**Autosomal Recessive Inheritance:**

**A**n autosomal gene is a gene located on a numbered chromosome and usually affects males and females in the same way. Autosomal recessive refers to how a particular trait is inherited. The word autosome refers to the non-sex chromosomes. In humans, those are Chromosomes 1 through 22. So an autosomal trait is one that occurs due to a mutation on Chromosomes 1 through 22. Recessive means that both copies of allele need to be the muted variant of gene to express its effect. One copy of the variant alone cannot express its effect. In this condition the person has the muted gene in genotype, but there is not change in phenotype. They are called carrier of the particular gene.

Humans need two copies of each gene in order to have the correct balance of DNA (with the exception of the sex-chromosome genes). One copy of each gene is passed to a child from their mother and the other from the father. The possible gene combinations a parent may have for a recessive gene are-

**Homozygous affected**- Both the alleles are muted **(rr)**

**Carrier (Heterozygus, Unaffected)-** One allele is muted and the other allele is normal **(rR)**

**Normal person**- Both the allele is normal working type **(RR)**

Where, r represents the autosomal recessive muted allele, and R= normal working allele

**If both parents are genetic carriers for the same autosomal recessive gene mutation (rR and rR):-**

For such a couple this means that in every pregnancy, there is:

1. 1 chance in 4 (25% chance) that they will have a child who inherits both copies of the recessive gene mutation from them. In this case, no working gene product will be produced and their child will be affected by the condition caused by this gene.
2. 1 chance in 4 (25% chance) that they will have a child who will inherits both copies of the working gene and will be unaffected by the condition and not a genetic carrier.
3. 1 chance in 2 (2 chances in 4 or 50% chance) that they will have a child who inherits the recessive gene mutation and the working copy of the gene from them and the child will be an unaffected genetic carrier of the condition, just like the parents

**If one parent is a genetic carrier for the autosomal recessive gene mutation (rR and RR):**

For such a couple this means that in every pregnancy, there is:

1. No chance that the couple will have a baby affected with the genetic condition caused by this particular gene.
2. 1 chance in 2 ( 50% chance) that they will have a child who inherits both copies of the working gene from them. In this case, the child will be unaffected by the condition.
3. 1 chance in 2 ( 50% chance) that they will have a child who inherits the recessive gene mutation and the working copy of the gene from them and the child will be an unaffected genetic carrier of the condition.

**If one parent is affected by the autosomal recessive condition:**

**There are two possible scenarios:**

Scenario 1: Parent with RR and rr

For such a couple this means that in every pregnancy, there is:

1. 1 chance in 1 ( 100% chance) that they will have a child who inherits the recessive gene mutation and the working copy of the gene from them and the child will be an unaffected genetic carrier of the condition.

Scenario 2: parent with rR and rr

For such a couple this means that in every pregnancy, there is:

1. 1 chance in 2 (50% chance) that they will have a child who inherits both copies of the recessive gene mutation from them. In this case, the child will be affected or predisposed to develop the condition
2. 1 chance in 2 (50% chance) that they will have a child who inherits the recessive gene mutation and the working copy of the gene from them and the child will be an unaffected genetic

**If both parents are affected by the autosomal recessive condition (rr and rr):-**

For such a couple this means that in every pregnancy, there is:

1. 1 chance in 1 (100% chance) that they will have a child who inherits both copies of the recessive gene mutation from them.
2. Each child will be affected or predisposed to developing the condition, just as the parents are affected or predisposed to develop the condition.

The most common conditions that are caused by an autosomal recessive gene mutation are cystic fibrosis, thalassaemia, haemochromatosis, sickle cell animea etc.