Four ) mitochondrial inheritance.

Gene for

the trait is present in mitochondrial DNA.

Mitochondrial trait or disorder is

passed to all offsprings if mother

is affected as a child inherits

mitochondrial genome only from mother.

If father is affected,

he does not pass it to any of the offspring.

5) X linked recessive inheritance.

Gene for that trait is recessive

and present on the X chromosome.

A male carrying such a X chromosome will be

affected as he has only One X chromosome.

A female with 1X chromosome with

the trait and the other without is

usually unaffected, but a carrier.

For a daughter to be affected,

the father should be affected and

mother has to be affected or a carrier.

A son will be affected if he inherits

the affected X chromosome from mother.

This disorder or trait never

passes from father to son.

X linked recessive disorders skips a

generation .

Common conditions associated

with this pattern is haemophilia, red-

green color blindness.

Six) X linked dominant inheritance.

Gene responsible for the

trait is on X chromosome.

The gene acts in a dominant manner.

Both males and females can

display that trait even when they

have only one copy of the gene.

All fathers that are affected by X

linked dominant disorder will have

affected daughters but not affected sons.

However,

if mother is also affected,

then sons will have a chance of

being affected.

If only mother is affected then children

have 50% chance of being affected

irrespective of their gender.

Condition associated with this inheritance

pattern are X linked hypophosphatemia,

Rett syndrome.

Pedigree in human use . Based on

the pattern of inheritance.

The family can be studied for

a particular trait or disease.

Inheritance pattern from parents

to offspring can be studied.

Inheritance pattern helps to find

recessive and dominant type of traits.

Pedigree of a family can be used by

genetic counselors to advise them

about risk of genetic conditions.

Pedigree chart of Queen Victoria,

Descendants and hemophilia.

Hemophilia is a X linked trait.

Hemophilia figured prominently in

the history of British royal family.

Inheritance of hemophilia in British royal

family is illustrated in the diagram.

Queen Victoria was a carrier of hemophilia.

She passed the disease

to three of her children.

A total of 10 males of Queen Victoria's

descendants were affected by the disease.

Today, however, no living member of

the royal family of Europe is believed

to carry the gene of hemophilia.

Hemophilia or royal disease has

affected the royal families of England,

Germany, Russia and Spain in

the 19th and 20th century.

Thus hemophilia is also known

as the Royal disease.

Sample pedigree and its analysis.

This is a sample pedigree where in

the Roman numerals denotes generation.

Older offspring is placed on the left.

Based on this, what is the total

number of females and males that

are present in the given pedigree?

As circle denote females

and square denotes males,

there are 16 females and 12 males.

How many males showed trait studied?

The colored squares are the males

which are affected by the trait.

Thus two males with the trait studied.

What is the sex of the offspring

in the numeral IV and 4?

As a symbol at IV and four is Rhombus,

it indicates unknown sex.

How many offspring did generation

I parents have ?

Generation I

parents had four offspring,

including two sons and two daughters.

What is the difference between numeral II - 5

and 6 and numeral III, 7 and 8?

Numeral II 5 and 6 are identical twins,

whereas numeral III,

7 and 8 are non identical twins.

What type of inheritance patterns

is shown in the pedigree?

Is it sex linked or autosomal?

In this image,

as both males and females are affected,

it is not a sex linked inheritance

but autosomal inheritance.

Books referred for the module as follows.