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Awareness about Chromosomal Theory of Inheritance among Allied Health Science Students

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Introduction: Chromosomal theory of inheritance is about the relationship between chromosomes and genes.Geneswere unrecognized until late 1900 and then Walter Sutton and Theodore Boveri created the chromosomal theory of inheritance based on Mendelian principles. They argued thatthe pairing and separation of a pair of chromosomes would lead to the segregation of pairs of factors (genes) they carried. Aim: This survey was conducted for assessing awareness about the chromosomal theory of inheritance among allied health science students. Materials and methods: This cross-sectional research on the chromosomal theory of inheritance was conducted with a self-administered questionnaire containing ten questions distributed amongst 100 Allied Health science students. The questionnaire assessed the awareness about the chromosomal theory of inheritance and the disorders followed by it, who did the experiments to prove the theory, and the connection between chromosome and gene. The responses were recorded and analyzed. There were no incomplete responses and no dropouts from the study. The final data obtained was organized, tabulated, and subjected to statistical analysis. Result: 82% of the respondents were aware about chromosomal theory of inheritance.83.7% of the respondents were aware about the connection between gene and chromosome.60% of the respondents were aware about Walter Sutton, Theodore Boveri, and their experiment.76% of the respondents were aware about the consequences of genetically inherited diseases.62% of the respondents were aware know about thomas Hunt Morgan and his experiment. Conclusion: There is moderate awareness among allied health students about the chromosomal theory of inheritance. Enhanced awareness initiatives and allied health sciences educational programs together with increased importance for curriculum improvements that will further help to promote knowledge and awareness of the chromosomal theory of inheritance among

the students.

Keywords: chromosomal theory of inheritance, awareness, allied health students.

1. Introduction

Chromosomal theory of inheritance talks about the relationship between chromosomes and genes.chromosomal theory was backed off as chromosomes, genes were unrecognized until late 1900. Then Walter Sutton and Theodore Boveri created the chromosomal theory of inheritance based on Mendelian principles thatthe pairing and separation of a pair of chromosomes would lead to the segregation of pairs of factors (genes) they carried.[1,2]

In this type of inheritance, one set is received from a female parent (maternal) and the other from a male parent (paternal).These two chromosomes constitute the homologous pair.Chromosomes retain their structural uniqueness and individuality throughout the lifecycle of an organism.[3]

A normal person has 23 pairs of chromosomes, an increase or decrease in this number will cause chromosomal abnormalities. Examples of chromosomal abnormalities are Down syndrome, Turner syndrome (abnormal chromosome number disorders), cystic fibrosis, Huntington's disease (inherited chromosomal disease.[4]

Awareness of the chromosomal theory of inheritance will give us a basic idea of how the disorders originated. Most of the diseases cannot be treated but awareness of it will give in-depth knowledge about the people affected by chromosomal disorders.This study is aimed to assess the awareness about the chromosomal theory of inheritance among allied health science students.

2. Material and methods:

This cross-sectional research on the chromosomal theory of inheritance was conducted with a self-administered questionnaire containing ten questions distributed among 100 allied health science students. The students were randomly selected across various disciplines of allied health sciences. The study setting was designated on the university campus. The survey instrument was a questionnaire pre-tested and evaluated for validity and reliability concerns.

The questionnaire included ten questions eliciting the demographic data through open-ended responses and multiple-choice questions for the other responses. The study was approved by the institutional ethical committee and informed consent was obtained from the participants. The questionnaire was posted on an online platform and the identity of the respondents was kept confidential.

The questionnaire assessed the awareness about the chromosomal theory of inheritance and the disorders followed by it, who did the experiments to prove the theory and connection between chromosome and gene. The responses were recorded and analyzed. There were no incomplete responses and no dropouts from the study. The final data obtained was organized, tabulated, and subjected to statistical analysis.

The salient questions in the study are:

1. Do you know about the chromosomal theory of inheritance?
2. Do you know about the connection between chromosomes and genes?
3. Do you know about Walter Sutton, Theodore Boveri, and their experiment?
4. Do you know about the consequences of genetically inherited diseases?
5. Do you know about Thomas Hunt Morgan and his experiment?

3. Result:

82% of the respondents were aware about chromosomal theory of inheritance (fig.1).84% of the respondents were aware about the connection between gene and chromosome (fig.2).60% of the respondents were aware about Walter Sutton, Theodore Boveri, and their experiment (fig.3).76% of the respondents were aware about the consequences of genetically inherited diseases(fig.4).62% of the respondents were aware know about Thomas Hunt Morgan and his experiment (fig.5).

Fig.1: Represents awareness on chromosomal theory of inheritance- basic definition.

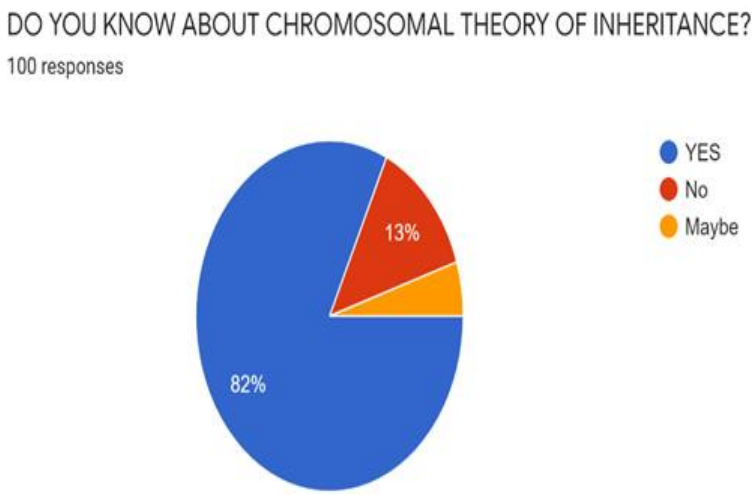


Fig.2 represents awareness on the connection between chromosome and gene.

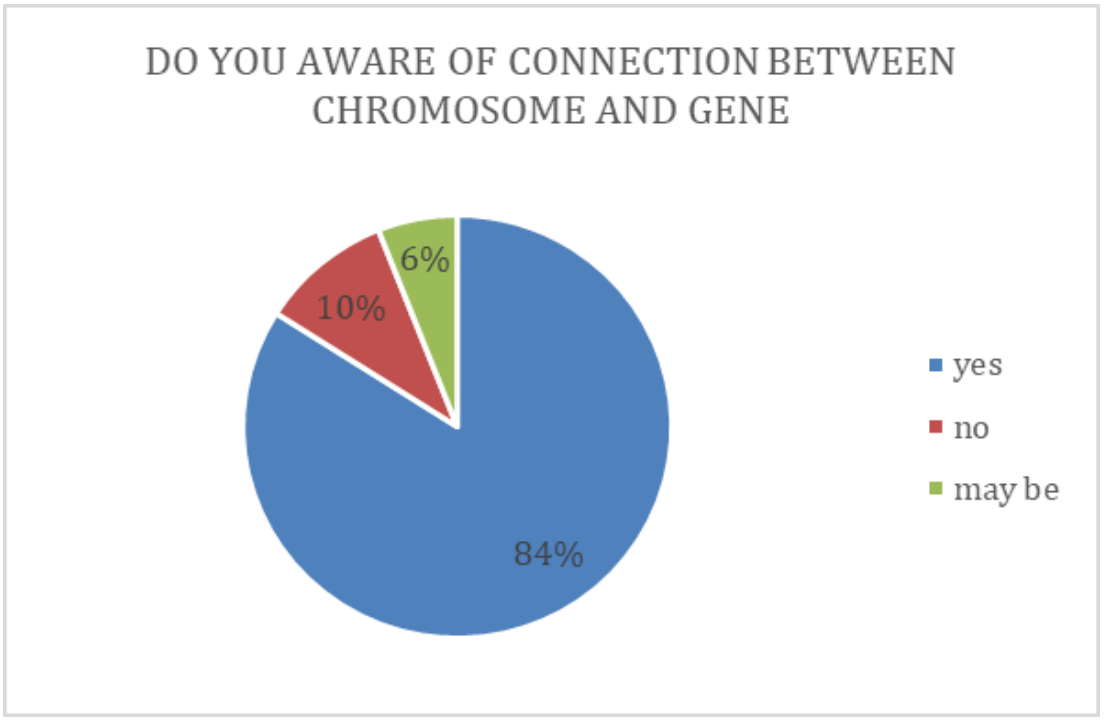


Fig.3: represents awareness on the waltersutton and theodoreboveri experiment.

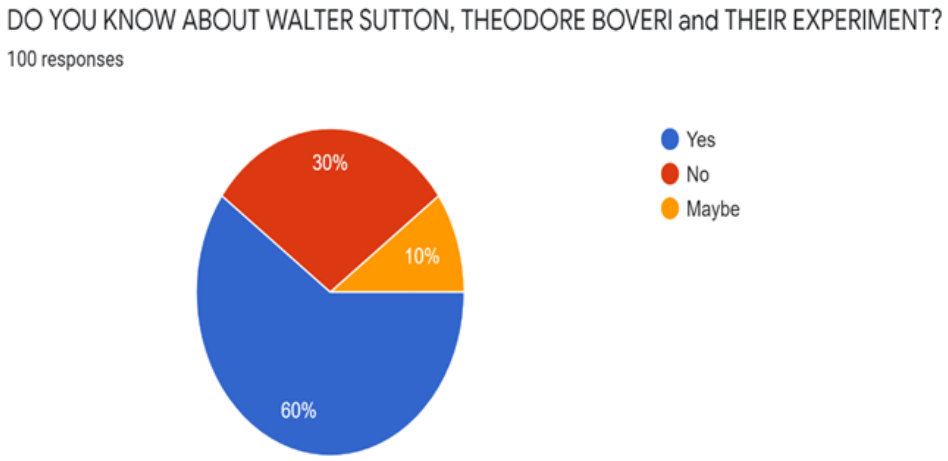


Fig.4: represents awareness of consequences on chromosomal inherited disease

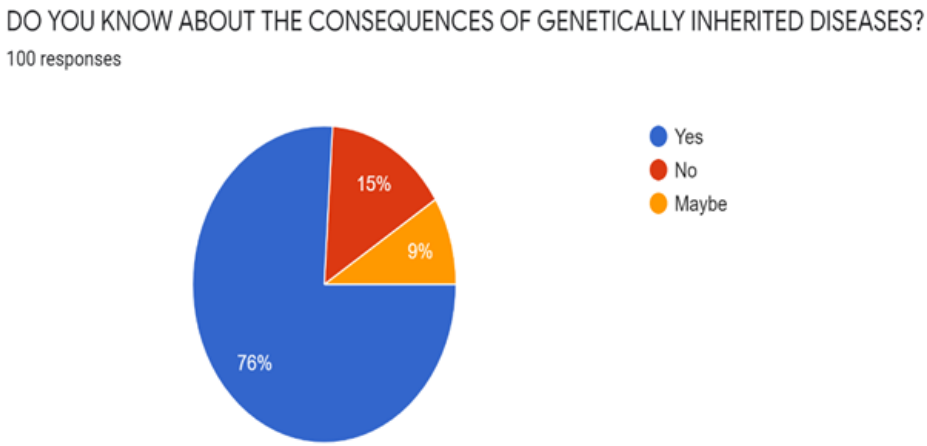
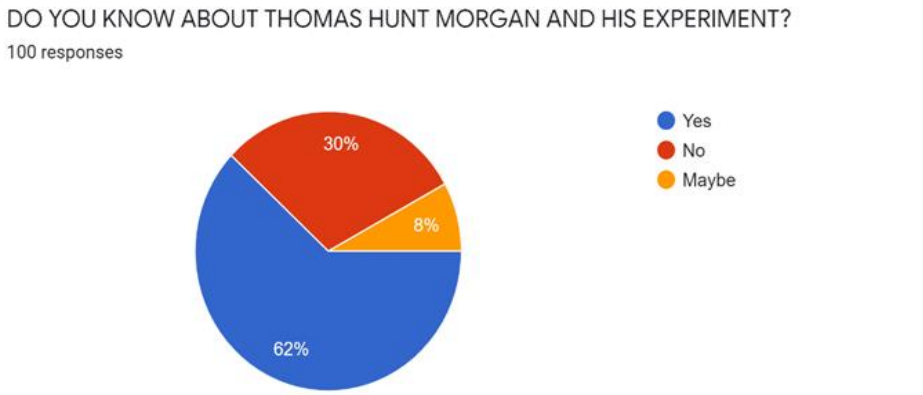


Fig.5: represents awareness on thomas hunt morgan experiment



4. Discussion:

Chromosomes are structures present in the nucleus of the cell that carries DNA. Genes are the hereditary unit made up of DNA, that occupies special locations on chromosomes. They both are paired, responsible for characters to pass on to the next generation. The chromosomal theory of inheritance basically studies the connection between chromosomes and genes. It states that the pairing and separation of a pair of chromosomes would lead to the segregation of pairs of factors(genes) they carried.[1] In this study, about 82% of the respondents were aware about chromosomal theory of inheritance.

In 1902 and 1903, Sutton and Boveri published independent papers proposing what we now call the chromosome theory of inheritance. This theory states that individual genes are found at specific locations on particular chromosomes and that the behavior of chromosomes during meiosis can explain why genes are inherited according to Mendel's laws.[2,3] In this study, about 60% of the respondents were aware about Walter Sutton, Theodore Boveri, and their experiment

Both genes and chromosomes, one member of the pair comes from the mother and one from the father.Genes are segments of DNA whereas chromosomes are structures within cells that contain persons gene.[4] In this study, about 84% of the respondents were aware about the connection between genes and chromosomes.

Chromosomal abnormalities are Down syndrome, Turner syndrome (abnormal chromosome number disorders), cystic fibrosis, Huntington's disease (inherited chromosomal disease. In this study, about 76% of the respondents were aware about the consequences of genetically inherited diseases.

Thomas Hunt Morgan and his students studied the genetics of fruit flies and found a mutation in a gene affecting fly eye color. This mutation made a fly's eyes white, rather than their normal red.[5] In this study, about 62% of the respondents were aware of Thomas Hunt Morgan and his experiment.

In the context of oral diseases, theChromosomal Theory of Inheritance is crucial for understanding the genetic basis of various conditions affecting the oral cavity. Many oral diseases, including certain types of cancers, congenital malformations, and syndromes with oral manifestations, can be traced to genetic mutations or chromosomal abnormalities.[6-10] For instance, chromosomal alterations like deletions, amplifications, and translocations are common in oral cancers such as squamous cell carcinoma, where they can activate oncogenes or inactivate tumor suppressor genes, leading to uncontrolled cell growth in the oral cavity. Additionally, several genetic syndromes with oral manifestations, such as Down syndrome ,certain forms of oral cancer cancers are directly linked to chromosomal abnormalities, presenting distinct oral features like macroglossia, delayed tooth eruption, and periodontal disease. Congenital malformations such as cleft lip and palate also have a genetic component tied to chromosomal mutations or deletions, aiding in early diagnosis and treatment planning. While environmental factors primarily influence periodontal diseases, genetic predisposition also plays a role, with certain chromosomal regions contributing to susceptibility, particularly in aggressive forms of periodontitis. Therefore, the Chromosomal Theory of Inheritance provides a framework for understanding the genetic basis of oral diseases, facilitating the development of genetic screening tools, targeted therapies, and personalized treatment plans.

5. Conclusion:

There is adequate awareness among allied health students about the chromosomal theory of inheritance. Enhanced awareness initiatives and allied health sciences educational programs together with increased importance for curriculum improvements that will further help to promote knowledge and awareness of the chromosomal theory of inheritance among the students.

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