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Understanding Factors Affecting Participation Rates and Facilitators of Compliance in Breast Screening Program in the UK: A Cross-Sectional Mixed Methods Study

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Abstract
Globally, breast cancer remains the most commonly diagnosed cancer among women, with evidence indicating that participation rates in the National Health Service (NHS) breast screening program continue to fall below the national target. This study investigates factors influencing participation rates and facilitators of compliance. A cross-sectional, mixed-methods study involved 73 eligible women aged 50–70 living in the UK. Results showed that most participants (97%) regularly attended screening appointments when invited. Four main factors influenced participation: positive screening experiences and regular attendance; awareness of the importance of early detection and family history; fear and anxiety; and accessibility and convenience. Facilitators of compliance included easy, flexible scheduling; convenient locations with parking spaces; a friendly, professional health screening team; a positive first-time experience; and health-related motivations. Reflecting the evolving landscape of the UK, the most notable issue is the lack of ethnic diversity among study participants. Future interventions should address this shift, moving away from generic invitations toward personalized, culturally tailored, data-driven approaches.

Keywords:
breast cancer screening; mammography; screening attendance; screening barriers; NHS breast screening program; patient experience

1. Introduction

Breast cancer continues to increase worldwide. An updated review in 2021 provided insights into this predicament, recording 2.26 million [95% UI, 2.24–2.79 million] new cases in 2020 [1]. The recent study by [2] in 2025 reveals that this situation seems to have worsened, with a major worry being the yearly continuous rise in the number of cases and deaths. In the UK, one in seven women is diagnosed with breast cancer during their lifetime, meaning it is the most common cancer [3]. The NHS breast screening program (NHSBSP) was introduced into England and Wales in 1988 [4]. It is currently available for women aged between 50–70 years (NHS Breast Screening (BSP)) [5]. Cancer Research UK found evidence that suggests the screening program prevents around 1300 deaths each year in the UK [6], and that this could improve with an increase in participation rates within the program. Currently, the breast screening uptake is below the achievable performance threshold in all nations in the UK [6,7]. This research therefore aims to investigate the factors affecting participation rates and facilitators of compliance in the screening program.

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The breast screening program consists of two low-dose mammograms on each breast. Women aged 50–70 are invited for a screening every 3 years by their GP practice. The program was employed to detect early signs of breast cancer, as survival rates are much higher if the cancer is caught early [5,8]. The screening program's primary goal is to diagnose people with breast cancer while it is still curable, in turn reducing deaths from breast cancer [9]. Breast cancer may not exhibit any physical symptoms for a long time; for example, it can take up to three years for a physical mass to form in the breast. The screening program allows for a bank of mammograms to be recorded, so all previous images can be compared with recent images to highlight any changes in the breasts since the last screening. Since 1989, regular breast screening has reduced deaths by 43% [10]. These data emphasize the importance of breast screening to ensure the cancer is caught early enough to commence treatment in time, demonstrating how important it is to attend breast screening every three years. The overall aim of this work was to investigate the factors that affect participation rates and facilitators of compliance in the Breast Cancer Screening Program. Objectives include:

- To identify specific factors that can act as a barrier to participating in the breast cancer screening program.
- To understand facilitators of compliance influencing whether people participate in the breast cancer screening program.
- To provide evidence-based recommendations that would improve participation and compliance, as well as the quality of breast screening services.

1.1. Brief Review of Literature

The decision for women to participate in the Breast Screening Program (BSP) is influenced by multiple factors, affecting the participants' overall decision. A literature review was conducted by [11] that investigated the factors that affect participation rates of the breast screening program, and it highlighted three main themes: psychological and practical factors, ethnicity-related factors, and the influence of socio-economic status. A key strength of this literature review is the integrative approach, which enables it to convey the multifaceted nature of screening behavior. Mottram et al. conducted a systematic review and meta-analysis to determine factors that are associated with attendance of the breast screening program, combining data with numerous international studies [12]. The article reports solid and reliable associations between higher participation rates and favorable socioeconomic indicators, such as higher income and education levels. The use of meta-analysis strengthens the reliability of these results by quantitatively combining data [13]; however, it was noted throughout the study that there was significant heterogeneity, reflecting variations in population characteristics and screening programs. Despite this limitation, [12] is able to provide robust evidence showing that factors that influence participation in the breast screening program can be combined into the following factors: socioeconomic, demographic, and experiential. While [11] provides a broad thematic overview of these factors, [12] adds to this by quantifying their strengths.

Psychological factors play a vital role in the decision to participate in the breast screening program. Fear and anxiety surrounding the breast cancer topic are frequently reported barriers that prevent women from participating. Alongside these factors, other influences such as pain, discomfort, and embarrassment also influence the overall decision of whether to participate [6,7]. A survey conducted by [14] found that of women who did not reattend, most of them reported the previous breast screening appointment to be painful, embarrassing, or distressing. This is a problem with the breast screening program that should be highlighted and prevented, to ensure this is not a factor that prevents women from reattending. Fallowfield et al. [15] investigated the psychological factors affecting women's decisions regarding attendance and reattendance at the breast screening program; however, this study took place in 1990, so it lacks relevance to the present day due to the age of the study. A cross-sectional study by [16] examined participants' knowledge of the risks and benefits associated with breast screening. It was discovered that only 19.5% of participants were able to correctly identify the harms and benefits. It was also found that 56.9% of participants stated they would take part in future screening if they were provided with more information beforehand. Prior research shows that women with false-positive screening results have lower reattendance rates [12]. Additionally, Hafslund et al. [17] found that such results were associated with increased anxiety at recall.

A systematic review conducted by [18] explored the barriers to the breast screening program and any interventions in place to improve the participation among women of Black African and Black Caribbean descent within the UK. The review highlighted multiple barriers, for example, cultural beliefs, fear of diagnosis, and mistrust of the healthcare services. Practical challenges such as language barriers and limited access to culturally appropriate information prior to screening also acted as barriers. Additionally, emotional factors such as fear and anxiety were mentioned in this study. One key strength of this review is its specific focus on UK-based participants, resulting in it having high relevance to the NHS breast screening pro-

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gram. Additionally, a mixed-methods systematic review by [19] investigated barriers to screening among ethnic minority women in the UK, and it supported the findings of [18] in that reducing or eliminating the factors would improve timely screening for these women in the UK.

A review published by BMC Health Services Research investigated women's preferences regarding breast screening [20]. According to the review, concerns about discomfort and radiation exposure played a significant role in the decision of whether to participate. Additionally, it mentioned convenience-related factors, for example, appointment times, waiting time, and travel distance. The article highlights the importance of effective communication prior to screening. An advantage of this review is that it examines screening from a patient-focused perspective; however, the reliance on self-reported opinions might not accurately represent actual scanning behavior. Hutton et al. [21] found that non-attending women identified several key barriers: difficulty accessing convenient appointment times and locations, concern about male mammographers, and anxiety about pain or previous painful experiences.

A cross-sectional study was conducted by [22], which investigated the relationship between having a family history of breast cancer and participating in breast screening. It found that women with a family history had more knowledge around the topic of breast cancer, which then resulted in them having more awareness of breast screening; however, family history alone was not enough to drive people to participate in the screening. Participants in this study were recruited from one medical center in Kuala Lumpur, which limits generalizability to the wider population and to women in the UK.

A narrative review by [23] investigated the effect of male mammographers on screening uptake. A shortage of mammographers limits the number and flexibility of appointments; hiring male radiographers could improve this. However, it was highlighted that this may work better in some countries and within some subgroups of women that fall into the eligibility category for breast screening. However, due to this being a narrative review, this research entails author bias and also relies heavily on some smaller and older studies. However, in contrast to this study, research by [21] found that 28% of participants in that study reported that a barrier to attending breast screening is concern about a man performing the mammogram. In addition to this, it is also important to note the significance of breast screening in males; the study by [24] highlights that screening for men with increased risk of breast cancer, for example due to family history, would be beneficial. Because the NHS breast screening program applies to women only, it will not be included in this study, as it is primarily focused on this program.

A systematic review by [25] examined different interventions in place to improve screening attendance. It found that most interventions had no significant impact on attendance, and that prompts/cues, such as text reminders, were most commonly used to increase attendance. It found that the most successful intervention was problem-solving, which involves identifying barriers to attending screening, establishing practical ways to overcome them, and understanding facilitators of compliance. However, the behavioral theory used in this study was inconsistent, which could affect the reliability of these findings.

2. Methodology

2.1. Study Design

This study employed a cross-sectional approach because it is a relatively affordable method of collecting data [26]. The cross-sectional strategy is a good fit for this research question, as it allows data collection at a specific point in time and is also a faster method [27]. This is beneficial as it increases the practicality, feasibility, and relevance of this study. This method enables secondary analysis if needed, while also allowing for multiple characteristics at once [28]. This is therefore well suited for this research question as it allows for flexibility and greater depth in this research. However, one drawback of this approach is that it does not allow a cause-and-effect relationship to be established, so when looking at recommendations to improve participation rates, it is not possible to see whether they are successful [29]. Nonetheless, this design was most appropriate for the research question as it enables identification of associations between different factors that can affect participation in the breast screening program. This study utilized a mixed-methods approach that entails both qualitative and quantitative data collection. This approach allowed for a more comprehensive understanding of the factors that affect participation in the breast screening program and was selected because it minimizes the limitations of both approaches while utilizing the advantages of qualitative and quantitative research [30]. It enables a solid understanding of complex social phenomena in healthcare that cannot be fully answered by a single-method approach [31].

2.2. Sample Selection and Recruitment

This study focused on women aged 50–70, which aligns with the requirements to participate in the breast screening program (NHS Breast Screening (BSP) [5]. A volunteer sampling method was used to recruit participants for this study, which means participants chose to take part in

the research once they were informed of the research aim and what it involved. This sampling strategy results in a sample group that is willing to participate in the study and is therefore usually dedicated and motivated during the study, compared to other sampling methods. Another reason volunteer sampling was chosen was its ease of data collection, as participants are usually readily available. However, ethics must be considered during this sampling method to ensure participants are fully informed and have consented to take part in the study. Participants were recruited online using social media platforms, and posters were displayed in a local clinic. These recruitment methods provided wide exposure and were free of charge, making it easier to recruit participants.

2.3. Participants and Inclusion Criteria

This study focused on the NHS breast screening program; therefore, the participants were individuals who were eligible for this program. This limited participants to women aged 50–70 who currently live in the UK (NHS Breast Screening (BSP) Program) [5]. This study aimed to obtain 60–80 questionnaire responses. This sample is not fully representative of the whole UK population of women aged 50–70, which in turn will limit the generalizability of the study. However, this sample size is appropriate for the study design and scope, given the time and cost constraints of an undergraduate dissertation. While it is not statistically supported for the large population size, the sample size is consistent with other cross-sectional studies [26,27].

2.4. Data Collection

The data collection method used for this study was a questionnaire (see Appendix A). This was chosen due to the large volume of data it can obtain. Another advantage of this method is that participants remain anonymous, which aligns with the study's ethics. However, a limitation of this method is that it can only collect a limited depth of data from participants compared to other methods, such as interviews or focus groups. Open questions in the questionnaire, which provide qualitative data, increase the depth of information compared to closed questions alone. Research from [32] found that questionnaires should not be open for more than seven days and that 67% of responses are within the first 24 h; based on this, the questionnaire was live and open for a period of seven days to allow for an optimum response rate. The questionnaire consisted of 12 questions, both open and closed, and the secure software 'Jisc Online Surveys' was used to launch the questionnaire. Questionnaires launched online are advantageous as they are a quick and easy way of collecting data; they are also easier for the participants due to the ease of completion [33]. The purpose of the first two questions was to ensure that the participants were eligible for the study by checking that they met the criteria. The use of both open and closed questions in the questionnaire has allowed for both qualitative and quantitative data to be collected, which ensures a deeper understanding of participants' views and opinions. Other methods were considered, for example, interviews or focus groups; however, these methods are time-consuming and also result in interviewer bias, which is hard to overcome and can reduce the validity of the study. Another reason these methods were not chosen was the large sample size that needed to be obtained to allow for a true representation of the wider population.

2.5. Data Analysis

One advantage of using a questionnaire is that the data collected is easier to analyze compared to other methods of data collection. With the mixed data collected, the data was separated and underwent data analysis first. For the quantitative data, the authors used descriptive statistics to describe and analyze the data, as they provide insights through graphs and numerical summaries. These graphs were generated directly from the Jisc survey to allow the data to be visualized when discussing the results in relation to the literature. For the qualitative data, both descriptive statistics and thematic analysis were used, so that the data is organized and easier to manage, while retaining a high level of detail. After both sets of data were analyzed, they were reviewed collectively to identify relationships or connections across the data [34]. Thematic analysis was chosen over content analysis as thematic analysis was more suited to the study's aims and objectives. Thematic analysis aims to identify themes and how they relate to one another, whereas content analysis aims to identify themes and then interpret them.

2.6. Ethical Considerations

Gaining ethical approval before conducting any research is essential to ensure that the study meets ethical standards and guidelines [35]. Before any data collection, the study received ethical approval from the Health Sciences University (HSU) Radiology Ethics Panel, Bournemouth, UK, on 16 January 2026, with Ethical Approval Number: HRS-2025-LovYH. Before consenting to the study, participants were provided with study information, which included the background of the study, what the study involves, any risks associated with taking part in the study, confidentiality, and that participation is not mandatory. All of this is important to allow for full consent to be provided before participation in the study [36]. After completing the

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questionnaire, participants were given a debrief information sheet containing information on what would happen to the results, further information on the topic area, and a link to sources of further support, if needed. Once the data had been collected, all of the results were stored on a password-protected device, on a secure server (Jisc), and deleted once no longer required.

3. Results

3.1. Characteristics of Participants

A total of 73 participants completed the questionnaire. All participants reported they were registered as female at birth and between the ages of 50–70, which is consistent with the eligibility criteria of the NHS breast screening program. Participants were distributed across two age groups: 90% were between 50–60 years of age, and 10% were between 61–70 years of age. In terms of ethnicity, the majority of the respondents identified as White British (93.1%), and others identified as White other (5.5%) and mixed ethnic group (1.4%). Participants were also asked whether they had a family history of breast cancer. 29% of respondents reported a family history of breast cancer, while 68% of participants had no known family history and 3% did not know. See Figure 1 below.

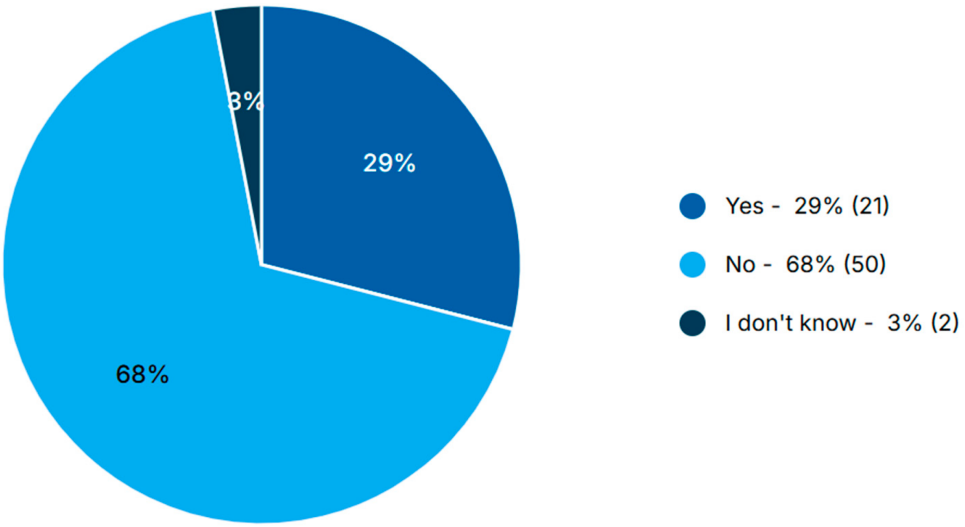

Figure 1: Percentage of participants who reported a family history of breast cancer.

3.2. Screening Invitation and Attendance

Participants were asked whether they had been previously invited to attend breast screening. 90% of respondents had been invited to breast screening before, compared to 10% who had not been invited before. Among those who had been invited, attendance patterns differed. 97% of respondents reported attending their screening appointment every time, compared to 1.5% who sometimes attended and 1.5% who had never attended. Those who had previously attended were then asked when they last attended; 59% had attended within the last year, with 32% having attended 1–2 years ago and 9% more than 2 years ago. See Figure 2 below.

3.3. Factors Encouraging Attendance

Respondents were asked to identify factors that encouraged them to attend the breast screening appointments. From this question, the main themes that were highlighted were detecting any problems early (97% of participants reported this), looking after their health (86% of participants reported this), and belief that screening was worthwhile (83% of participants reported this). Other frequently selected motivators included the feeling of reassurance (77% of participants reported this), wanting peace of mind (72% of participants reported this), and reminder texts, letters and calls (58% of participants reported this).

Less frequently selected motivators included convenient appointment times, support/encouragement from family and friends, and a recommendation from a GP or another health professional. It was also noted that having personal or family medical history from either themselves or family was a contributing factor as to why they participated in the breast screening program. See Table 1 below.

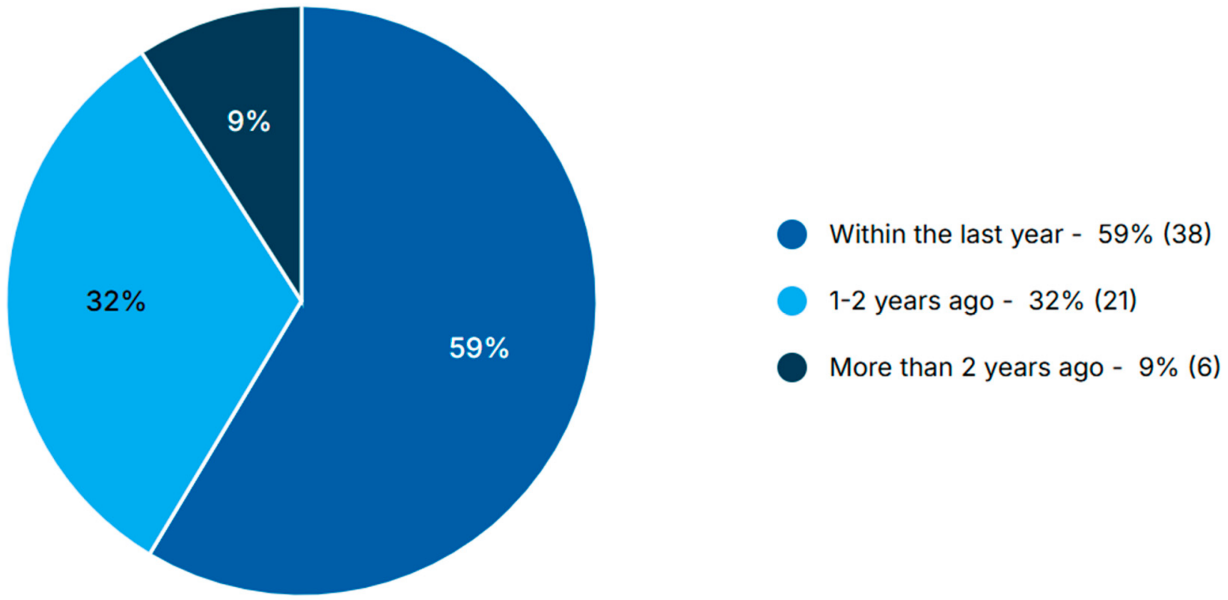

Figure 2: Percentage of respondents by time since their last attendance at the breast screening clinic.

Table 1: Factors that encourage respondents to attend breast screening.

Question: "8. What, if anything, encourages you to attend breast screening? Please select all that apply." Total Responses: 65			
S. No.	**Option**	**Count**	**Percentage**
1	To look after my health	56	86%
2	To detect any problems early	63	97%
3	Recommendation from my GP or another health professional	12	18%
4	Reminder letters, texts, or calls	38	58%
5	Support or encouragement from family or friends	8	12%
6	Convenient appointment times	19	29%
7	A screening location that is easy to get to	38	58%
8	Previous positive experience with screening	20	31%
9	Belief that screening is effective and worthwhile	54	83%
10	Feeling reassured by getting checked	50	77%
11	Wanting peace of mind	47	72%
12	I go because it's part of routine health care	33	51%
13	Nothing encourages me to attend	0	0%
14	Other (please specify)	3	5%

3.4. Barriers to Screening Attendance

Participants were additionally asked to identify factors that could make it difficult to attend a breast screening appointment. 18% of respondents who answered this question reported that appointment times not suiting their needs were a contributing factor, and 14% of respondents reported that the screening location was a barrier to screening attendance. Psychological barriers were also reported; for example, 7% of respondents felt embarrassed or uncomfortable during the procedure, and 4% reported anxiety or fear about the screening results, both of which acted as barriers to attending. 64% of participants said that nothing would make it difficult for them to attend the screening program. See details in Figure 3 below.

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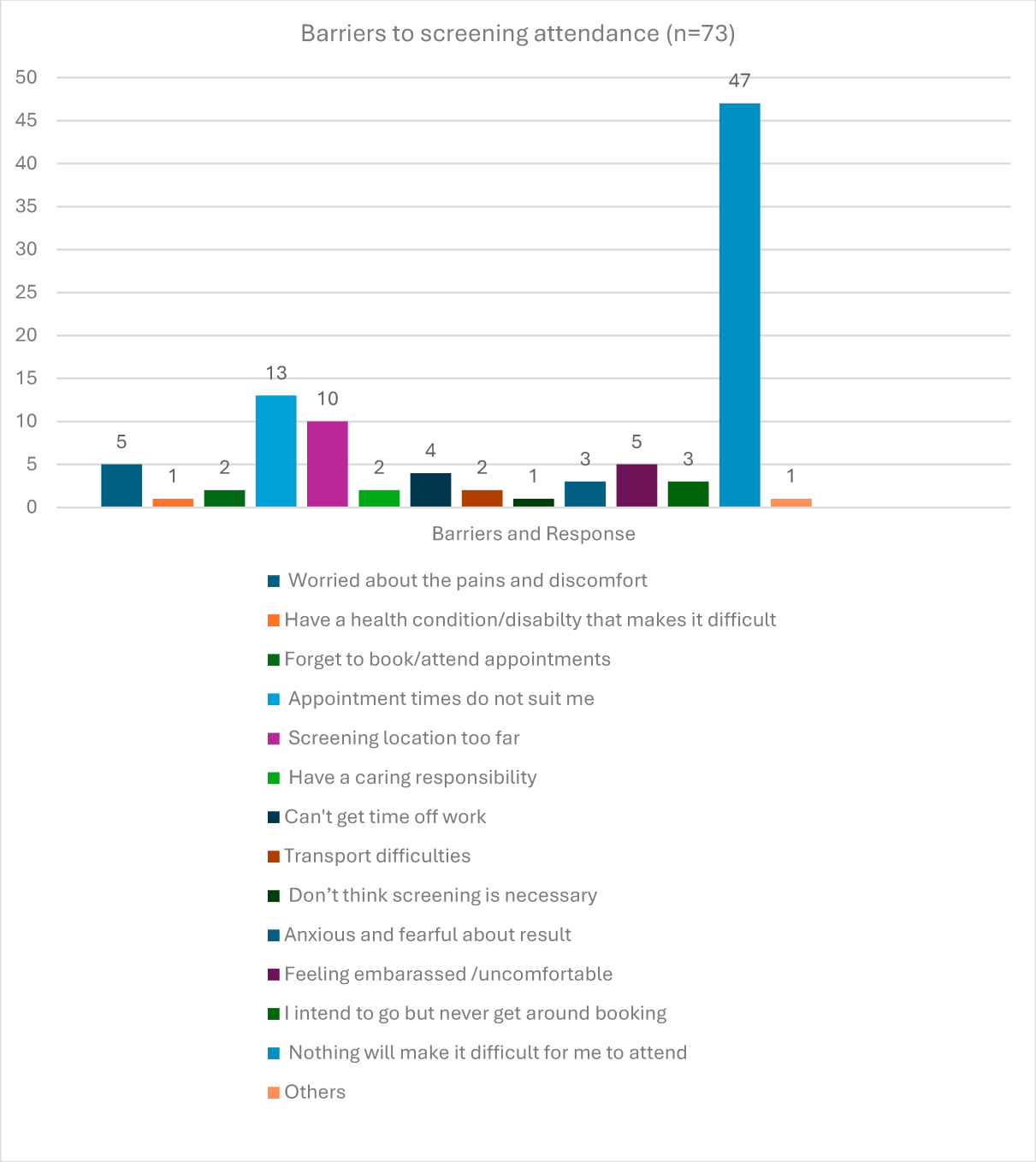

Figure 3: Responses obtained from all study respondents regarding barriers to screening attendance. Please note that the following categories recorded zero responses and, thus, are not displayed: confusing screening information, uncertainty about what screening involves, lack of someone to accompany the participant, cultural/religious reasons, preference not to think about cancer, and previous negative screening experience.

3.5. Factors Influencing Screening Decisions

Participants were asked to indicate how likely several factors were to influence their decision to attend the screening program. Recommendations from their general practitioner (GP) (86%) and invitation letters (95%) were identified as the most important factors in the overall decision to participate in the screening program. Fear of radiation and harm (7%) and previous painful/uncomfortable screening (17%) were reported as least likely to influence the decision to attend breast screening. Other factors that gained

mixed views on how likely and not likely they were to influence the overall decision included anxiety about the results, caring responsibilities/time constraints, and distance/transport availability (Appendix B). These results suggest that both practical and psychological factors play a role in screening behavior.

3.6. Factors That Could Improve Attendance

Respondents were asked what would encourage them to attend screening appointments. In terms of high-ranking interventions, it was reported that 52% of respondents felt that appointment reminders, for example, letters, texts, and calls, would encourage them, and 41% would like more flexible appointment times, e.g., evenings or weekends. Other interventions highlighted included instructions or reminders that make booking easier (38% felt this would be helpful), being offered appointments closer to home or work (37% felt this would be helpful), and messages that emphasize the benefits of early detection (34% felt this would be helpful). A few other suggestions included information that addresses worries about pain and discomfort (26%), personalized information about one's risk (25%), being able to speak to health professionals to ask questions (25%), information about how screening reduces risk of late diagnosis (25%), a more private and comfortable screening environment (14%), and hearing that others have had positive experiences (10%) (see Appendix B for details).

3.7. Qualitative Data Findings

Throughout the questionnaire, four main themes were clearly highlighted:

- Positive experiences and regular attendance

Positive experiences and established habits of regular attendance acted as powerful psychological and operational facilitators for ongoing breast screening uptake and compliance, directly reducing health anxieties and building trust in clinical services. Welcoming environments (clean, private, and respectful clinic layouts encourage women to return and speak positively about the service to peers), staff interactions (compassionate, respectful, and clear communication from practitioners minimizes feelings of vulnerability and personal embarrassment), procedural comfort (efficient appointments that allot extra time for anxious patients reduce the impact of physical discomfort or pain during a mammogram) strongly predict future participation by turning screening into a normalized preventative health behavior. The responses obtained below support this:

"*always had a very positive experience and would recommend others to go*",

"*always been a positive experience*",

"*I have had previous experiences with breast screening, and I've been very impressed with my waiting time to be seen. The nurses and doctors have been very thorough and understanding and explained everything*",

"*I have only been called to one routine screening and the staff were wonderful, and it encouraged me to make the time to go when called, and to reassure my friends and to encourage them to attend*",

"*the staff are always lovely and discreet, which helps in attending*",

"All were very helpful, considerate and understanding; never had an issue"

"*I've attended twice and found it fine each time. The ladies at the screening center were lovely both times*".

"*I attended my first breast screening yesterday; it was a very positive experience. Everything was clearly explained throughout the process, and I felt confident in the people carrying out the screening. I have to travel further as my local screening location is not accessible to wheelchairs; this did not deter me. It was an easy process to change to an accessible location*".

One of the respondents mentioned having a variable experience during her screening visits, noting that radiographer experience and reception experience are crucial factors affecting compliance with screening programs, saying, *"Experience on the day has been quite variable. It's noticeable when you are being seen by an experienced radiographer and when not. The reception experience is important too. A smile and a little kindness go a long way. Please treat everyone as if it is their first visit*".

- Importance of early detection and family history

Awareness of early detection and a positive family history strongly motivate women to attend regular breast screening, acting as vital cues to action that increase personal risk perception and adherence to mammography appointments. One of the participants who unfortunately lost her mother to breast cancer made a poignant statement, saying "*breast screening is so important. Maybe if it was around 30 years ago, my mother would still be alive.*"

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- Fear and anxiety

Anticipation of physical pain or discomfort from breast compression during the procedure, anxiety about a potential cancer diagnosis, fear of facing potential lifestyle and treatment impacts if cancer is found, concerns about radiation, and high levels of unmanaged emotional distress may lead to avoidance or delayed appointments (though mild worry can occasionally motivate action in individuals with high perceived risk).

One participant stated, "*kind and friendly staff are reassuring; however, the fear of the pain is still an influencing factor. The concern around the effect of radiation on developing future cancers caused by the screening*". Another said, "*some mammograms more painful than others*". Also, "*the anxiety of waiting for a phone call*" was mentioned, although the participant did recognize the care and empathy received, as well as the well-rehearsed procedure, which was impressive. Notably, participants who were fully aware of the health benefits did not consider pain a barrier to attendance. One said "*I've been for two screenings, and found the process straightforward. Bit sore having your boobs squished but very very worth it for peace of mind*". Another, who has had mammograms nearly every 3 years, said, "*I have very small breasts which can make it more painful I believe. I would rather endure that momentarily and be healthy and catch things early*". However, one of the respondents did not see the procedure as painful, saying, "*only had one so far, the staff were lovely and I had no pain whatsoever. For someone who has CPTSD, I was put at ease and felt comfortable with the procedure*".

- Accessibility and convenience

Accessibility and convenience are vital factors that facilitate breast screening attendance, primarily driven by close geographic proximity, flexible scheduling options, and mobile mammography units. Removing logistical hurdles and reducing waiting times directly increases participation rates among eligible populations. These points are reflected in several responses. One of the participants said, "*in my experience, it's been in supermarket car parks, which is absolutely fine. The more screening, the better I say*". Another participant with a similar experience said, "*it's all been straightforward to attend, and at convenient locations with easy parking*". Two other participants shared a similar experience, the first saying, "*always been dealt with kindly, ease of location and convenience of times, and always got results when said*", and the second saying, "*I've been impressed with my waiting time to be seen*". Regular breast screening attendees made some comments which could well be seen as facilitators of compliance. One of them said, "*always had a good experience of booking and availability*". Another participant added, "*the availability of the mobile service rather than attending a general hospital*". Another said, "*I find my invites to attend every timely and easy to reschedule*". Another participant also said, "*Appointments have always been easy to attend*".

3.8. Summary of Findings

Overall, the results indicate that participation in breast screening is high within this sample, with most of the participants attending appointments regularly when invited. It is highlighted that regular attendance is facilitated by several factors, namely:

i. Ease of booking and rescheduling
ii. Use of mobile service
iii. Convenient locations with parking spaces
iv. Friendly and experienced team
v. Professional care and reassurance about fears/anxieties
vi. Positive first-time experience
vii. Health-related motivations

While very few barriers were reported, practical and psychological concerns were identified as reasons people did not attend screening. There are clear improvements that can be made to the program, including flexible appointment times, better communication, and appointment reminders to support a further increase in participation rates.

4. Discussion

This study aimed to investigate the factors affecting participation rates and facilitators of compliance in the NHS breast screening program. The overall results of the study suggest that within the sample of 73 participants, 97% of those reported consistent attendance with the screening program. However, a number of influencing factors were identified, including practical, psychological, and informational aspects. Even though this study reported high attendance at screening, this might not be representative of the wider population, as screening uptake is still below the target level according to Cancer Research UK [6,7]. It is also important to note that there was a clear skew towards 50–60 years of age within the participants of the study, which may have influenced the findings, limiting the generalizability of the results to the older group of participants, 61–70 years of age. In the UK, the NHS breast cancer screening program automatically invites anyone registered as female with a GP for their first mammogram at the age of 50. After the initial appointment, routine scans continue every three years until a person turns 71. Automatic invitations stop after age 71, which is why the upper age

limit for this research was 70, but people over 71 can still call their local unit to request a screening. There is also an expectation that anyone who notices unusual breast symptoms or has a family history contacts the GP, where screening may begin earlier, rather than waiting for a routine screening invitation [37]. In other countries such as the United States, many parts of Europe, Asia, and Africa, routine breast cancer screening programs tend to start earlier, at 40 years of age, on a biennial or annual basis, reflecting a global debate over balancing early detection against dense tissue challenges and false positives.

According to studies [38,39], screening between the ages of 40 and 74 resulted in more life-years gained and more breast cancer deaths averted. While the screening age of 50 is currently the standard in the UK due to a higher overall cancer prevalence after age 50 in this region, the growing early onset of breast cancer in other parts of the world and the increased migration of these populations to the UK highlight the need to reassess current strategies to ensure effective disease control and reduction of breast cancer-related mortality. In general, the results of the study align with the broader literature, confirming that participation in breast screening is influenced by a combination of socioeconomic, psychological, and practical factors [12]. However, studies by [18,19] both highlight ethical and cultural barriers to attending screening, findings not replicated in this study. This is likely due to the lack of ethnic diversity in the study participants, with 93.1% being White British; geographic location may also have been a major factor. In addition, awareness and access are limited, as minorities appear to be less frequently informed about ongoing studies or local networks due to socioeconomic pressures. This includes inflexible work hours and intense caregiving duties, both common in deprived neighborhoods, which significantly reduce breast screening awareness and uptake among minority women [40]. There is a need to design interventions and policies to reduce inequalities in screening uptake and breast cancer outcomes for minority populations, as there is a current gap in this area.

The results showed that several factors facilitated compliance with screening activities. The easy and flexible nature of booking and rescheduling of appointments was one of the factors. The significance of communication and flexibility, for example, invitation letters and multiple appointment times, was a strong influence on attendance decisions. This supports research by [21], which found that increasing the availability of appointment times increased breast screening attendance. Additionally, increased communication through multiple appointment reminders, rather than one-time invitations, is beneficial.

Another motivating factor mentioned was convenient screening locations and availability of parking for attendees. Data from the Department for Transport National Travel Survey [41] show that 71% of women aged 17 and older in the UK hold a license, a figure that has risen by nine percentage points over the last two decades, making parking space an important consideration. To fully achieve convenience and increase uptake in screening programs, mobile mammography units constitute a major requirement for any intervention. Developing partnerships with major supermarkets (e.g., Asda, Tesco, Aldi, Lidl) wherein mammography screening vans are positioned directly in high-footfall, familiar areas with abundant free parking is a key facilitator that improves attendance and compliance by removing travel and parking barriers. Locating mobile units near local GP practices or community hospitals also minimizes travel distances for patients. These measures align with the findings of [42], which reported a 22% increase in screening uptake among women who had previously missed their breast screening appointments. This aligns with research from [20] and is also highlighted by [12], which examines whether those with higher socio-economic backgrounds are more likely to attend screening due to greater flexibility and access to transport.

Again, participants' first-time experience with the screening team seems to be a deciding factor for compliance with screening initiatives. A positive first encounter with health staff directly builds patient trust and boosts future participation, with several factors noted by [43,44] shaping this initial impression, such as empathetic staff attitudes, professional care and reassurance, clear communication, and a welcoming facility environment. From the results, it was clear that participants expressed the feeling of reassurance and peace of mind as motivators for participating in screening. This aligns well with research from [11,15], both of which identified that psychological factors play a vital role in participation in screening. As well as reassurance and peace of mind, it was reported that there was anxiety, embarrassment, and fear around breast screening. This supports the findings of [14,17], which identified the psychological effects of breast screening, including anxiety and embarrassment, as contributing factors. Even though these factors were identified as barriers to participating in screening, they were less influential than expected, with 97% of participants still attending regular breast screening. It was also reported that fear of radiation and pain were minimal concerns, which contrasts with a study from [21] and could indicate improved patient education and advancements in screening in recent years. Ritchie et al. [16] found that only a minority of participants in five European countries fully understood

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the risks and benefits of screening, highlighting a significant gap in public education. The high attendance rates revealed by this study could stem from trust in the healthcare system and habitual compliance rather than fully informed decision-making. This is important as it raises the question of whether participation in breast screening equates to informed consent. It is worthwhile to consider clinical imaging mechanics and approaches that promote pain-free mammograms. These include open communication with the technologist to adjust the positioning and compression speed to the patient's comfort level, over-the-counter pain relievers before appointments, positioning alterations, reduction in caffeine/sodium intake (as these can increase breast tenderness and water retention), and wearing a padded sports bra after the procedure.

The last factor found in this study that drives screening compliance concerned health-related motivations, specifically fear of disease, perceived personal risk, and the importance of early detection. According to [45,46], early detection has two major components: the first being breast health education and screening to recognize symptoms to promote early diagnosis. The second is early detection of risk factors and high-risk individuals, which may help prevent disease onset or moderate the disease course, thereby decreasing associated disease burden. Early detection in breast cancer management is crucial, as it leads to less invasive treatments, improved quality of life, higher treatment success rates, and better overall health outcomes. The findings of this study align with research from [9], which discusses how early diagnosis is a fundamental benefit of the screening program, indicating family history as a factor, with 29% of participants reporting a family history of breast cancer. However, participants without a family history still reported high attendance rates, suggesting that family history is not a major factor affecting participation rates. This is consistent with previous research from [22] that found that family history helps increase knowledge and awareness of screening but does not always increase participation in screening. Moreover, the literature shows that education and sensitization on risk factors directly improve patient compliance with breast screening programs by increasing health literacy, reducing fear, promoting better lifestyle modifications and proactive self-examinations, and motivating early detection habits [47,48]. A knowledge gap around fear of radiation still seems evident among a few women in this study.

Nonetheless, it is imperative to recognize the glaring radiography workforce shortage and the requirement that only females perform mammography in the UK, protected under the Equality Act 2010. According to the Society of Radiographers [49], the UK faces a critical radiography workforce shortage, with vacancy rates nearing 20% for breast screening and symptomatic mammographers. Despite recent calls to allow male radiographers to help ease these shortages, UK regulations still designate this as a single-sex service requiring female-only staff. While there has been debate around relaxing the rule to allow male radiographers to conduct examinations (similar to other sensitive areas of medicine, such as obstetrics), and despite acknowledgment of the immense strain this requirement puts on resources, this has unfortunately not resulted in official changes. The NHS and professional bodies should engage and actively implement strategies to expand workforce provision and address these severe staffing shortfalls. These include introducing an apprenticeship route for a mammography associate or support-worker role, task shifting, and expanding training places for diagnostic radiographers (through apprenticeships and traditional undergraduate degrees) to meet growing demand.

4.1. Implications to Practice

Understanding factors affecting participation rates and facilitators of compliance in the breast screening program in the UK provides a crucial framework for evolving public health delivery. By combining quantitative data on demographic participation with qualitative insights into female screening experiences, the study highlights that clinical compliance is not merely a matter of patient choice, but a complex intersection of structural, emotional, and cultural variables.

A primary clinical implication of the study is the necessity to transition away from one-size-fits-all communication models to increase screening uptake among ethnic minority groups and socioeconomically deprived neighborhoods, as these groups were severely underrepresented in this study. While the geographic location of the local clinic may have been a challenge, recruiting participants online via social media platforms also demands structural adaptations in how breast screening services are offered, as these women often face inflexible working hours, childcare dependencies, and high travel costs. This calls for NHS mobile breast screening units to be data-driven. This implies that instead of positioning mobile vans based purely on historical convenience, clinical leads should cross-reference geographic information system (GIS) mapping with regional low-uptake data. Most of these underrepresented populations belong to communities where cancer carries significant social stigma or fatalistic beliefs; practitioners should collaborate with trusted local ambassadors, faith leaders, and grassroots organizations to normalize conversations surrounding asymp-

tomatic screening. Parking mobile units directly outside community centers, supermarket hubs, or local places of worship directly addresses travel poverty and reduces physical access friction. There is also a need for commissioners to implement multilingual, culturally tailored health literacy campaigns, including utilizing diverse media formats for invitation, such as short message service (SMS) reminders containing direct, translated visual links to brief educational videos detailing the mammography procedure.

Furthermore, this study's findings mandate a shift from generic invitation systems toward personalized, community-centric, and highly accessible service delivery. This reflects the evolving UK breast screening framework, from a passive system of 'inviting' to an active ecosystem of 'engaging'. Optimizing scheduling by offering pre-booked evening and weekend appointments, rather than auto-assigning rigid daytime slots that often trigger high cancellation rates, will benefit working women, especially those in minority groups. Enhancing systems to send out multiple reminders and increasing the availability and flexibility of appointment times would be an effective way to increase attendance. Thus, this approach should be adopted alongside providing convenient locations with parking spaces and a dedicated, friendly screening team.

Again, this study recognized the significant impact that a positive first-time experience has on compliance with breast screening initiatives. Because fear of physical pain, loss of femininity, and feelings of exposure often drive non-compliance, the role of the mammographer should expand beyond technical execution to trauma-informed, person-centered care. All women attending screening should be treated as if it were their first time, showing empathy and care, and maintaining clear communication. Therefore, to enhance the patient experience, mammographers should receive advanced communication training focused on emotional regulation, ensuring they can actively de-escalate patient anxiety during the highly vulnerable moments immediately preceding the scan.

4.2. Limitations of Study

The first limitation of this study was that most participants regularly attended breast screening appointments. This could be due to self-selection bias, whereby individuals who engage with healthcare services are more likely to participate in the study. This bias is important to consider when interpreting the data; for instance, the low reporting of barriers like fear and discomfort may not represent the broader population. Studies that focus on non-attenders, for example, [18], reported more significant psychological and cultural barriers. While this study complements the studies of [18] by being skewed toward attenders, the limited number of non-attenders limits the ability to be generalized to the whole population. However, it provides a balanced view toward achieving an objective reality of the situation, which is crucial for making evidence-based decisions. The lack of ethnic diversity within the sample is another limitation, with 93.1% being White British. This highlights the absence of certain subgroups, restricting applicability to more diverse populations [50]. According to the study by [19] on research barriers in ethnic minority groups, the lack of these findings in this study is due to the lack of diversity in the study and does not indicate that the barriers are unimportant, but rather that they could not be assessed in these groups. Additionally, the cross-sectional design limits the ability to draw causal conclusions. An example is that, while the study found reminders beneficial, it cannot say whether they actually increase breast screening attendance; this would require a longitudinal study. Finally, the study relies on self-reported data. This could introduce potential social desirability bias and recall bias [51].

5. Conclusions

This study aimed to investigate the factors that affect participation rates and facilitators of compliance in the NHS breast screening program. Overall, the results show that participation is influenced by both psychological and practical barriers. Key motivators of compliance were ease and flexibility around booking, appointment reminders, convenient locations with parking spaces, use of mobile vans, positive first-time experience, attitudes of the health screening team, professional care and reassurance, and health-related motivators. By directly addressing structural barriers, personalizing communication, retraining frontline staff in trauma-informed clinical care, and embedding screening triggers into daily primary care, the NHS can systematically close the inequality gap, increase compliance rates, and optimize early cancer detection.

List of Abbreviations

BMC	BioMed Central
BSP	Breast Screening Program
CPTSD	Complex Post-Traumatic Stress Disorder
GP	General Practitioner
GIS	Geographic Information System
HSU	Health Sciences University
NHS	National Health Service

NHSBSP	National Health Service Breast Screening Program
SMS	Short Message Service

Author Contributions

Conceptualization, investigation, formal analysis, resources, and writing—original draft: H.W.; validation, supervision, formal analysis, data curation, writing—review and editing, and visualization: V.C.N.; Methodology, supervision, and project administration: S.S. All authors have read and agreed to the published version of the manuscript.

Availability of Data and Materials

The datasets are available from the corresponding author on reasonable request.

Ethics Committee Approval

Before any data collection was undertaken, the study received ethical approval from the Health Sciences University (HSU) Radiology Ethics Panel, Bournemouth, UK on 16 January 2026, with Ethical Approval Number: HRS-2025-LovYH. Before consenting to the study, participants were provided with information about the study background, what it involves, any risks associated with taking part, confidentiality, and that participation is voluntary.

Human Rights Statement

The authors confirm that the study was conducted in accordance with the Declaration of Helsinki, developed by the World Medical Association.

Consent for Publication

All study respondents who participated in this study read the debrief page and consented to participate in the study before proceeding to the remaining aspects of the questionnaire.

Conflicts of Interest

The authors declare no conflicts of interest.

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AI Declaration

The authors declare that no AI tools or AI-assisted technologies were used in writing, editing, analysis, or preparation of this manuscript. All content was solely created and reviewed by the authors, who take full responsibility for its accuracy and originality.

Supplementary Materials

Supplementary materials (Appendix A: Questionnaire Template; Appendix B: Summary of Data Collection and Analysis) have been published online and are available at https://www.scifiniti.com/3105-0123/1/2026.0005.

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