

The eye is one of the most important vital organs in the human body, enabling the individual to interact with the outside world through vision. Shared environmental and genetic factors In some cases, diseases occur as a result of the interaction of genes with environmental factors, such as exposure to ultraviolet rays, which may increase the likelihood of diseases such as hereditary macular degeneration. Genetic diseases that affect the eye vary in terms of their impact and symptoms, and include, for example, retinitis pigmentosa, congenital retinopathy, Stargardt disease, age-related macular degeneration of a genetic basis, and corneal disorders and keratoconus. Genetic transmission patterns Genetic eye diseases are usually transmitted based on the inheritance pattern, including: Dominant inheritance: It is sufficient for an individual to carry one copy of the mutated gene to develop the disease, such as some forms of hereditary glaucoma. Recessive inheritance: The disease only appears if an individual inherits two mutated copies of the gene, one from each parent, as is the case with retinopathy pigmentosa. Sex-linked inheritance: transmitted through the sex chromosome (X or Y), and diseases linked to the X chromosome are often more common in males, such as sex-linked retinal dystrophy. Consanguineous marriage In some societies, consanguineous marriage increases the risk of transmitting genetic diseases of the eye, as the chance of meeting similar recessive genes carrying disease-causing mutations increases. Genetic diseases of the eye are health issues that combine medical challenges with genetic complexity, as they result from mutations in the genetic material (DNA) that are passed from one generation to the next or appear randomly as a result of acquired genetic changes. These diseases not only affect vision, but also have profound psychological and social effects on those affected, making dealing with them require great efforts at the individual and societal levels. Changes in genes responsible for eye functions Some genes are responsible for producing proteins necessary for the health of the retina, optic nerve, or lens. However, this delicate organ may be susceptible to many diseases that impede its basic function, including those resulting from genetic factors. This knowledge has provided promising opportunities for developing early diagnosis methods. It has also opened new horizons for treating genetic eye diseases through innovative techniques such as gene therapy, stem cells, and biotransplantation. These diseases are classified based on their genetic transmission pattern, as they can be: 1- Dominant genetic diseases: transmitted when there is only one copy of the affected gene. 3- Sex-linked: transmitted through the sex chromosomes, and often affect males more than females . Genetic mutations Genetic mutations occur when there is a permanent change in the DNA sequence, which leads to the production of abnormal proteins or the failure to produce proteins necessary for the proper function of the eye. Some of these mutations are inherited from parents, while others may occur spontaneously during fetal development. Any change in them may lead to diseases such as macular degeneration or hereditary cataracts. Changes in genes responsible for the eye's response to light, such as genes associated with rod and cone cells in the retina, may cause disturbances in night vision or color vision. With developments in the field of genetics and medicine, it has become possible to accurately identify the genetic causes of these diseases. Causes of Genetic Eye Diseases The causes of genetic eye diseases are due to changes or mutations in the genetic material (DNA) that affect the genes responsible for the normal development and functions of the eye. 2- Recessive genetic diseases: appear only when there are two copies of the affected gene (one from each parent). The main causes of

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