

Age and Education Influencing Willingness in Men to Recommend Breast Cancer Screening: A Comparative Study of University Personnel and Clinical Attendees

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Purpose: Breast cancer is a major global health concern. In some societies, male family members influence women's healthcare decisions, yet their awareness and attitudes toward breast cancer screening remain poorly understood. Our research aimed to analyze awareness, knowledge, and willingness to recommend breast cancer screening among men from two distinct populations, and to examine how age and educational level influence willingness to recommend breast examinations for female family members.

Patients and Methods: This prospective cross-sectional survey study included male academic staff at a university (University Personnel Group, n=105) and male patients visiting a hospital polyclinic with non-breast-related complaints along with their male companions (Clinical Attendee Group, n=100). A 10-item structured questionnaire assessed demographics, knowledge about breast cancer, and attitudes toward mammography screening using statistical analysis.

Results: Both groups demonstrated similar knowledge levels regarding breast cancer frequency in women (~55%), male breast cancer occurrence (~45%), and annual mammography necessity (~52%). The clinical attendee group showed significantly greater willingness to recommend breast examinations compared to the university personnel group (94.0% vs 74.3%, $p<0.001$). In the clinical attendee group, willingness increased with age (88.9% in ages 15–25 to 100% in ages 40+), showing a significant positive trend ($p<0.05$). The university personnel group exhibited peak willingness (87.1%) in the 25–40 age group, with lower rates in other age categories. Educational status strongly influenced willingness in the university personnel group, increasing from 33.3% at high school level to 87.8% at Master's/Ph.D. level, while the clinical attendee group maintained high willingness (91.7–100%) across all education levels.

Conclusion: Our findings show patterns of breast cancer awareness and screening recommendation willingness between clinical attendees and university personnel. While basic knowledge about breast cancer was similar, willingness to recommend screening differed significantly, with age and education having differential impacts between groups.

Keywords: breast cancer screening, male awareness, family support, age, educational status, cross-sectional survey

Introduction

Breast cancer is a major global health concern and an estimated 2.3 million new cases diagnosed annually worldwide.¹ Projections indicate that both morbidity and mortality from breast cancer will more than double by 2035.² In Türkiye, breast cancer is the most common cancer and leading cause of cancer-related deaths among women.³ This escalating global burden makes it imperative to conduct comprehensive research and develop evidence-based interventions for breast cancer prevention and early detection.²

The World Health Organization evaluates the risk-benefit ratio of mammography screening for women after age 40 across diverse healthcare settings.⁴ Türkiye's Ministry of Health National Cancer Screening Program recommends

biennial mammography for women aged 40–69 years, delivered through Cancer Diagnosis Screening and Education Centers.^{5–9} Despite free screening availability, mammography participation rates in Türkiye remain below recommended levels at less than 10%. These low rates highlight the need for additional research that identify factors that influence breast cancer screening participation.^{5–9}

While breast cancer predominantly affects women, male breast cancer represents less than 1% of all breast cancer diagnoses. Male breast cancer has rising incidence and highlights the importance of breast cancer awareness among men.¹⁰

Male Family Influence on Breast Cancer Screening

The role of men in supporting breast cancer awareness and encouraging screening behaviors among female family members represents an understudied and potentially important dimension of breast cancer prevention and early detection. Recent systematic evidence demonstrates that social support significantly impacts women's screening participation.² Social support from family, friends, and community networks can either support or hinder screening behaviors. Many women rely on male family members to make health decisions. This represents a group that requires targeted support from health teams for emotional, instrumental, and informational needs.²

In various societies, men play a vital role in guiding and encouraging women to follow breast cancer early detection recommendations.^{11,12} Social support provided by families, especially by male partners, has been linked to enhancement of breast cancer screening practices.¹¹ Female relatives of breast cancer patients have an increased risk and are recommended to participate in regular screening. Despite these guidelines, screening adherence remains markedly deficient among this high-risk population. The study revealed that only 17% perform breast self-examination, 18% receive clinical breast examination, and 17% obtain mammography screening, while 48% report complete absence of any screenings.^{13,14} Several studies have demonstrated that perceived risk of developing breast cancer influences screening behaviors. Women who perceive themselves at higher risk are more likely to participate in regular screening.^{14,15}

Research among Arab men has established that men's opinions and support serve as important influences on their female family members' breast cancer screening behaviors. Asking men to encourage female family members to participate in screening activities has proven to be an effective strategy.¹¹ A 2024 systematic review of breast cancer screening literature found that all participants were women except for one qualitative study focusing on Arab men's perceptions of female BCS. This finding highlights a significant research gap.²

Recent research demonstrates that Turkish women identify the need for spouse support as a key factor affecting their participation in breast cancer screening programs.¹⁶ However, the influence of male family members on female relatives' screening behaviors remains incompletely understood.

Demographic Factors and Screening Behaviors

Contemporary systematic evidence identifies demographic variables as critical determinants of screening behaviors. A comprehensive 2024 review analysing 36,043 participants across 34 geographically diverse studies found that “demographic variables such as age, education level and employment status significantly influence screening rates”.² Over half of the studies reviewed focused on sociodemographic factors as facilitators and barriers to breast cancer screening participation.

Current State of Male Involvement in Screening Advocacy

Studies have increasingly explored the knowledge and attitudes of men toward mammography screening. A cross-sectional study in Saudi Arabia with a total of 9691 male respondents found that while 79% of male participants would recommend mammography to their female family members, only 33.8% had good knowledge about mammography.¹⁷ The study also found that participants over 30 years old were significantly more likely to recommend mammography than younger participants, with highest recommendation rates among men over 40 years ($p < 0.001$), and that higher educational levels and employment status were significantly associated with willingness to recommend mammography.¹⁷

Similarly, a study from Nigeria showed that 85.5% of men had positive attitudes on screening of breast cancer. However, only 54.3% of men were involved in screening of their partners.¹⁸ These findings suggest a significant gap between men's supportive attitudes and their involvement in supporting female cancer screening.

Qualitative research has provided deeper insights into men's perceptions, with studies documenting that men often perceive breast examination as particularly important for older women (40 and up) and women after menopause, indicating age-related awareness patterns in men on breast cancer in women.¹⁹

Conceptual Foundation

The Health Belief Model (HBM), extensively validated across decades of research with over 13,000 citations. This provides a robust theoretical framework for examining health-related decision-making processes.²⁰ The HBM demonstrates that health behaviors are influenced by knowledge, perceived benefits of health actions, and demographic characteristics such as age and education.²⁰ In the context of male involvement in breast cancer screening advocacy, these constructs²⁰ help explain willingness to recommend screening to female family members. Specifically, men's awareness of breast cancer, understanding of screening benefits, and demographic characteristics influence their willingness to advocate for screening. Our questionnaire design aligns with this theoretical foundation to assess knowledge, behavioral intentions (willingness to recommend screening), and demographic influences (age and education).²⁰ This approach aligns with established health behavior research methodology.²¹ The Breast Cancer Screening Beliefs Questionnaire has demonstrated the effectiveness of theory-based approaches to elaborate screening behaviors in diverse populations.²¹

Research Gap and Study Objectives

The importance of male family support in breast cancer screening decisions has been well documented. Additionally, demographic factors are established influences on health behaviors. However, limited research has examined age and education effects on men's willingness to recommend breast examinations across different population groups.

Our study aims to address a gap in the literature by examining the awareness, knowledge, and attitudes regarding breast cancer among two groups: a clinical attendee group and a university personnel group. Our research is to understand age and education effects on men's willingness to recommend breast examinations across these two groups. We seek to provide valuable insights into demographic factors that influence willingness to provide support. Understanding these patterns is important for developing targeted intervention approaches. These interventions can effectively encourage breast cancer screening practices through male family support. This approach can contribute to breast cancer prevention and early detection.²

Our research provides a foundational information. This information can guide the future design of studies for men from diverse demographic backgrounds.

Materials and Methods

Ethics Approval Statement

This study was conducted after obtaining ethical approval from the Istanbul Aydin University Ethics Committee (approval number: 2024/12, approved in February 2024). The ethics application was submitted in December 2023, and data collection began after receiving ethical approval. All procedures performed were in accordance with the ethical standards of the 1964 Helsinki Declaration and its later amendments.

Study Design and Participants

This prospective cross-sectional survey study was designed in December 2023 and conducted following ethics committee approval to assess men's awareness of breast cancer, screening programs, and mammography, as well as their willingness to recommend breast examinations to female family members. All participants provided informed consent before completing the questionnaire.

The participants were divided into two groups. The University Personnel Group (n=105) consisted of male university personnel at Istanbul Aydin University. The Clinical Attendee Group (n=100) consisted of male patients visiting outpatient clinics at Istanbul Aydin University hospital with non-breast-related complaints and their male companions. These two populations were selected to represent men with different patterns of institutional affiliation and exposure to health-related environments. The university personnel group represents men in an academic setting, while the clinical

attendee group represents men accessing healthcare facilities. This comparison allows examination of whether willingness to recommend breast cancer screening differs between these two groups.

Survey Instrument

We developed a structured questionnaire for our survey study. 10 questions covered demographics, knowledge about breast cancer, and willingness to recommend breast cancer screening. The demographic section included questions about age, educational status, and marital status. Knowledge assessment focused on awareness of breast cancer frequency in women, family history of breast cancer, knowledge about male breast cancer occurrence, and awareness about annual mammography recommendations. The final section evaluated participants' willingness to recommend breast examinations to female family members, their opinion on the appropriate age to begin mammography, and whether female family members had previously undergone breast examinations.

In this study, "willingness to recommend breast examinations" refers to self-reported intention by participant as measured through face-to-face survey responses. Specifically, affirmative answer of participants in survey to whether they would consider taking their spouse or mother for a breast examination after receiving information about breast cancer screening. We acknowledge that self-reported willingness represents behavioral intention rather than behavior.

The questionnaire was conducted face-to-face in Turkish and translated to English for publication. Questions were presented in the exact order shown in Table 1. Both groups received identical face-to-face surveys with the same questions administered in comparable settings to minimize differential bias between groups.

Table 1 Demographic Characteristics, Breast Cancer Knowledge, and Willingness to Recommend Screening to Female Family Members by Study Group

Questions	Clinical Attendee Group		University Personnel Group		P Value	Test*
	Number	Percentage (%)	Number	Percentage (%)		
Question 1: How old are you?					0.15	X ²
15-25	36	36.0	50	47.6		
25-40	39	39.0	31	29.5		
40-50	13	13.0	6	5.7		
50-60	6	6.0	10	9.5		
60 above	6	6.0	7	6.7		
Question 2: What is your educational status?					< 0.0001	X ²
Primary school	3	3.0	0	0.0		
Middle school	8	8.0	0	0.0		
High school	17	17.0	3	2.9		
University	72	72.0	61	58.1		
Master's/Ph.D.	0	0.0	41	39.0		
Question 3: What is your marital status?					< 0.05	X ²
Single	58	58.0	80	76.2		
Married	41	41.0	25	23.8		
Question 4: Do you have knowledge about the frequency of breast cancer in women?					1.00	X ²
No	45	45.0	47	44.8		
Yes	55	55.0	57	54.3		
Question 5: Do you have any first-degree relatives with breast cancer?					0.47	X ²
No	84	84.0	92	87.6		
Yes	16	16.0	12	11.4		

(Continued)

Table 1 (Continued).

Questions	Clinical Attendee Group		University Personnel Group		P Value	Test*
	Number	Percentage (%)	Number	Percentage (%)		
Question 6: Do you know that men can also have breast cancer?					0.42	X ²
No	58	58.0	54	51.4		
Yes	42	42.0	51	48.6		
Question 7: Do you have knowledge about the necessity of annual mammography for women?					0.90	X ²
No	49	49.0	49	46.7		
Yes	51	51.0	55	52.4		
Question 8: If your answer is yes, after what age?					0.63	m
30	15	27.8	20	33.3		
40	37	68.5	37	61.7		
50	2	3.7	3	5.0		
Question 9: Has your spouse (or if you are single, your mother) ever gone for a breast examination?					< 0.05	X ²
Yes	44	44.0	40	38.1		
No	36	36.0	28	26.7		
I do not know	20	20.0	37	35.2		
Question 10: After this information, would you consider taking your spouse or mother for an examination?					< 0.001	X ²
No	6	6.0	27	25.7		
Yes	94	94.0	78	74.3		

Notes: *The Mann–Whitney *U*-test was employed to analyze quantitative independent data. Chi-square test was used in the analysis of qualitative independent data.

Abbreviation: SD, Standard deviation.

Statistical Analysis

For general comparisons between groups, categorical variables were analyzed using Chi-square tests (X²), while the Mann–Whitney *U*-test was used for the recommended age for mammography due to non-normal distribution of this numerical data.

We performed an analysis of the relationship between age groups and willingness to recommend breast examinations. For this analysis, we used age categories across both groups (“15–25”, “25–40”, “40–50”, “50–60”, and “60+”) and generated cross-tabulations to determine the percentage of participants in each age group who were willing to take their spouse or mother for examination. Adaptive testing approach using Chi-square tests and Fisher’s exact test was performed to assess the statistical significance of the observed associations. Chi-square tests were used when expected cell frequencies were ≥5, while Fisher’s exact test was applied when expected cell frequencies fell below 5.

To analyze the relationship between age and willingness to take spouse/mother for breast examination, we conducted a Cochran–Armitage trend test. Age groups were encoded numerically (15–25=1, 25–40=2, 40–50=3, 50–60=4, 60+=5) to assess the linear trend. This approach allowed us to quantify the statistical significance of age-related trends in willingness to recommend breast examination within each group.

Similarly, we analyzed the relationship between educational status and willingness to recommend breast examinations. Primary School, Middle School, High School, University, and Master’s/Ph.D. Cross-tabulations were generated to calculate the percentage of positive responses within each education levels. Statistical analysis was conducted to assess potential associations.

Pairwise comparisons between specific groups were analyzed using Chi-square tests for samples with expected cell frequencies ≥5 and Fisher’s exact test when expected cell frequencies were <5.

To address potential confounding due to baseline demographic differences between groups, multivariable logistic regression was performed for the primary outcome (willingness to recommend breast examination) and adjusted for age group, education level, and marital status to account for potential confounding. We calculated both group comparisons (crude analysis) using a single variable and statistically adjusted comparisons using multiple variables. Crude analysis

represents the direct comparison between University Personnel and Clinical Attendees. Adjusted analysis uses multi-variable logistic regression to calculate group differences while accounting for potential confounding by age, education, and marital status. Both crude and adjusted odds ratios are reported. A change of >10% between crude and adjusted odds ratios was considered indicative of potential confounding.

Statistical analysis was performed using Python programming language (version 3.12.4) with pandas (2.2.3), NumPy (1.26.4), SciPy (1.11.4), Matplotlib (3.10.1), and Seaborn (0.13.2) libraries. Statistical significance was established at $p < 0.05$ for all analyses.

Data Visualization

Results were compiled into comparative tables showing absolute numbers, percentages, p-values, and the statistical test used for each comparison. For visualizing relationships between categorical variables and willingness to recommend mammography, we created side-by-side heatmap visualizations (Figures 1A, B and 2A, B) with color intensity representing the percentage of positive responses within each category.

For key comparisons, we created bar charts (Figures 1C and 2C) displaying willingness percentages with corresponding sample sizes and significance annotations. Statistical significance was indicated at three threshold levels ($p < 0.05$, $p < 0.01$, $p < 0.001$) using bracket notation in these figures.

Sample Size Calculation

Sample size calculation was utilized to determine the number of participants needed to detect significant differences in willingness to recommend breast examinations. Using a two-sided significance level of 0.05 and power of 80%, we calculated that a minimum of 53 participants per group would be required for the primary comparison between the University Personnel Group and Clinical Attendee Group, based on an anticipated difference of 20% in willingness rates. Sample size calculations were performed using the normal approximation method for comparing two independent proportions.

Results

Demographic and Knowledge Characteristics

Table 1 presents the demographic characteristics and breast cancer knowledge of the two study groups. In Question 1, there were no statistically significant differences in age distribution between the clinical attendee group and University personnel group ($p = 0.15$). The clinical attendee group had 75.0% of participants under 40 years of age (36.0% aged 15–25 and 39.0% aged 25–40), while the University personnel group had 77.1% under 40 years (47.6% aged 15–25 and 29.5% aged 25–40).

In Question 2, significant differences were observed in educational status ($p < 0.0001$). The University personnel group had substantially higher proportions of participants with advanced degrees (39.0% with Master's/Ph.D. compared to 0% in the Clinical Attendee Group) and fewer participants with education below university level (2.9% with high school education or less compared to 28.0% in the Clinical Attendee Group).

In Question 3, marital status differed significantly between groups ($p < 0.05$), with a higher percentage of single participants in the University personnel group (76.2% vs 58.0% in the Clinical Attendee Group).

In Question 4, both groups reported similar knowledge about breast cancer frequency in women, with no significant difference between groups (55.0% in the clinical attendee group vs 54.3% in the University Personnel Group, $p = 1.00$). Similarly, in Question 5, there were no statistically significant differences in the prevalence of first-degree relatives with breast cancer between groups (16.0% vs 11.4%, $p = 0.47$).

In Question 6, knowledge on the existence of breast cancer in men was comparable between groups, reported by 42.0% of the clinical attendee group and 48.6% of the University personnel group ($p = 0.42$). In Question 7, knowledge regarding the necessity of annual mammography for women was reported by approximately half of the participants in both groups (51.0% and 52.4%, $p = 0.90$).

Among those who responded affirmatively to knowledge about annual mammography in Question 8, most participants in both groups identified age 40 as the appropriate starting age (68.5% of Clinical Attendees and 61.7% of University Personnel), with no significant difference in the recommended starting age distribution between groups ($p = 0.63$).

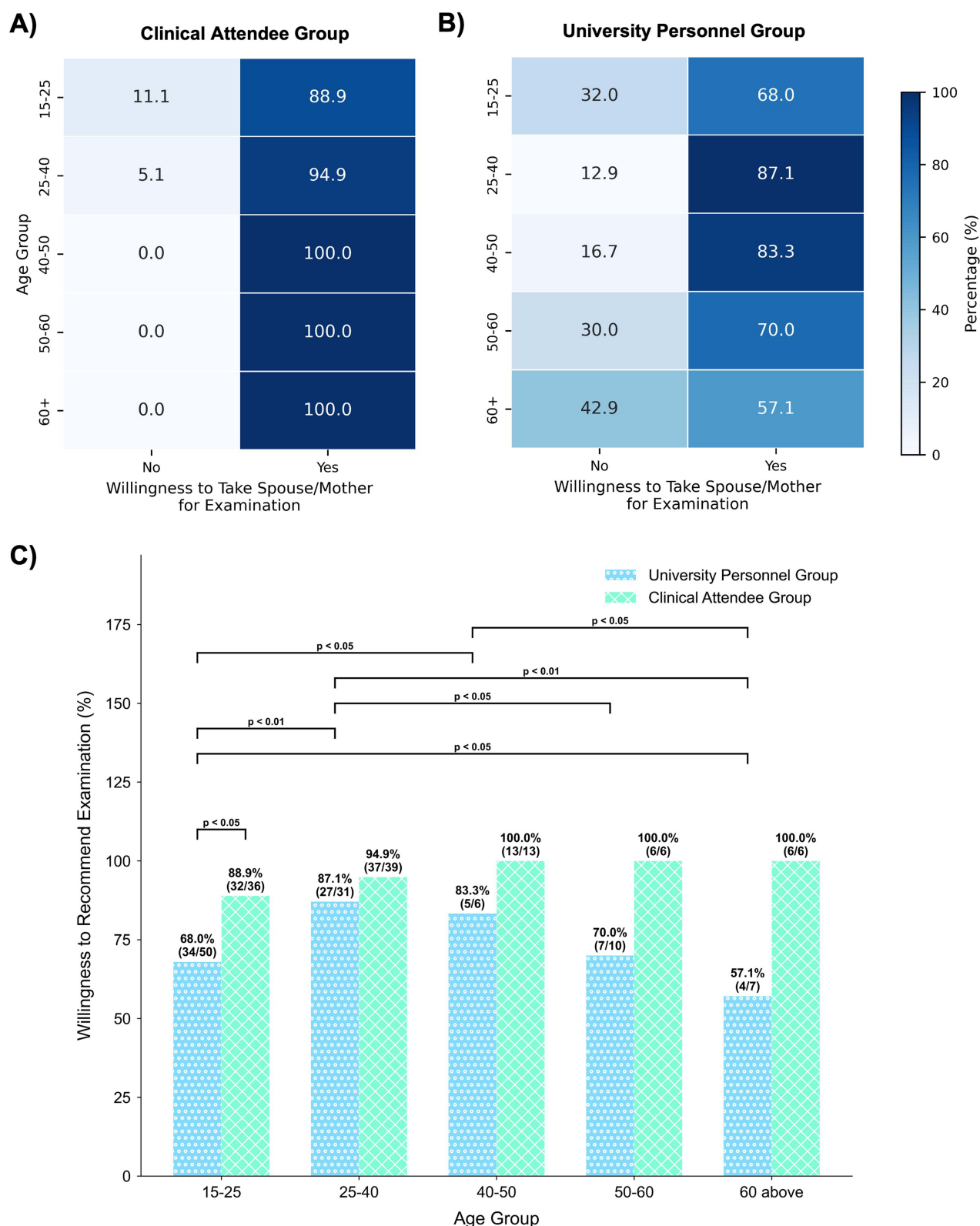


Figure 1 Willingness to recommend breast cancer screening for female family members by age group. **(A)** Heatmap showing distribution of responses in the clinical attendee group across age groups. Values represent percentages of “No” (left) and “Yes” (right) responses. **(B)** Corresponding heatmap for the University Personnel Group. Color intensity indicates percentage values according to the scale bar. **(C)** Bar chart comparing willingness percentages between Clinical Attendee Group (blue) and University Personnel Group (green) across age categories. Numbers within bars indicate proportion of willing participants relative to total participants in each age group. Brackets denote statistically significant differences between groups with corresponding p-values.

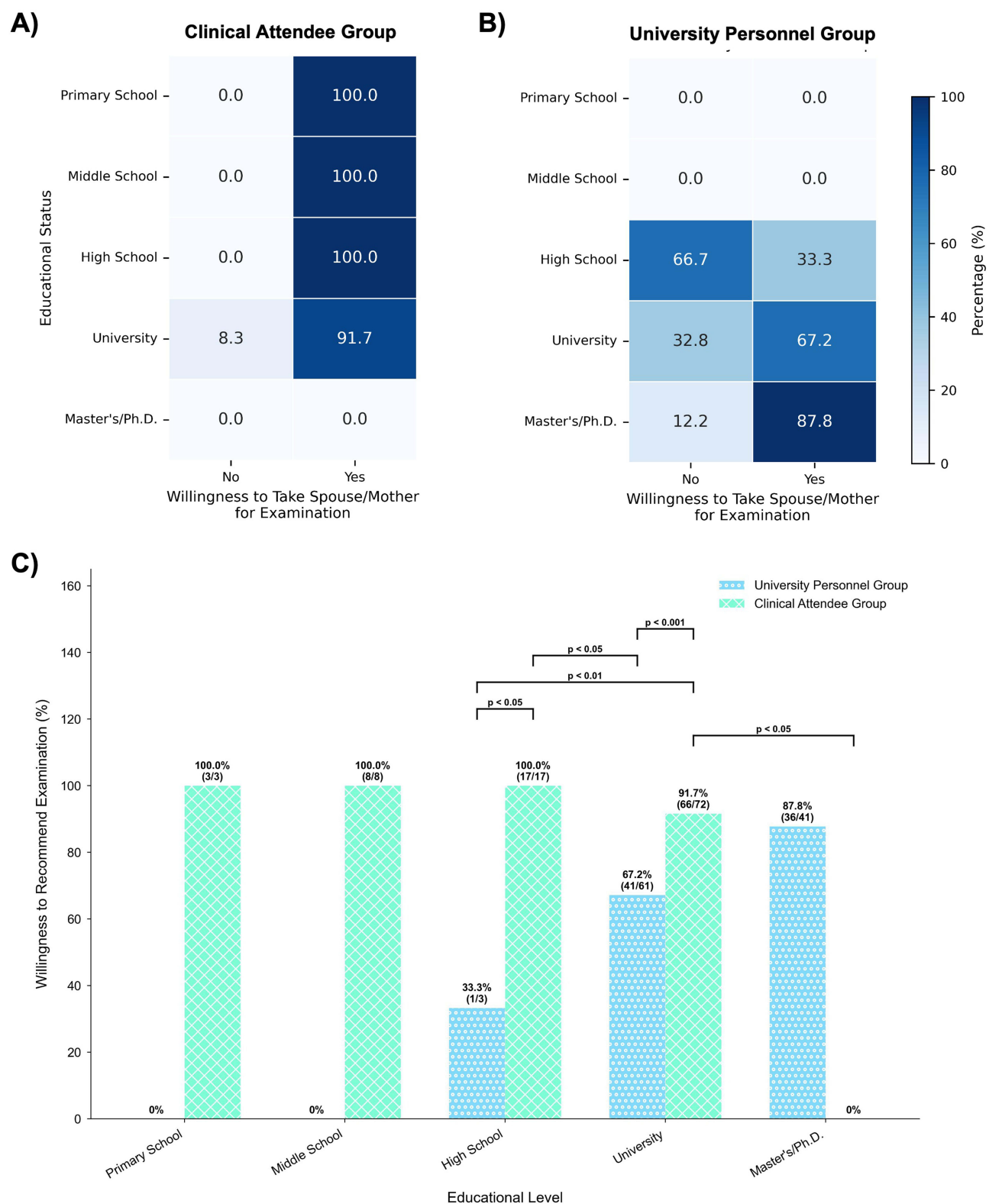


Figure 2 Willingness to recommend breast cancer screening for female family members by educational level. **(A)** Heatmap showing distribution of responses in the clinical attendee group across educational levels. Values represent percentages of “No” (left) and “Yes” (right) responses. **(B)** Corresponding heatmap for the University Personnel Group. Color intensity indicates percentage values according to the scale bar. **(C)** Bar chart comparing willingness percentages between Clinical Attendee Group (blue) and University Personnel Group (green) across educational levels. Numbers within bars indicate proportion of willing participants relative to total participants in each education category. Brackets denote statistically significant differences between groups with corresponding p-values.

In Question 9, regarding past screening behavior, a statistically significant difference was observed between the groups ($p < 0.05$). The clinical attendee group more frequently reported that their spouse or mother had undergone a breast examination (44.0% vs 38.1%), while a higher proportion of University personnel group participants reported not knowing whether their female relatives had undergone breast examinations (35.2% vs 20.0%).

Notably, in Question 10, after receiving information about breast cancer screening, the clinical attendee group showed significantly greater willingness to take their spouse or mother for an examination compared to the University personnel group (94.0% vs 74.3%, $p < 0.001$).

Relationship Between Age and Willingness to Recommend Breast Examinations

Figure 1 presents visualizations illustrating the relationship between age groups and willingness to recommend breast examinations for female family members in both study groups. The analysis reveals distinct patterns between the two groups.

In Figure 1A, the clinical attendee group demonstrated a clear pattern of increasing willingness to recommend breast examinations with advancing age. In the youngest age group (15–25 years), 88.9% of participants expressed willingness (32 “Yes” responses vs 4 “No” responses). This willingness increased to 94.9% in the 25–40 age group (37 “Yes” responses vs 2 “No” responses). Most notably, all participants in the older age categories showed complete willingness: 100% in the 40–50 age group (13 “Yes” responses vs 0 “No” responses), 100% in the 50–60 age group (6 “Yes” responses vs 0 “No” responses), and 100% in the 60+ years group (6 “Yes” responses vs 0 “No” responses). Statistical analysis using the Cochran-Armitage trend test revealed a significant positive trend across age groups in this group ($p < 0.05$), confirming that willingness to recommend breast examinations significantly increased with advancing age.

In Figure 1B, the University personnel group exhibited a markedly different pattern. The highest willingness was observed in the 25–40 age group at 87.1% (27 “Yes” responses vs 4 “No” responses), followed by the 40–50 age group at 83.3% (5 “Yes” responses vs 1 “No” response). Willingness rates were lower in both the youngest age group (15–25 years) at 68.0% (34 “Yes” responses vs 16 “No” responses) and older age groups: 70.0% in the 50–60 years group (7 “Yes” responses vs 3 “No” responses) and 57.1% in the 60+ years group (4 “Yes” responses vs 3 “No” responses). Despite these observed differences, the trend analysis did not reach statistical significance ($p = 0.9205$), indicating no statistically significant age-related trend in this group.

As illustrated in Figure 1C, comparative analysis between the two groups showed statistically significant differences across age groups. Specifically, a significant difference was observed in the 15–25 age group ($p < 0.05$), as the clinical attendee group showed substantially higher willingness rates compared to the University personnel group (88.9% vs 68.0%). While the clinical attendee group also showed higher willingness in the 25–40 age group (94.9% vs 87.1%) and the 60+ age group (100% vs 57.1%), direct same-age comparisons between groups for these categories did not reach statistical significance.

Additionally, significant differences were observed between non-adjacent age groups, with several notable cross-group comparisons. The clinical attendee group aged 25–40 showed significantly higher willingness than the University Personnel Group in the 15–25 age group ($p < 0.01$), 50–60 age group ($p < 0.05$), and 60+ age group ($p < 0.01$). Similarly, the clinical attendee group aged 40–50 showed significantly higher willingness than both the 15–25 age group ($p < 0.05$) and 60+ age group ($p < 0.05$) of the University Personnel Group. The clinical attendee group aged 15–25 also showed significantly higher willingness than the University Personnel Group aged 60+ ($p < 0.05$). The clinical attendee group showed higher willingness rates across all age categories compared to the University Personnel Group. The differences in the same-age comparisons for the 40–50 and 50–60 age groups did not reach statistical significance.

Overall, these findings highlighted age-related patterns in willingness to recommend breast examinations between the two groups. The clinical attendee group showed a significant positive association between age and willingness (Cochran-Armitage trend test, $p < 0.05$). However, the University personnel group demonstrated a more complex, non-linear pattern without a significant age trend ($p > 0.05$).

Association Between Educational Status and Willingness to Recommend Breast Examinations

Figure 2 presents visualizations illustrating the relationship between education groups and willingness to recommend breast examinations for female family members in both study groups. The analysis reveals patterns between the two groups.

In Figure 2A, the clinical attendee group demonstrated a consistently high willingness to recommend breast examinations across all represented educational levels. Participants with Primary School education showed 100% willingness (3 “Yes” responses vs 0 “No” responses), as did those with Middle School education (8 “Yes” responses vs 0 “No” responses) and High School education (17 “Yes” responses vs 0 “No” responses). A slightly lower but still high willingness rate of 91.7% was observed among University-educated participants (66 “Yes” responses vs 6 “No” responses). There were no participants with Master’s/Ph.D. qualifications in this group.

In Figure 2B, the University personnel group exhibited a pattern characterized by increasing willingness with higher educational attainment. At the High School education level, willingness was notably low at 33.3% (1 “Yes” response vs 2 “No” responses). This increased to 67.2% among University-educated participants (41 “Yes” responses vs 20 “No” responses), and further increased to 87.8% among those with Master’s/Ph.D. qualifications (36 “Yes” responses vs 5 “No” responses). The University personnel group had no participants with Primary or Middle School education.

As illustrated in Figure 2C, comparative analysis between the two groups demonstrated statistically significant differences across educational levels. A significant difference was observed at the High School education level ($p < 0.05$), with the clinical attendee group demonstrating a substantially higher willingness rate (100%) compared to the University personnel group (33.3%). Similarly, a highly significant difference was observed at the University education level ($p < 0.01$), with the clinical attendee group showing greater willingness (91.7%) compared to the University personnel group (67.2%). A strong statistical difference ($p < 0.001$) was found between the University-educated participants in the clinical attendee group and those with Master’s/Ph.D. qualifications in the University Personnel Group, despite both groups showing relatively high willingness rates (91.7% vs 87.8%). Additionally, a significant difference ($p < 0.05$) was observed between participants with High School education in the clinical attendee group and those with Master’s/Ph.D. qualifications in the University personnel group (100% vs 87.8%).

Notably, the University personnel group exhibited a clear positive association between educational level and willingness to recommend breast examinations, with willingness increasing from 33.3% at High School level to 67.2% at University level, and further to 87.8% at Master’s/Ph.D. level. This educational gradient was not observed in the Clinical Attendee Group, which maintained near-complete willingness across all represented educational levels.

Multivariable Analysis of Willingness to Recommend Breast Examination

Significant baseline differences were observed between groups in educational attainment ($p < 0.001$) and marital status ($p < 0.01$), necessitating adjustment for potential confounding in the primary outcome analysis.

In Table 2, the crude analysis demonstrated that Clinical Attendees had significantly higher willingness to recommend breast examinations compared to University Personnel (94.0% vs 74.0%, respectively). Using Fisher’s exact test, the crude odds ratio was 5.49 ($p < 0.001$), indicating that Clinical Attendees had approximately 5.5-fold higher odds of willingness compared to University Personnel.

In Table 2, multivariable logistic regression adjusting for age group, educational level, and marital status confirmed that the group effect persisted after controlling for potential demographic confounders (Table 2). The adjusted odds ratio

Table 2 Crude and Adjusted Analysis of Willingness to Recommend Breast Examination

Analysis Type	University Personnel Percentage (%)	Clinical Attendees Percentage (%)	Odds Ratio Clinical and University	P Value	Method
Crude	74.0%	94.0%	5.49	<0.001	Fisher’s exact
Adjusted*	74.0%	94.0%	3.98*	<0.001	Multivariable logistic regression

Note: *Adjusted for age group, educational level, and marital status.

was 3.98 (Clinical Attendees vs University Personnel, $p < 0.001$), indicating that Clinical Attendees maintained significantly higher odds of willingness even after accounting for baseline demographic differences, with minimal evidence of confounding by demographic variables.

Discussion

Our study revealed significant differences in breast cancer awareness and screening attitudes between Clinical Attendee and University Personnel groups, with particular patterns related to age, education, and willingness to recommend breast examinations.

Age-Related Patterns in Screening Recommendation

Previous research examining male involvement in breast cancer screening has consistently demonstrated a positive association between advancing age and willingness to support mammography.^{17,22} Gadi et al reported willingness rates increasing from 73% in men under 21 to 84% in those aged 31–40.¹⁴ Kamila et al identified that husbands over 30 years consistently showed greater willingness to support mammography screening than younger participants.¹¹

Our findings confirm this established age-related pattern within the clinical attendee group, which demonstrated increasing willingness to recommend breast examinations with advancing age (Figure 1A). Willingness rates increased from 88.9% in the youngest group (15–25 years) to 100% in all older age categories (40+ years) in the clinical attendee group, strongly supporting the documented positive association between age and screening advocacy.

However, our results reveal that this well-established age-related pattern does not apply universally across all male populations. The university personnel group demonstrated a markedly different pattern, with peak willingness occurring in middle age (87.1% in the 25–40 age group) followed by a gradual decline in older age categories, particularly among those 60+ years (57.1%). This pattern diverges from the consistent age-related increases reported in previous literature and demonstrates that population-specific factors may affect established age-related trends in willingness to recommend breast examinations.^{17,22}

Figure 1C further illuminates these differences, showing statistically significant variations ($p < 0.05$) in willingness to recommend mammography across age groups. While both groups demonstrated generally high recommendation rates, the clinical attendee group maintained consistently higher percentages across all age categories. Our results align with Kamila et al's findings that individuals with direct exposure to healthcare environments showed greater awareness and support for breast cancer screening compared to the general population.²²

Educational Status and Screening Recommendations

Extensive research has established education as one of the most consistent predictors of health behaviors and screening participation, with higher educational attainment consistently correlating with better health outcomes and advocacy behaviors.^{23,24} Zimmerman & Woolf (2014) documented that educational status serves as a major predictor of health outcomes, with higher education enhancing health literacy and promoting positive health behaviors.¹⁶ Cutler & Lleras-Muney (2010) demonstrated that education significantly influences health behaviors through multiple pathways including improved knowledge, better access to information, and enhanced decision-making capabilities.¹⁷

Studies examining male involvement in breast cancer screening have consistently confirmed this educational gradient. Gadi et al reported that higher educational attainment was significantly associated with men's likelihood to recommend mammography to female relatives ($p < 0.01$), with 83% of university-educated participants recommending mammography compared to only 68% of those with less than high school education.¹⁷ Similarly, Okafor et al determined that men with post-secondary education exhibited significantly higher involvement in their female partners' cancer screening ($p < 0.05$) compared to men with less secondary education.¹⁸ These findings suggest that education serves as a vehicle for enhanced health awareness and positive screening support.^{17,18}

Our findings confirm this established educational gradient within the university personnel group, which demonstrated a clear positive association between educational level and willingness to recommend breast examinations (Figure 2B). Willingness increased from 33.3% at the high school level to 67.2% at the university level, and further to 87.8% at the Master's/Ph.D. level, aligning with the documented education-health behavior relationship.^{17,18}

However, our results reveal a deviation from this established educational pattern in the literature.^{17,18}

The clinical attendee group maintained consistently high willingness to recommend breast examinations across all educational levels (91.7–100%), with participants having lower education demonstrating equivalent or higher support than highly educated university personnel (Figure 2A). This finding represents an important exception to the established educational pattern in male involvement in breast cancer screening and suggests that group-specific contextual factors may influence willingness to recommend screening for female family members.

Figure 2C showed significant differences in willingness between groups across educational levels. The university personnel group demonstrated increased willingness at higher education levels. However, the clinical attendee group maintained consistently high willingness regardless of educational attainment. These findings suggest that factors beyond formal education may influence willingness to recommend breast cancer screening.

Study Limitations

Our research is a single-center, cross-sectional foundational study designed to investigate patterns of breast cancer screening attitudes among men in two distinct populations. In our study, we prioritized characterizing these patterns before conducting in-depth exploration of underlying mechanisms.

Our study has several important limitations. The cross-sectional design and single-center setting limit our ability to generalize the findings to larger geographical areas and cultural contexts. Future research can utilize longitudinal designs to better understand the relationships between various factors and willingness to recommend breast examinations. These factors include socioeconomic-related factors, cultural beliefs and taboos surrounding breast health, healthcare accessibility, family history of breast cancer, prior experience with healthcare systems, health literacy levels, and psychological factors such as fear and anxiety about cancer diagnosis.

Social desirability bias may have influenced our results. We collected data using face-to-face interviews in clinical and academic settings. Participants may have provided socially acceptable responses, particularly given cultural expectations regarding family health responsibilities. However, our comparative design using identical methodology for both groups helps minimize systematic bias effects. Future studies could minimize this bias through anonymous online surveys or indirect questioning techniques.

Our measurement of “willingness” represents self-reported behavioral intention rather than behavior. Future studies could benefit from longitudinal follow-up to assess whether stated willingness translates into actual screening support behaviors.

In future studies, psychological, cultural, or socioeconomic determinants and other related factors can be investigated in depth to elucidate the statistical relationships between these factors in multi-center studies. Additionally, conducting studies with larger sample sizes, multiple centers, and more diverse populations would enhance the generalizability of the findings and provide a more comprehensive understanding of the factors influencing men’s attitudes and behaviors related to breast cancer screening of female family members and relatives.

By addressing these limitations and building upon our findings, future studies can contribute valuable insights to inform the development of targeted interventions and public health strategies aimed at promoting breast cancer awareness and screening participation among both men and women.

Conclusion

Our findings showed patterns of breast cancer awareness and screening recommendation willingness between clinical attendees and university personnel. While both groups demonstrated similar baseline knowledge about breast cancer, willingness to recommend screening differed significantly, with age and education having differential impacts between groups.

The clinical attendee group showed significantly greater overall willingness to recommend breast examinations (94.0% vs 74.3%, $p < 0.001$) and demonstrated a clear positive association between age and willingness. Conversely, the university personnel group exhibited peak willingness in the 25–40 age group (87.1%) with a strong educational gradient.

Our findings suggest that the education gradient in willingness to recommend breast cancer screening to female relatives may not apply universally across all populations. The clinical attendee group maintained consistently high willingness regardless of educational level. These results provide foundational evidence for future studies to develop population-specific approaches to male involvement in breast cancer screening advocacy. However, multi-center studies

with larger, more diverse samples are needed before specific clinical or policy recommendations can be made. Our foundational study identifies subgroups as potential intervention targets, but testing specific intervention strategies requires future research.

Our study establishes important foundational patterns that future research can build upon to better understand the factors influencing men's support for female family members' breast cancer screening behaviors.

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Disclosure

The authors report no conflicts of interest in this work.

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