4. IndiGen Project

Prelims: Bio Technology

Mains: GS-III Awareness in Field of Nano - Technology

Why in News?

- The Council of Scientific and Industrial Research (CSIR) has finished conducting "whole-genome sequence" of a 1,008 Indians as part of a programme called "IndiGen".

IndiGen Project:

- Programme funded by the Department of Biotechnology will sequence at least 10,000 Indian genomes. The CSIR's "IndiGen" project, as it is called, selected the 1,000-odd from a pool of about 5,000 and sought to include representatives from every State and diverse ethnicities. Every person whose genomes are sequenced would be given a report.
- The project is and is also seen as a precursor to a much larger exercise involving other government departments to map a larger swathe of the population in the country.
- Anyone looking for a free mapping of their entire genome can sign up for "IndiGen".
- Those who get their genes mapped will get a card and access to an app which will allow them and doctors to access information on whether they harbour gene variants that are reliably known to correlate with genomes with diseases.
- The driving motive of the project is to understand the extent of genetic variation in Indians and learn why some genes — linked to certain diseases based on publications in international literature — do not always translate into diseases.
- Once such knowledge is established, the CSIR expects to tie up with several pathology laboratories who can offer commercial gene testing services.

Genome:

- A genome is the DNA, or sequence of genes, in a cell.
- Most of the DNA is in the nucleus and intricately coiled into a structure called the chromosome. The rest is in the mitochondria, the cell's powerhouse.
- Every human cell contains a pair of chromosomes, each of which has three billion base pairs or one of four molecules that pair in precise ways.
- The order of base pairs and varying lengths of these sequences constitute the "genes", which are responsible for making amino acids, proteins and, thereby, everything that is necessary for the body to function. It is when these genes are altered or mutated that proteins sometimes do not function as intended, leading to disease.

Genome Sequencing:

- Sequencing a genome means deciphering the exact order of base pairs in an individual. This "deciphering" or reading of the genome is what sequencing is all about.
- It has been known that the portion of the genes responsible for making proteins — called the exome — occupies about 1% of the actual gene. Rather than sequence the whole gene, many geneticists rely on "exome maps" (that is the order of exomes necessary to make proteins).
- However, it has been established that the non-exome portions also affect the functioning of the genes and that, ideally, to know which genes of a person's DNA are "mutated" the genome has to be mapped in its entirety.

India's Effort:

- While India, led by the CSIR, first sequenced an Indian genome in 2009, it is only now that the organisation's laboratories have been able to scale up whole-genome sequencing and offer them to the public.
- Globally, many countries have undertaken genome sequencing of a sample of their citizens to determine unique genetic traits, susceptibility (and resilience) to disease. This is the first time that such a large sample of Indians will be recruited for a detailed study.
- Under "IndiGen", the CSIR drafted about 1,000 youth from across India by organising camps in several colleges and educating attendees on genomics and the role of genes in disease. Some students and participants donated blood samples from where their DNA sequences were collected.