



Knowledge and Attitude Toward Genetic Testing and Genetic Counselling Among General Population

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ABSTRACT

Background: Genetic testing can identify inherited variants associated with hereditary cancer susceptibility, while genetic counselling supports informed decision-making and interpretation of results. Public knowledge and attitudes may influence acceptance and appropriate use of these services. Objectives: To assess knowledge and attitudes toward genetic testing and genetic counselling among the general population and examine their association with selected sociodemographic factors and family history of cancer. Methods: A cross-sectional questionnaire-based survey was analysed using 132 complete responses from the supplied dataset. Knowledge was assessed using 15 three-option items scored 1 for a correct response and 0 for an incorrect or 'Don't know' response. Attitudes were assessed using ten five-point Likert items; negatively worded items concerning cost, privacy and anxiety were reverse-scored for an exploratory total attitude index. Descriptive statistics and non-parametric tests were used. Results: Participants had a mean age of 36.66 ± 11.80 years (range 18–58); 71 (53.8%) were female and 61 (46.2%) male. The mean knowledge score was 7.61 ± 2.86 out of 15 (50.7% of the maximum), while the mean attitude score was 33.98 ± 3.26 out of 50. Knowledge and attitude scores showed a positive correlation (Spearman $\rho=0.300$, $p<0.001$). Knowledge was not significantly associated with sex, educational status or family history in this sample, although knowledge decreased modestly with increasing age ($\rho=-0.179$, $p=0.040$). Attitude score was also negatively correlated with age ($\rho=-0.290$, $p<0.001$). Conclusion: The survey demonstrates moderate knowledge with generally favourable responses toward genetic testing and counselling, alongside substantial uncertainty about several core concepts. The findings support the need for accessible genetic-literacy education and counselling pathways. Larger, probability-based studies using a formally validated instrument are needed to confirm these findings. Keywords: Genetic testing; genetic counselling; cancer genetics; hereditary cancer.

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I. INTRODUCTION

Genetic information has become increasingly relevant to cancer prevention, early detection, risk assessment and family-based health planning. A subset of cancers arises from inherited pathogenic variants, and identifying hereditary risk can affect not only an individual but also biological relatives. Genetic testing, however, is not a diagnosis of cancer and is not indicated for everyone; appropriate testing depends on personal and family history, clinical characteristics and the expected clinical utility of the result.¹ Testing may use samples such as blood or saliva, and results may be positive, negative or uncertain. A positive result indicates increased susceptibility rather than certainty of cancer, while a negative result does not eliminate all risk.

Misconceptions may therefore lead to inappropriate reassurance or unnecessary anxiety.¹ Genetic counselling is central to the testing pathway: it explains why testing is considered, its benefits and limitations, and its privacy and family implications, and helps individuals interpret results and plan follow-up. Blanchette et al. found that among patients with advanced cancer, only 48% felt they had sufficient knowledge to make an informed decision about genomic testing, while 34% reported a need for formal genetic counselling.² Knowledge and attitudes are not uniform across populations. A study of 961 adults in the United States reported generally favourable attitudes toward genetic testing for cancer risk, with greater knowledge linked to more positive attitudes.³ A systematic review of ethnic minority populations found low awareness and concerns about emotional consequences, confidentiality, stigma and discrimination,⁴ and work among average-risk populations has shown limited knowledge despite favourable attitudes.⁵ The Indian context warrants specific investigation because access to testing and counselling is developing amid variation in awareness, affordability and availability of trained professionals. A study at Tata Memorial Centre, Mumbai, identified cost and limited genetic literacy as barriers among cancer patients and caregivers.⁶ The present study therefore evaluated knowledge and attitudes toward genetic testing and genetic counselling among the general population and explored their relationships with age, sex, educational status and family history of cancer.

II. OBJECTIVES

1. To assess the level of knowledge regarding genetic testing and genetic counselling among adults from the general population.
2. To assess attitudes and willingness of adults from the general population toward genetic testing and genetic counselling.
3. To determine the association between knowledge and attitudes regarding genetic testing and genetic counselling and selected sociodemographic factors such as age, sex, educational status, and family history of cancer.

III. MATERIALS AND METHODS

Study design and setting: This was a descriptive cross-sectional (single time-point), questionnaire-based observational study. A cross-sectional study collects data from participants at a single point in time to describe knowledge and attitudes and examine associations between variables. The responses were collected from 1st of August 2026 to 1st of October 2026. **Study technique:** The study used a structured, self-administered questionnaire survey as its data-collection technique. A standardised set of 30 closed-ended items (demographic and family-history variables, 15 knowledge items with Yes/No/Don't know options, and 10 attitude items on a five-point Likert scale) was presented in the same form to every respondent, which allowed responses to be scored numerically and analysed quantitatively. Responses appear to have been collected through an online form (the form-generated email addresses were not used in the analysis), and participants were enrolled by a non-probability (convenience) approach rather than random sampling. The resulting dataset of complete responses was then analysed using descriptive statistics and non-parametric tests (Spearman rank correlation, Mann–Whitney U and Kruskal–Wallis tests) to describe knowledge and attitude levels and to test their associations with age, sex, educational status and family history of cancer. **Participants:** The dataset contained 132 complete analyzable responses. Recorded ages ranged from 18 to 58 years. The dataset contained responses from both male and female participants; no 'Other' response was recorded. Educational categories represented were secondary education, higher secondary education, graduate and postgraduate. **Inclusion criteria:** Adults aged 18 years and above from the general population, of either sex and any educational level, who gave consent to participate and completed all items of the questionnaire. **Exclusion criteria:** Respondents aged below 18 years, those who did not give consent, and those with incomplete or missing responses to the questionnaire items were excluded from the analysis. **Sample size calculation:** The sample size was calculated for a single-proportion (prevalence) estimate in a cross-sectional survey using the standard formula for prevalence studies (Cochran's formula),^{12,13} as given below: $n = Z^2 \times p \times (1 - p) / d^2$ where n = minimum required sample size; Z = standard normal deviate corresponding to the 95% confidence level (1.96); p = expected proportion (prevalence) in the population; and d = absolute precision (margin of error). Source of the p value: An expected proportion of $p = 0.50$ (50%) was assumed, as is conventionally done when no prior estimate of prevalence is available, because $p = 0.50$ gives the maximum variability ($p \times (1 - p) = 0.25$) and therefore the largest, most conservative sample size.^{12,13} The absolute precision was set at $d = 0.10$ (10%) and the confidence level at 95%. Calculation: $n = (1.96)^2 \times 0.50 \times (1 - 0.50) / (0.10)^2 = 3.8416 \times 0.25 / 0.01 = 96.04$, rounded up to 97. Allowing for 10% non-response, the adjusted sample size was $n_{adj} = n / (1 - 0.10) = 97 / 0.90 = 107.8$, i.e. approximately 108. The present dataset contains 132 completed responses and therefore exceeds that single-proportion target. This calculation does not establish adequate power for every association in Objective 3; association-specific sample-size calculations may require larger samples. **3 Questionnaire:** The questionnaire contained 30 substantive items. Section A recorded age, sex, educational status, cancer-related knowledge/family-history variables; Section B

contained 15 knowledge items; and Section C contained 10 attitude items using a five-point Likert response. Email addresses generated by the form were not used in the analysis. Knowledge scoring: Knowledge items 6–20 were scored 1 for the prespecified correct response and 0 for an incorrect or 'Don't know' response, giving a maximum score of 15. Correct responses were: Q6–15 Yes; Q16 No; Q17–19 Yes; Q20 No. Attitude scoring: Items 21–30 were scored from 5 (strongly agree) to 1 (strongly disagree). Items 25–27 were negatively worded and were reverse-scored when calculating the exploratory total attitude index. The maximum possible score was 50. Because the attitude items cover different constructs, including willingness, perceived usefulness, cost, privacy and anxiety, the total should be interpreted as an exploratory index rather than a validated psychometric scale. Statistical analysis: Continuous variables were summarized using mean, standard deviation, median and range as appropriate; categorical variables were summarized as frequencies and percentages. Spearman rank correlation was used for relationships involving age and between knowledge and attitude scores. Mann–Whitney U testing was used for two-group comparisons and Kruskal–Wallis testing for comparisons across more than two groups. Two-sided $p < 0.05$ was considered statistically significant. Analyses were performed on the 132 complete responses.

IV. RESULTS

Participant characteristics: The mean age was 36.66 ± 11.80 years, with a median of 35.5 years and range of 18–58 years. There were 71 females (53.8%) and 61 males (46.2%). Thirty-eight participants (28.8%) reported a family history of cancer, 55 (41.7%) reported no family history, and 39 (29.5%) were unsure. Educational status included 33 (25.0%) with secondary education, 27 (20.5%) with higher secondary education, 38 (28.8%) graduates and 34 (25.8%) postgraduates.

Table 1. Participant characteristics

Variable	Category	n (%)
Sex	Female	71 (53.8)
Sex	Male	61 (46.2)
Education	Secondary	33 (25.0)
Education	Higher secondary	27 (20.5)
Education	Graduate	38 (28.8)
Education	Postgraduate	34 (25.8)
Family history	Yes	38 (28.8)
Family history	No	55 (41.7)
Family history	Don't know	39 (29.5)

Variable Category n (%) Sex Female 71 (53.8) Sex Male 61 (46.2) Education Secondary 33 (25.0) Education Higher secondary 27 (20.5) Education Graduate 38 (28.8) Education Postgraduate 34 (25.8) Family history Yes 38 (28.8) Family history No 55 (41.7) Family history Don't know 39 (29.5) Knowledge: The mean knowledge score was 7.61 ± 2.86 out of 15 (50.7% of the maximum possible score; 95% CI for the mean, 7.11–8.10). The median was 7, with observed scores ranging from 2 to 15. Awareness of genetic testing and genetic counselling was reported by 40.9% and 42.4% respectively. Correct responses were most frequent for the concept that some cancers can occur because of inherited genetic changes (64.4%) and that genetic testing can provide information relevant to biological relatives (62.9%). The least frequently correct concepts were that a positive genetic test does not always mean definite future cancer (29.5%) and that not every cancer patient requires genetic testing (31.8%).

Table 2. Knowledge item responses

Knowledge item	Correct n (%)
Heard of genetic testing	54 (40.9)
Heard of genetic counselling	56 (42.4)
Inherited genetic changes can contribute to cancer	85 (64.4)
Cancer risk can be inherited from parents	72 (54.5)
Testing can identify inherited cancer-associated changes	76 (57.6)
Blood can be used for testing	67 (50.8)
Saliva can be used for testing	73 (55.3)
Results may be relevant to biological relatives	83 (62.9)
Counselling helps understand results	76 (57.6)
Counselling helps decide about testing	75 (56.8)
Not every cancer patient requires testing	42 (31.8)
Testing can be uncertain/inconclusive	60 (45.5)
Counselling can occur before testing	77 (58.3)
Counselling can occur after testing	69 (52.3)
Positive test does not guarantee future cancer	39 (29.5)

Knowledge item Correct n (%) Heard of genetic testing 54 (40.9) Heard of genetic counselling 56 (42.4) Inherited genetic changes can contribute to cancer 85 (64.4) Cancer risk can be inherited from parents 72 (54.5) Testing can identify inherited cancer-associated changes 76 (57.6) Blood can be used for testing 67 (50.8) Saliva can be used for testing 73 (55.3) Results may be relevant to biological relatives 83 (62.9) 4 Knowledge item Correct n (%) Counselling helps understand results 76 (57.6) Counselling helps decide about testing 75 (56.8) Not every cancer patient requires testing 42 (31.8) Testing can be uncertain/inconclusive 60 (45.5) Counselling can occur before testing 77 (58.3) Counselling can occur after testing 69 (52.3) Positive test does not guarantee future cancer 39 (29.5) Attitudes: The mean exploratory attitude score was 33.98 ± 3.26 out of 50 (68.0% of the maximum possible score; 95% CI, 33.42–34.55). Favourable responses (agree or strongly agree) were common across all ten items, ranging from 69.7% to 74.2%. The highest favourable response was willingness to discuss relevant genetic results with family members (74.2%), followed by willingness to undergo testing if recommended by a doctor and belief that knowledge of inherited risk could help health decisions (72.0% each). Approximately 70% agreed that they would consider genetic testing even if it showed increased inherited risk.

Table 3. Attitude item responses

Attitude item	Agree/Strongly agree n (%)
Willing to undergo testing if doctor recommends	95 (72.0)
Would like counselling before testing	93 (70.5)
Willing to discuss results with family	98 (74.2)
Inherited-risk knowledge would help health decisions	95 (72.0)
Concerned about cost	93 (70.5)
Concerned about privacy	92 (69.7)
Would feel anxious if inherited risk found	96 (72.7)
Counselling is useful when hereditary risk suspected	92 (69.7)
Would recommend counselling with strong family history	96 (72.7)
Would consider testing despite increased-risk result	93 (70.5)

Attitude item Agree/Strongly agree n (%) Willing to undergo testing if doctor recommends 95 (72.0) Would like counselling before testing 93 (70.5) Willing to discuss results with family 98 (74.2) Inherited-risk knowledge would help health decisions 95 (72.0) Concerned about cost 93 (70.5) Concerned about privacy 92 (69.7) Would feel anxious if inherited risk found 96 (72.7) Counselling is useful when hereditary risk suspected 92 (69.7) Would recommend counselling with strong family history 96 (72.7) Would consider testing despite increased-risk result 93 (70.5) Associations: Knowledge and attitude scores were positively correlated (Spearman $\rho=0.300$, $p<0.001$), indicating that higher knowledge scores tended to accompany more favourable attitude-index scores. Knowledge score was modestly inversely correlated with age ($\rho=-0.179$, $p=0.040$), while attitude score showed a stronger inverse correlation with age ($\rho=-0.290$, $p<0.001$). No statistically significant difference in knowledge was observed by sex (Mann–Whitney U, $p=0.679$), and no significant difference in attitude score was observed by sex ($p=0.677$). Educational status was not significantly associated with knowledge (Kruskal–Wallis $p=0.986$) or attitude ($p=0.529$). Family history category was not significantly associated with knowledge ($p=0.204$) or attitude ($p=0.467$).

Table 4. Associations between knowledge/attitude scores and selected variables

Comparison	Knowledge p	Attitude p
Sex (Mann–Whitney U)	0.679	0.677
Education (Kruskal–Wallis)	0.986	0.529
Family history (Kruskal–Wallis)	0.204	0.467
Age (Spearman ρ)	$\rho=-0.179$, $p=0.040$	$\rho=-0.290$, $p<0.001$

Comparison Knowledge p Attitude p Sex (Mann–Whitney U) 0.679 0.677 Education (Kruskal–Wallis) 0.986 0.529 Family history (Kruskal–Wallis) 0.204 0.467 Age (Spearman ρ) $\rho=-0.179$, $p=0.040$ $\rho=-0.290$, $p<0.001$

Table 5. Knowledge–attitude correlation

Comparison	Knowledge vs attitude
Knowledge vs attitude	$\rho=0.300$, $p<0.001$

Comparison Knowledge vs attitude Knowledge vs attitude $\rho=0.300$, $p<0.001$ Internal consistency: Cronbach's alpha was approximately 0.60 for the 15-item knowledge set and 0.17 for the ten-item attitude index. The low attitude alpha is consistent with the heterogeneous content of the attitude items and indicates that the ten items should not be treated as a strongly unidimensional validated scale. The attitude findings are therefore best presented both item-by-item and as an exploratory composite. 5

V. DISCUSSION

In this cross-sectional analysis of 132 respondents, factual knowledge was incomplete: the mean knowledge score was 7.61 out of 15, and only 40.9% and 42.4% had heard of genetic testing and genetic counselling respectively. Broad hereditary concepts were better understood (64.4% recognised inherited cancer risk and 62.9% its relevance to biological relatives) than the details of testing and result interpretation. Two misconceptions stood out: only 31.8% knew that not every cancer patient requires testing, and only 29.5% rejected the idea that a positive result always means definite future cancer. Pre-test counselling is designed to address such misunderstandings and may improve knowledge and reduce worry, although the certainty of evidence remains limited.⁷ Attitudes were generally favourable, with about seven in ten respondents answering positively to each item (mean attitude score 33.98 out of 50). This contrast suggests that acceptance of genetic services may exist even without full understanding of indications and uncertainty. Concerns did not translate into rejection: around 70% were concerned about cost and privacy and 72.7% anticipated anxiety if inherited risk were found, yet approximately 70% would still consider testing or counselling. Respondents may therefore need reassurance about confidentiality, affordability and emotional implications, consistent with reviews identifying psychosocial barriers and facilitators of service uptake.⁸ Similar gaps and barriers were reported among Indian cancer patients and caregivers⁶ and patients with advanced cancer.² Higher knowledge was associated with more favourable attitudes, consistent with a large US survey,³ although causality cannot be inferred; the finding supports educational interventions. Knowledge and attitude were not significantly associated with sex, education or family history, but this should be interpreted cautiously as the sample was not probability-based. The inverse relationship with age is exploratory, as the cross-sectional design cannot separate age from cohort effects, access to information or other unmeasured factors.

VI. CONCLUSION

In this sample of 132 respondents, knowledge regarding genetic testing and genetic counselling was incomplete, with a mean knowledge score of 7.61/15, while attitudes were generally favourable across the individual questionnaire items. Knowledge and attitude scores were positively associated, and both showed modest inverse relationships with age; sex, education and family-history categories were not significantly associated with the composite scores. The most prominent knowledge gaps concerned the indication for testing and the probabilistic meaning of a positive

result. These findings support accessible genetic-literacy education, clear counselling pathways and communication that addresses cost, privacy and emotional concerns. Larger and methodologically rigorous studies using validated general-population instruments are needed before these findings can be generalized.

VII. LIMITATIONS

The dataset contains 132 responses and appears to be a convenience/online survey rather than a probability sample; therefore, findings cannot automatically be generalized to the wider Indian population. The questionnaire was not documented as a formally validated instrument. The low Cronbach's alpha for the attitude index reinforces the need for validation and pilot testing before definitive psychometric interpretation. The cross-sectional design permits association but not causal inference. The association analysis was exploratory and was not powered specifically for every subgroup comparison. A larger, preferably multicentre probability-based sample would provide stronger evidence.

ETHICAL CONSIDERATIONS

Ethical approval was obtained from the Institutional Ethics Committee prior to the start of the research. Conflict of Interest: There was no conflict of interest in relation to this study. Funding: This study was fully self-funded.

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