

# Public Awareness About Frailty Prevention and Possible Association Between Frailty and Disability: A Cross-Sectional Study in Saudi Arabia

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**Background:** Frailty, a condition characterized by diminished physiological reserves, is a significant public health concern globally, particularly due to its association with adverse outcomes such as hospitalization, dependence, and mortality. Despite the importance of early detection and prevention, public awareness about frailty remains insufficient, especially in Saudi Arabia.

**Objective:** The purpose of this study was to assess public awareness of frailty and its association with disability, focusing on the socio-demographic factors that influence awareness.

**Methods:** A cross-sectional study design was employed with 1000 participants from urban and rural regions of Saudi Arabia. Data was collected using a structured questionnaire to evaluate their knowledge, attitudes, and perceptions regarding frailty awareness, particularly around its prevention strategies.

**Results:** A total of 1000 respondents participated in the survey. The majority of participants were males aged 18 to 39. The results indicated significant predictors of frailty awareness, including gender, education level, income, health status, and self-rated health. Frailty preventive techniques were more likely to be known by men, those with greater education, higher income, and better health.

**Conclusion:** The findings highlight the need for targeted public health campaigns to improve awareness, especially among under-represented groups. Addressing socio-demographic factors in future interventions may reduce frailty risks and support health promotion and prevention efforts in Saudi Arabia.

**Keywords:** frailty, public health awareness, socio-demographic factors, disability prevention, Saudi Arabia, health behavior

## Introduction

Frailty, diminished physiological reserves and increased susceptibility to stressors, has become a global public health concern. As a result, there has been a notable increase in research directed towards the understanding of various elements related to frailty, from its causes to prevention measures. Evidence links frailty to adverse outcomes, including increased risks of hospitalization, dependence, and mortality. Although frailty is recognized as an early indicator of functional decline, public awareness is insufficient, limiting early detection and prevention.<sup>1,2</sup> International studies support early identification and show that interventions such as physical activity, nutritional support, and comprehensive geriatric assessments effectively delay or prevent disability.<sup>3</sup> In Saudi Arabia, where cultural, demographic, and healthcare dynamics differ from global contexts, there is a paucity of evidence regarding public comprehension of frailty. This gap highlights the urgent need for locally tailored research, particularly in light of the country's rapidly aging population and evolving healthcare priorities.

Saudi Arabia's Vision 2030 reform agenda emphasizes health promotion and preventive care, creating a strategic framework for integrating frailty awareness into public health initiatives. Regional studies have begun to shed light on

the prevalence and impact of frailty. For instance, a study reported that 21.4% of community-dwelling elder adults in Saudi Arabia experience frailty, indicating a significant public health concern.<sup>4</sup> Furthermore, lifestyle interventions such as walking—have proven effective in reducing frailty and enhancing quality of life among Saudi elder adults.<sup>5</sup> There still remains a lack of comprehensive understanding on the factors affecting public knowledge of frailty, such as demographics, educational attainment, and access to healthcare information. Addressing this gap is essential for developing culturally relevant policies that align with Vision 2030.

Therefore, this study was designed to evaluate public awareness of frailty prevention and its potential link to disability in Saudi Arabia. In particular, the authors sought to explore the Key determinants of awareness, evaluate prevention strategies and propose targeted interventions. The results are meant to guide public health policy and lessen the financial and social costs associated with frailty-related disabilities in the Kingdom.

## Methodology

### Ethical Considerations

The study adhered to strict ethical guidelines in accordance with the Declaration of Helsinki. In this regard, ethical approval for the study was obtained from the Institutional Review Board (IRB) of Umm Al Qura University (HAPO-02-K-012-2025-01-2493). Prior to data collection, written informed consent was obtained from all participants, with clear explanations provided regarding the study's purpose, procedures, and their right to withdraw at any stage. Further, participants were fully informed of their role in the study to ensure that all those choosing to participate in the study had full information on what was expected of them in the study. Participant confidentiality and anonymity were ensured throughout the research process, with all data securely stored and accessible only to authorized personnel. These ethical safeguards align with established best practices in human research ethics.<sup>6</sup>

### Study Design

A cross-sectional study design was utilized to assess public awareness of frailty prevention and its association with disability in Saudi Arabia. This design was selected for its efficiency in capturing a snapshot of awareness levels and its ability to identify demographic and cultural factors influencing perceptions.<sup>7</sup>

### Population and Sampling

The research focused on participants aged 18 and older living in both urban and rural areas of Saudi Arabia. A sample size of 1000 participants was determined using Cochran's technique to guarantee sufficient representation and statistical power.<sup>8</sup> Stratified random sampling was utilized to ensure representation across critical characteristics, such as gender, educational attainment, socio-economic status, and geographic locations. This methodology guaranteed that the sample accurately reflected the population while reducing selection bias.<sup>9</sup>

### Data Collection Tools

Data for analysis in this study were collected using a structured questionnaire which was specifically designed to assess participants' knowledge, attitudes, and perceptions about frailty prevention and its association with disability. The questionnaire included sections on socio-demographic characteristics (specifically age, gender, education level, socio-economic status, residential location) and specific items on frailty awareness and prevention strategies. To ensure clarity, reliability, and cultural appropriateness, the questionnaire was pre-tested on a pilot sample of 50 participants. Feedback from the pilot study was used to refine the instrument, enhancing its validity and reliability.<sup>10</sup>

### Data Collection Methods

The data collection was executed using an online survey, distributed through several channels, including healthcare facilities, community events, public assemblies, and social media platforms such as Twitter, Instagram, and WhatsApp. These strategies facilitated engagement from a diverse array of participants, especially in areas with limited internet

accessibility. Participation in the study was completely optional, and participants received comprehensive information regarding the study's objectives and methods prior to completing the questionnaire.<sup>11</sup>

## Data Analysis

The collected data were analyzed using statistical software, specifically the IBM's SPSS (version 26) and R (version 4.1.3).

Descriptive statistics were utilized to describe awareness levels, employing frequencies, percentages, averages, and standard deviations for representation. Chi-square tests were performed to examine relationships among health practices, health perceptions, and awareness of frailty prevention. Logistic regression analysis was used to identify predictors of awareness, with socio-demographic variables included as independent factors. A p-value threshold of <0.05 was considered statistically significant for all analyses.<sup>12</sup>

## Results

### Demographic Analysis

The analysis of demographic characteristics (Table 1) revealed several notable patterns, with significant probabilities indicating the likelihood of specific traits within the respondent group. A total of 1000 participants completed the survey and among them, approximately 70% (n = 700) of respondents were male, with females comprising the remaining 30% (n = 300) (p < 0.05). This indicates a statistically significant gender imbalance within the study sample. The age group 30–39 years was the most represented, accounting for around 45% of participants (p < 0.01). This was followed by individuals aged 18–29 years (25%, n = 250) and 40–49 years (20%, n = 200). The remaining 10% of the study's participants (n = 100) were distributed across other age brackets, demonstrating a notable skew toward middle-aged respondents (p < 0.05).

The largest group of respondents held postgraduate qualifications (master's or doctorate degrees), making up 60% of the sample (p < 0.01). Those with bachelor's degrees accounted for 30%, while 10% reported other educational backgrounds. The large proportion of highly educated individuals suggests a sample skewed toward higher socio-

**Table 1** Demographic Distribution of Respondents

Demographic Characteristic	Category	Percentage (%)	Significance (p-value)
Gender	Male	70	< 0.05
	Female	30	< 0.05
Age Group (years)	18–29	25	< 0.05
	30–39	45	< 0.01
	40–49	20	< 0.05
	Others	10	< 0.05
Education Level	Postgraduate	60	< 0.01
	Bachelor's Degree	30	< 0.01
	Other Qualifications	10	< 0.05
Monthly Income (SAR)	> 10,000	50	< 0.01
	1000–5000	20	< 0.05
	Other	30	< 0.05

**Notes:** All percentages are based on the total number of participants in the survey. p < 0.05 is considered significant.

economic strata. More than half of the participants reported monthly incomes exceeding 10,000 SAR ( $p < 0.01$ ). About 20% earned between 1000–5000 SAR, while 30% reported other income levels. This income distribution aligns with the high educational attainment observed, reflecting a statistically significant tendency toward higher-income individuals ( $p < 0.05$ ). The demographic profile of respondents highlights a predominance of highly educated males in their 30s, mainly from higher income brackets. These statistically significant trends provide crucial context for interpreting the study's subsequent findings.

## Health Habits, Perceptions of Health, and Opinions on Awareness and Prevention

### Health Habits

Table 2 illustrates the association between health habits, perceptions of health, and awareness of frailty prevention. The majority of respondents (75%,  $n = 750$ ) reported no chronic illnesses ( $p < 0.05$ ). Regular physical activity was prevalent, with 40% engaging in exercise 3–4 times per week and 30% exercising 1–2 times per week. Smoking prevalence was notably low, with only 10% of participants identifying as current smokers ( $p < 0.01$ ). These findings reflect generally healthy lifestyles among respondents, characterized by regular physical activity and minimal smoking rates.

### Perceptions of Health

Over 85% of respondents rated their general health as “good” or “excellent” ( $p < 0.01$ ). Furthermore, 90% ( $n = 900$ ) acknowledged frailty and weakness as significant public health concerns ( $p < 0.01$ ), demonstrating strong health awareness and an understanding of the broader implications of frailty.

### Opinions on Awareness and Prevention

Nearly 80% of participants identified regular physical activity and a balanced diet as the most effective strategies for preventing frailty ( $p < 0.01$ ). While 85% emphasized the importance of raising awareness about frailty prevention ( $p < 0.01$ ), opinions on existing public health campaigns were divided. Approximately 40% of participants believed current efforts were adequate, 30% expressed uncertainty, and 30% felt improvements were needed.

**Table 2** Association Between Health Habits, Perceptions of Health, and Awareness of Frailty Prevention

Category	Subcategory	Percentage (%)	Chi-square Test (p-value)
Health Habits	No chronic illnesses	75	< 0.05
	Exercise (3–4 times/week)	40	< 0.05
	Exercise (1–2 times/week)	30	< 0.05
	Smokers	10	< 0.01
Perceptions of Health	Rated health as “good” or “excellent”	85	< 0.01
	Frailty as a public health concern	90	< 0.01
Opinions on Awareness and Prevention	Physical activity/diet as effective prevention	80	< 0.01
	Importance of awareness campaigns	85	< 0.01
	Willingness to participate in programs	90	< 0.01
Opinions on adequacy of public campaigns	Adequate	40	< 0.05
	Uncertain	30	< 0.05
	Need Improvement	30	< 0.05

**Notes:** The Chi-square test was used to explore associations between awareness levels and the categorical variables of health habits, perceptions of health, and opinions on awareness and prevention. A p-value of less than 0.05 was considered statistically significant.

**Table 3** Logistic Regression Analysis of Predictors of Awareness of Frailty Prevention

Variable	Odds Ratio (OR)	p-value
Gender (Male)	1.50	0.03
Age (30–39)	1.20	0.12
Postgraduate Education	2.00	0.01
Income (>10,000 SAR)	1.80	0.02
No Chronic Illness	2.50	0.005
Good or Excellent Health	2.30	0.01

**Notes:** Independent variables include gender, education level, income, health habits, and self-rated health. Odds ratios (OR) represent the odds of being aware of frailty prevention, with p-values indicating statistical significance. A p-value less than 0.05 was considered statistically significant.

Encouragingly, 90% (n = 1000) of respondents expressed willingness to participate in awareness programs aimed at understanding and preventing frailty ( $p < 0.01$ ), highlighting strong community engagement potential.

The results show that respondents generally demonstrated healthy behaviors, strong health knowledge, and positive attitudes toward frailty prevention. However, the study also identified gaps in current public health efforts, underscoring the need for targeted and culturally tailored initiatives to raise awareness and promote preventive measures. These findings reinforce the importance of sustained efforts to build an informed, health-conscious population.

## Identification of Predictors of Awareness with Socio-Demographic Variables

Table 3 shows the results of the logistic regression analysis. The results identified several significant predictors of awareness regarding frailty prevention. Gender was a significant factor, with males having 1.5 times higher odds of awareness compared to females ( $p = 0.03$ ). Education level also played a key role, with individuals holding postgraduate degrees having twice the odds of being aware ( $OR = 2.00$ ,  $p = 0.01$ ). Income was another significant predictor, as those earning more than 10,000 SAR had 1.8 times higher odds of awareness ( $OR = 1.80$ ,  $p = 0.02$ ). Individuals without chronic illnesses had 2.5 times greater odds of being cognizant of frailty prevention ( $OR = 2.50$ ,  $p = 0.005$ ). Individuals who assessed their health as good or excellent had 2.3 times greater chances of awareness ( $OR = 2.30$ ,  $p = 0.01$ ). These findings underscore the significance of socio-demographic variables, health condition, and self-perception in shaping understanding of frailty prevention.

The logistic regression analysis identified education, income, health status, and gender as significant predictors of awareness of frailty prevention. These factors highlight the need for targeted awareness campaigns that consider socio-demographic variables to promote frailty prevention strategies effectively.

## Discussion

The results of this study provide important insights into the demographic characteristics, health habits, perceptions, and attitudes toward frailty prevention among respondents. The findings not only align with existing literature but also underscore the complex interplay between socio-demographic factors, health behaviors, and awareness levels, providing a foundation for future interventions.

## Demographic Profile

The predominance of male respondents in this study indicates a statistically significant gender imbalance, consistent with previous studies, suggesting that men are more likely to participate in structured workplace or health-related surveys.<sup>13</sup> Notably, in previous research frailty awareness levels were high among males. Saudi Arabia, likewise other countries, has a

considerably high level of awareness on frailty among males than females. The significant representation of individuals aged 30–39 years highlights the health-consciousness typically observed in middle-aged adults.<sup>14</sup> Understandably, these are individuals who are either involved with caring for the elderly (for instance their parents and guardians) or are also concerned about their health in the near future as they grow into middle adulthood. Their interest in frailty and its prevention offers a critical insight: stakeholders—including government bodies, researchers, and health officials—should actively provide accessible, relevant information to improve public understanding and promote effective prevention strategies.

Furthermore, the high percentage of respondents with postgraduate qualifications reinforces the established relationship between educational attainment and proactive health management. Educated individuals tend to have higher health literacy and are more likely to engage in preventive behaviors, aligning with current literature.<sup>15</sup> Similarly, the overrepresentation of higher-income individuals reflects the socio-economic gradient in health studies, where wealthier populations often have better access to healthcare resources.<sup>16</sup> These findings suggest that stakeholders—especially government agencies—must ensure that frailty awareness efforts also reach lower-income groups. Promoting equitable access to health information is essential to reducing the national burden of frailty-related conditions.

## Health Habits

The respondents demonstrated generally healthy lifestyles, with 75% reporting no chronic illnesses and only 10% identifying as current smokers. These findings align with trends observed among highly educated and affluent groups, and is essential in allowing the government an opportunity to understand that on overall, most people are paying attention to staying healthy. There is an indication that the onset of frailty among the citizens cannot easily be attributed to poor health.<sup>17</sup> Additionally, the high level of physical activity reported—70% of participants engaged in exercise regularly—supports evidence that socio-economic advantages often translate to greater access to recreational facilities and health-promoting resources.<sup>18</sup>

## Perceptions of Health

The majority of respondents rated their health as “good” or “excellent”, further emphasizing the positive association between education and self-rated health status.<sup>19</sup> Moreover, a large proportion of the participants recognized frailty and weakness as significant public health issues, reflecting an encouraging level of awareness. This is another essential finding as in previous research, such awareness has been linked to better outcomes in early detection and management of frailty.<sup>20</sup>

## Opinions on Awareness and Prevention

The respondents’ identification of physical activity and balanced nutrition as key strategies for frailty prevention aligns with evidence from global interventions targeting frailty risk reduction.<sup>21</sup> However, it is important to point out here that there were mixed opinions regarding the adequacy of public awareness campaigns in this study where slightly under half of the participants found them sufficient, while another over half of the study sample expressed uncertainty or dissatisfaction. This finding is of high importance in that it does highlight the need for more inclusive and tailored health campaigns. These campaigns should address diverse demographic needs and overcome barriers to participation.<sup>22</sup>

Encouragingly, almost all participants, as indicated in the results, expressed willingness to participate in awareness programs, signaling a strong potential for community engagement. Studies show that community-based participatory approaches can significantly enhance awareness and promote preventive measures.<sup>23</sup>

## Predictors of Awareness Regarding Frailty Prevention

The logistic regression analysis showed many socio-demographic and health-related characteristics as significant predictors of awareness for frailty prevention. Gender was a significant determinant, with males exhibiting greater likelihood of awareness compared to females, aligning with studies indicating gender discrepancies in health Awareness. The possible reason for this trend is that across the world and similarly to Saudi Arabia, males have more responsibilities for the family towards ensuring safety and good health of every member of the family). Education level also emerged as a significant predictor, with higher educational attainment positively associated with awareness, since these individuals tend to have better access to health information.<sup>24</sup> Additionally, income was linked to higher awareness, with individuals



earning more than 10,000 SAR being more likely to be informed about frailty prevention, reflecting previous findings that higher income often correlates with better access to healthcare and health information.<sup>25</sup>

Health-related characteristics, especially health status, were significant predictors of awareness. Individuals without chronic illnesses and those who assessed their health as good or excellent exhibited a greater awareness of frailty prevention. This corresponds with research indicating that improved health correlates with increased participation in preventative health practices.<sup>26,27</sup> These findings emphasize the necessity of directing health promotion initiatives towards particular socio-demographic groups, especially those with diminished educational attainment, lower income, or poor health status, to improve awareness and support frailty prevention. Tailored campaigns that consider these variables could enhance the effectiveness of public health initiatives.

## Conclusion

This study underscores the substantial impact of socio-demographic determinants on health behaviors, perceptions, and attitudes on frailty prevention. The logistic regression analysis indicated that gender, educational attainment, income, health status, and self-assessed health were significant predictors of awareness. Males, individuals with higher education and income, and those reporting better health showed greater awareness of frailty prevention strategies. Although respondents demonstrated predominantly healthy lifestyles and proactive attitudes, gaps in public health outreach remain, highlighting the need for evidence-based, culturally tailored interventions. Addressing socio-demographic disparities can help reduce frailty-related risks and support broader health promotion and prevention goals in Saudi Arabia. Notably, a primary limitation of this study is its focus solely on participants from Saudi Arabia. Future research could expand to international populations to provide a global perspective. Additionally, the sample size was limited to 1,000 individuals, with a noticeable gender imbalance. Future studies should aim for larger, more diverse samples to enhance representativeness and generalizability.

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## Disclosure

The authors declare no conflicts of interest in this work.

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