

## Assessment of knowledge, attitude and awareness towards genetic disorders among healthcare professional students: A cross-sectional study

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### KEYWORDS

Genetic Diseases, Medical Students, Knowledge, Awareness, Attitude, Genetics Education, India

### ABSTRACT

India does not have a separate national program for public health aimed at screening newborns for genetic disorders. In present-day developing countries like India, the consideration of treatment through genetics is out of the question due to the unavailability of resources for such complicated treatments; the best approach that can be adopted is prevention. This study aims to surveying the current state of knowledge, awareness, and attitude of medical students towards genetic diseases, pointing out the advantages and disadvantages of the existing educational approach, and suggesting corrections. The study encompassed 402 individuals, consisting of undergraduate students and interns. A Google Forms survey was disseminated to assess knowledge, awareness, and attitudes about genetic illnesses and testing. The results indicated a significant variation in knowledge and attitudes between male and female students and highlighted the need for improved genetics education.

### 1. Introduction

The 21st century has seen major advancements in genetics, enhancing the diagnosis and management of genetic disorders, including rare and common conditions like cancer and neurological disorders [1, 2]. Despite these advancements, integrating genomic medicine into clinical practice remains challenging, especially in developing countries like India, where resources and awareness are limited [3-5]. India faces a significant burden of genetic disorders due to its large, diverse population, high birth rates, and cultural practices such as consanguineous marriages [6-8]. The absence of a national newborn screening program for genetic disorders further exacerbates this burden [8]. Preventive measures, including health awareness campaigns, genetic testing, marriage counselling, and antenatal screening, are essential in managing this challenge [9-11].

Medical education plays a crucial role in these preventive efforts [12,13]. To effectively address genetic disorders, future healthcare professionals must be well-trained in genetics [14]. However, medical schools in developing countries often have inadequate genetics curricula, leading to gaps in knowledge and preparedness among students [1, 16]. Effective integration of genomics into clinical practice requires not only technical skills but also a strong understanding of genetics among healthcare professionals [17]. Genetic literacy supports accurate diagnosis, management, and public health initiatives aimed at reducing the impact of genetic diseases [18]. Educated healthcare providers can offer valuable genetic counselling and contribute to early detection and prevention [19].

In India, where resources for genetic testing and treatment are limited, prevention through education is key [20]. This study assesses the knowledge, awareness, and attitudes of medical students at Saveetha Institute of Medical and Technical Sciences in Chennai [21]. By identifying educational gaps, the study aims to inform strategies to enhance genetics education and improve public health outcomes. The survey of 402 medical students will provide insights into the effectiveness of current genetics education and highlight areas for improvement.

### 2. Methodology

#### Study Design and Population

This cross-sectional study was conducted at the Saveetha Institute of Medical and Technical Sciences in Chennai, India. The study population comprised undergraduate medical students and interns, totalling 402 participants. Inclusion criteria included students currently enrolled in the medical program who consented to participate in the study. This broad inclusion criterion ensured a diverse and representative sample of the medical student population, allowing for comprehensive analysis across different demographics.

#### Data Collection Tools

Data were collected using a Google Forms survey designed to assess knowledge, awareness, and attitudes toward genetic diseases. The questionnaire, derived from previous research, included sections on socio-demographic traits, knowledge of genetic illnesses and testing, and attitudes towards genetic diseases and genetic testing. This comprehensive approach ensured that all relevant aspects of the students' knowledge and attitudes were captured.

### Questionnaire Design and Validation

The questionnaire was divided into three sections: socio-demographic information, knowledge of genetic illnesses and testing, and attitudes towards genetic illnesses and genetic testing. Knowledge scores ranged from 0 to 6, with higher scores indicating better knowledge. Attitude scores were measured on a scale of 1 to 20, with higher scores indicating a more positive attitude. The questionnaire was validated through a pilot test, ensuring its reliability and effectiveness in capturing the necessary data. The questionnaire's reliability was validated by computing Cronbach's alpha for both the knowledge and attitude sections.

### Scoring and Data Management

Knowledge and attitude scores were calculated and managed using SPSS software. Descriptive statistics summarized demographic characteristics and scores, providing a clear overview of the data. Independent t-tests and ANOVA were used to compare scores across different groups, with P-values < 0.05 considered statistically significant. This rigorous statistical analysis ensured that the findings were robust and reliable.

### Statistical Analysis

Statistical analysis revealed significant associations between demographic variables, such as gender and year of study, and knowledge and attitude scores. These associations suggest the need for targeted educational interventions to address these disparities and enhance genetics education among medical students. This in-depth analysis provided valuable insights into the specific areas where improvements in education are needed.

### Ethical Considerations

Informed consent was obtained from all participants, and confidentiality was maintained throughout the study. These ethical considerations ensured that the study was conducted responsibly and with respect for the participants' rights and privacy.

### 3. Results

This study assessed the knowledge, awareness, and attitudes of 402 medical students regarding genetic disorders. Table 1 reveals that 67.7% of participants were female (n=272) and 32.3% male (n=130). The largest group was third-year students (46.5%, n=187), followed by first-year students (28.6%, n=115). Second-year and fourth-year students each made up 10.9% (n=44), with interns being the smallest group (3.0%, n=12). Regarding family history, 12.2% (n=49) had relatives with genetic conditions, while 87.8% (n=353) did not.

Table 2 provides measures for knowledge, awareness, and attitudes. Knowledge scores ranged from 0 to 6, with a mean of 4.731 and a standard deviation of 1.163. The 25th percentile was 4, the median was 5, and the 75th percentile was 5, indicating high and consistent knowledge. Awareness scores, ranging from 0 to 30, had a mean of 24.355 and a standard deviation of 4.323, with a broader range (IQR = 7). Attitude scores ranged from 0 to 20, with a mean of 16.768 and a standard deviation of 3.642, showing generally positive attitudes with some variability.

Table 3 summarizes awareness of genetic disorders' impacts. The statement "Genetic disorders are a major cause of infant mortality" scored a mean of 3.74 (SD = 1.862), indicating low variability (IQR = 0.45). "Genetic diseases can affect any person" had a mean score of 3.59 (SD = 1.914, IQR = 4), while "Numerous genetic diseases have curative therapy" scored 2.85 (SD = 1.997, IQR = 4). The highest mean score was for "Basic medical genetics knowledge should be compulsory in primary and secondary education" (4.58, SD = 1.225). Table 4 shows attitudes towards genetic disorders. Strong consensus was observed on the importance of prevention (mean = 4.32, SD = 1.501, IQR = 0) and the lack of social awareness (mean = 4.42, SD = 1.407, IQR = 0). Opinions were more varied on the eradication of genetic disorders (mean = 3.42, SD = 1.958, IQR = 4).

Table 5 explores demographic variables and knowledge. Male students had a higher mean knowledge score (4.853, SD = 0.915) compared to female students (4.672, SD = 1.262), with a significant difference (P = 0.001). Knowledge increased with academic progression, with interns scoring the highest (5.583, SD = 0.792) and first-year students scoring the lowest (4.417, SD = 1.084) (P = 0.001). Family history did not significantly impact knowledge (P = 0.371). Table 6 shows no significant differences in awareness by gender (P = 0.396) or academic year (P = 0.983). Family history had a minor impact (P = 0.241). Table 7 indicates that male students had a significantly higher mean attitude score (17.407, SD = 3.183) compared to female students (16.463, SD = 3.810) (P = 0.015). Attitudes did not vary significantly by academic year (P = 0.996) or family history (P = 0.513).

### 4. Discussion

Research undertaken at a tertiary care teaching hospital in Chennai revealed that female students represented a higher percentage (67.7%) compared to male students (32.3%). The distribution across academic years showed a concentration in the third year (46.5%), with smaller proportions in the first year (28.6%), second year (10.9%), fourth year (10.9%), and among interns (3.0%). The level of knowledge about genetic diseases among students was generally high, with a mean score of 4.731. Notably, male students had a higher mean knowledge score (4.853) compared to female students (4.672), a statistically significant difference (p = 0.001). This disparity may be influenced by factors such as personality traits, socioeconomic status, and early education [22, 23].

First and second-year students displayed an average understanding of medical genetics, suggesting that they are inadequately prepared to handle genetic issues in clinical practice. This knowledge gap could mean that senior students

may not possess sufficient genetic knowledge, aligning with findings from similar international studies [24]. As genetic factors are increasingly recognized in diseases previously attributed to environmental or lifestyle causes [25], future healthcare professionals need to be well-versed in medical genetics. The study underscores the need to enhance genetics education in medical schools by implementing a more comprehensive curriculum [26].

Regarding perceptions of genetic disorders, students favoured prevention as the best approach and supported pre-conception and post-marriage counselling to reduce genetic diseases, particularly among individuals from lower socioeconomic backgrounds. However, opinions on the eradication of genetic disorders and the associated social concerns were less clear [27, 28]. Many students also lacked a definitive view on whether genetic disorders have been cured, raising concerns about their knowledge of treatment options, which is crucial for patient care [29, 30]. To ensure adequate and evidence-based patient care, improving medical students' knowledge about genetic diseases and their treatments is imperative [31-33].

## 5. Conclusion

This study highlights significant gaps in knowledge, awareness, and attitudes towards genetic diseases among medical students in India. It underscores the need for enhanced genetics education and targeted interventions to improve genetic literacy and counselling skills. Collaboration among academic institutions, research organizations, and healthcare providers is crucial to address these gaps and improve health outcomes for those affected by genetic disorders. Integrating comprehensive genetics education into medical curricula is essential for preparing future healthcare professionals to manage genetic disorders effectively and contribute to public health initiatives, ultimately improving patient care.

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## Declaration of Conflicting Interests

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**Table 1.** Demographic Profile of Medical Students (n = 402)

Variables	Frequency (n)	Percentage (%)
<b>Gender</b>		
Male	130	32.3
Female	272	67.7
<b>Academic Year</b>		
First Year	115	28.6
Second Year	44	10.9
Third Year	187	46.5
Fourth Year	44	10.9
Interns	12	3.0
<b>Family members suffering from genetic disease</b>		
Yes	49	12.2
No	353	87.8

**Table 2.** Descriptive Statistics for Medical Students Knowledge, Awareness, and Attitudes Toward Genetics

Variables	Max	Mean	SD	25 <sup>th</sup> Percentile	Median	75 <sup>th</sup> Percentile	IQR
knowledge	6	4.731	1.163	4	5	5	1
Awareness	30	24.355	4.323	21	25	28	7
Attitude	20	16.768	3.642	14	18	20	6

**Table 3.** Summary of Medical Students' Understanding of the Epidemiological and Social Effects of Genetic Disorders

Questions	Mean	SD	25 <sup>th</sup> percentile	Median	75 <sup>th</sup> percentile	IQR
Genetic disorders are a major cause of infant mortality.	3.74	1.862	3.85	4	4	0.45
Genetic diseases can affect any person	3.59	1.914	1	5	5	4
Numerous genetic diseases have curative therapy.	2.85	1.997	1	1	5	4
Social stigma is a factor when someone hides having a genetic disease.	3.83	1.824	1	5	5	4
Basic medical genetics knowledge should be made compulsory in primary and secondary education to enhance social awareness.	4.58	1.225	5	5	5	0
Parents are to be held accountable for getting a child with a genetic disease without a family history	3.20	1.993	1	5	5	4

**Table 4.** Statistical Summary of Medical Students' Perspectives on Genetic Disorder Prevalence and Management

Questions	Mean	SD	25 <sup>th</sup> percentile	Median	75 <sup>th</sup> percentile	IQR
Prevention is the best management for genetic disorders in our society.	4.32	1.501	5	5	5	0
Common genetic disorders can be eradicated from society.	3.42	1.958	1	5	5	4
There is a lack of social awareness of genetic disorders.	4.42	1.407	5	5	5	0
Post-marriage and pre-conception counselling provide a better way to prevent common genetic diseases in lower socioeconomic families	4.24	1.568	5	5	5	0

**Table 5.** Correlation Between Demographic Characteristics and Understanding of Genetic Disorders

Variables	Knowledge score Mean (SD)	Mean difference (95% CI)	P-value
<b>Gender</b>			
Male	4.853 (0.915)	0.181 (-0.625, 0.424)	<b>0.001*</b>
Female	4.672 (1.262)		
<b>Academic Year</b>			
First Year	4.417 (1.084)		<b>0.001*</b>
Second Year	5.136 (1.357)		
Third Year	4.786 (1.148)		
Fourth Year	4.681 (1.073)		
Interns	5.583 (0.792)		
<b>Family members suffering from genetic disease</b>			
Yes	4.591 (1.383)	-0.158 (-0.507, 0.189)	0.371
No	4.750 (1.130)		

\*Significant value < 0.05; Independent t-test; ANOVA

**Table 6.** Impact of Demographic Characteristics on Awareness of Genetic Disorders

Variables	Awareness score Mean (SD)	Mean difference (95% CI)	P-value
<b>Gender</b>			
Male	24.615 (4.277)	0.3837 (-0.503, 1.271)	0.396
Female	24.231 (4.213)		
<b>Academic Year</b>			
First Year	24.443 (4.247)		0.983
Second Year	24.500(3.938)		
Third Year	24.246 (4.332)		
Fourth Year	24.545 (3.938)		
Interns	24.000 (5.187)		
<b>Family members suffering from genetic disease</b>			
Yes	25.080 (4.437)	0.759 (-0.511, 2.024)	0.241
No	24.263 (4.201)		

\*Significant value < 0.05; Independent t-test; ANOVA

**Table 7.** Effect of DemographicCharacteristicson Perspectives Regarding Genetic Disorders

Variables	Attitude score Mean (SD)	Mean difference (95% CI)	P-value
<b>Gender</b>			
Male	17.407 (3.183)	0.944 (0.185, 1.703)	<b>0.015*</b>
Female	16.463 (3.810)		
<b>Academic Year</b>			
First Year	16.791 (3.968)		0.996
Second Year	16.795 (3.386)		
Third Year	16.764 (3.624)		
Fourth Year	16.818 (3.377)		
Interns	16.333 (2.964)		
<b>Family members suffering from genetic disease</b>			
Yes	16.449 (3.668)	-0.364 (-1.456, 0.728)	0.513
No	16.813 (3.642)		

\*Significant value < 0.05; Independent t-test; ANOVA