



Research article

Recruitment strategies for cervical cancer screening in three Mediterranean low and middle-income countries: Albania, Montenegro, and Morocco

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Abstract: *Introduction:* Cervical cancer (CC) poses a substantial burden in low-and middle-income countries (LMICs), where challenges in implementing effective screening programs and achieving high participation rates persist. *Aims:* This study sought to compare different strategies for recruiting women for CC screening in Albania, Montenegro, and Morocco, and compared usual care (ongoing invitation method) with an alternative approach (intervention strategy). *Methods:* Within each country, the following comparisons were made: face-to-face (FF) invitations versus phone calls (PCs) in Albania, PCs versus letter invitations in Montenegro, and FF invitations to women attending healthcare centers versus a combined approach termed “Invitation made in Morocco” (utilizing PC and FF for hard-to-reach women) in Morocco. Questionnaires that assessed facilitators and barriers to participation were administered to women who either attended or refused screening. *Results:* In Albania, significant differences in the examination coverage were observed between the invitation

methods (PC: 46.1% vs. FF: 87.1%, $p < 0.01$) and between the rural and urban settings (rural: 89.1% vs. urban: 76.3%, $p < 0.01$). In Montenegro, the coverage varied based on the recruitment method (PC: 17.7% vs. letter invitation: 7.6%; $p < 0.01$), the setting (urban: 28.3% vs. rural: 13.2%; $p < 0.01$), and age (<34 years: 10.9% vs. 34+: 9.6%, $p < 0.01$). In Morocco, no significant differences were observed. Common screening facilitators included awareness of CC prevention and understanding the benefits of early diagnosis, while key barriers included a limited perception of personal CC risk and the fear of testing positive. *Discussion:* FF appeared to be effective in promoting participation, but its broader implementation raised sustainability concerns. PC invitations proved feasible, albeit necessitating updates to population registries. Restricting FF contacts for hard-to-reach communities may enhance the affordability and equity.

Keywords: cervical cancer; screening; low-and middle-income countries; recruitment; participation; barriers; facilitators

Abbreviations: CC: Cervical cancer; EuMedCN: European Mediterranean Cancer Network; FF: Face-to-face; HICs: High-income countries; HPV: Human Papilloma Virus; IMM: Invitation made in Morocco; LMICs: Low-and middle-income countries; PC: Phone call; WHO: World Health Organization

1. Introduction

Cervical cancer (CC) stands as the fourth most frequently diagnosed cancer and the fourth cause of cancer-related mortality among women globally [1]. Alarming, approximately 90% of CC cases (mainly locally advanced and metastatic carcinoma of cervix) and premature deaths occur in low-and middle-income countries (LMICs) compared to high-income countries (HICs) [1,2]. Moreover, Human Papilloma Virus (HPV) infection is the most common causative etiology for CCs in LMICs [3].

Primary prevention, notably through HPV vaccination, and secondary prevention measures such as screening have proven effective in reducing CC incidence and mortality [2]. Nevertheless, their implementation has exhibited significant heterogeneity [2]. Indeed, HPV vaccination coverage remains limited in LMICs, with less than 30% of countries providing vaccination services [4]. Similarly, only 20% of women in LMICs have undergone prior screening examinations, in contrast to the over 60% observed in HICs [5].

While most HICs boast well established CC screening programs, the healthcare systems in LMICs have to face several challenges, hindering their ability to offer effective and sustainable services due to deficiencies in technical, human, and financial resources [5]. However, implementation remains disjointed even in LMICs with active programs, and participation rates are low, influenced by several organizational and individual factors [6–8]. Noteworthy organizational factors include aspects such as program structure, modes of recruitment, accessibility, infrastructures, procedures for the return of results, and connections to further assessments and therapy. All these aspects pose particular challenges in LMICs due to shortages in population registries, resource constraints, and the scarcity of adequately trained healthcare professionals [6–8]. Additionally, individual determinants, such as CC awareness, and socio-cultural and religious barriers exert a substantial influence on screening participation [6–8].

With respect to the CC burden, the World Health Organization (WHO) launched the “Global Strategy to Accelerate the Elimination of Cervical Cancer as a public health problem” in November 2020, outlining ambitious targets to be achieved by 2030 [9]. These goals include ensuring that 90% of girls are vaccinated by the age of 15 years, 70% of women are screened by 35 and again by 45 years, and 90% of women diagnosed with CC receive high-quality treatments [9]. The attainment of these targets is particularly challenging in LMICs [5].

Since 2010, a multidisciplinary network (EuMedCN) was launched, which gathered experts in cancer control, national health authorities, and international organizations; this supported the implementation of effective and sustainable cancer screening programs across the Mediterranean region. This network holds potential significance in bolstering the WHO’s ambitious strategy [10]. EuMedCN encompasses cancer experts from Mediterranean HICs, specialists and professionals from non-EU Balkan countries, and Northern African and Middle Eastern states bordering the Mediterranean Sea [10].

Three countries (Albania, Montenegro, Morocco) belonging to the aforementioned network were selected for a trial with the primary objective of evaluating women’s participation in CC screening using different recruitment strategies [11]. The secondary objectives include investigating the main barriers and facilitators for either attending or refusing CC screening invitations. Within the EuMedCN countries, these three areas were selected due to their availability to be involved in the trial, their robust CC epidemiological framework, the presence of ongoing pilot screening projects, and a steadfast political commitment to cancer prevention. Thus, Albania, Montenegro, and Morocco emerged as optimal environments to pilot and analyze the organizational complexities in inviting women for CC screenings. This paper presents the trial’s results.

2. Materials and methods

This study, conducted during the pre-COVID-19 period (2017–2019), aimed to investigate CC screening practices in Albania, Montenegro, and Morocco, with a focus on comparing the “*usual care*” (ongoing invitation) to an “*intervention strategy*” (alternative approach) in each country. Notably, Montenegro had an established CC screening program, while Albania and Morocco only had pilot/local experiences. The diverse screening organization, settings, study periods, invitation modalities, tests, and study protocols across the countries are illustrated in Table 1. In particular, the specific target populations, varying across the three countries, were identified and mutually established with the respective country leaders. The decision to focus on a narrower target population, rather than adopting the broader one recommended by the International Guidelines, is attributed to both the experimental nature of the trial and the constrained economic, structural, and personnel resources.

The identification of the more appropriate comparator with the standard invitation procedure was the result of detailed discussions and evaluations with stakeholders and screening managers in the three regions. The identified solutions were those that encountered acceptability, feasibility, and affordability criteria from both the health operators and the women’s point of view. In Albania, the traditional FF invitation by community nurses was compared to PCs, which is a direct and proactive approach that has been seen as an effective strategy to encourage female attendance to CC screening. In Morocco, FF was compared with a specifically designed strategy, named “*invitation made in Morocco*” (IMM), which primarily relied on PC invitations and, if unsuccessful, employed home visits. In Montenegro, where an active screening program was already in place, it was agreed to

juxtapose the usual care via phone contacts with a personalized invitation letter, as in many HICs. Sending a personalized invitation letter holds the potential to extend the program outreach and achieve a wider coverage of the target population in a cost-effective manner, requiring fewer time and personnel resources.

Table 1. Screening characteristics and study protocol by country.

Country	Setting (Study period)	Age	Invitation list (source)	Screening test	Usual care	Intervention strategy (comparator)
Albania	Fier District (Jan–Dec 2017)	30–49 years	General Practitioner	HPV-test	Face to face	Phone call
Montenegro	Podgorica (Nov 2018–Feb 2019)	30–36 years	Montenegrin Health Insurance Fund Informatics System	HPV-test	Phone call	Personalized letter
Morocco	Tangier Kenitra Marrakech (Jan 2018–Feb 2019)	30–49 years	Anti-tetanus vaccination	Visual inspection with acetic acid (VIA)	Face to face	Invitation-made in Morocco

The criteria to declare women as “not reached” were established based on the number of unsuccessful attempts in each arm (after two home visits in the FF arm and in case of incorrect phone numbers or after three unsuccessful attempts in PC arm). Additionally, this alternative approach, which is inherently proactive, could enhance the interaction with subjects, ultimately resulting in improved communication.

The exclusion criteria at the moment of the test included the following: pregnant women from the eighth month onward, those who had not engaged in prior sexual activity, individuals with a history of hysterectomy, and those with a previous CC diagnosis and/or treatment.

A supplementary qualitative analysis involved anonymous questionnaires to assess the participation barriers and facilitators, and employed a 5-point Likert scale. Women who refused screening (at least 30%) completed the barriers’ questionnaires, while all screening attendees were provided the facilitators’ forms. Additionally, their satisfaction with the invitation strategy and intentions for future screening participation were investigated among all questionnaire respondents.

2.1. Statistical analysis

The study involved a sample size of 2000 women in Albania, 2000 women in Montenegro (with a balanced representation of 1000 from rural areas and 1000 from urban areas), and 1800 women in Morocco (600 from each province, encompassing both urban and rural areas). Data acquisition involved local entry, and subsequent anonymized transmission to the Coordinating Centre for analysis. Endpoints of interest encompassed various steps of the screening process:

1. Women reached: expressed as a proportion of the eligible population, this parameter served as an indicator of practicability.

2. Women scheduling a screening appointment: representing the intention of women to participate in CC screening, this metric was calculated as a subset of women reached.

3. Women tested: reflecting the actual participation, this metric was derived as a subset of the women reached.

4. Examination coverage: a comprehensive parameter denoting the proportion of women screened out of the eligible population, providing insights into the quality of the screening process.

The individual pathways were assessed 3.5 months subsequent to the invitation, which was a time interval agreed upon with local providers and was considered sufficient for a woman to decide whether to comply with the screening invitation within the study period.

Further stratified analyses, specific to the setting and age groups, were exclusively conducted for Albania and Montenegro. These analyses were not applied to Morocco due to the strategy adopted for data collection, which did not include absent women.

The questionnaire analyses involved a grouping strategy, which combined the responses of “*not at all/slightly*” and “*moderately*” versus “*very/extremely*” for the relevant metrics. Descriptive statistics, two-sample independent t-tests, and χ^2 tests were deployed for the quantitative analyses. Statistical computations were executed using STATA v. 15, thus ensuring robust analytical methodologies.

2.2. Ethics approval of research

Ethical considerations adhered to the principles of the Helsinki Declaration and national legislations, thus ensuring detailed information dissemination and obtaining written informed consent from all participants. Three distinct protocols were introduced, each tailored to specific areas, carefully developed with contextual diversities in mind, and inspired by collaborative decision-making with local stakeholders. Each Ethical Committee approved the trial. Qualitative questionnaires were collected in anonymous.

3. Results

3.1. Statistical analysis

3.1.1 Albania

In Albania (Table 2), the comparison between “usual care” (FF) and the “intervention strategy” (PC) involved 1996 women (urban: 996, 49.9%; rural: 1000, 50.1%). Due to the non-updated phone numbers, a 1:1 randomization was not feasible, and women without a correct phone number were assigned to the usual care arm. This resulted in 711 (35.6%) women being recruited through PC and 1285 (64.4%) being recruited through FF, with an unbalanced distribution between the two arms. This issue was particularly relevant in rural areas (PC: 17.7%; FF: 82.3%), while balancing was maintained in urban contexts (PC: 53.6%; FF: 46.4%). The mean age of the invited women was 41.6 ± 5.7 years.

Usual care, represented by FF invitation, proved to be more effective across multiple parameters:

1. Reaching (FF: 96.9% vs. PC: 67.5%; $p < 0.01$);
2. Screening scheduling (FF: 98.3% vs. PC: 87.1%; $p < 0.01$);
3. Testing (FF: 89.9% vs. PC: 68.3%; $p < 0.01$);
4. Examination coverage (FF: 87.1% vs. PC: 55.8%; $p < 0.01$).

Differences were noted by setting for reaching, screening scheduling, testing, and examination coverage, with rural areas consistently exhibiting higher rates ($p < 0.01$). No significant age-related differences were observed ($p > 0.10$).

3.1.2. Montenegro

In Montenegro (Table 2), the usual care (PC) was compared to the intervention strategy (invitation letters), which involved 1758 women (urban: 1000, 56.9%; rural: 758, 43.1%). Following randomization, 876 women (49.8%) were contacted by phone and 882 (50.2%) were contacted by letter. The mean age of the invited women was 32.7 ± 2.2 years.

The invitation letters exhibited a higher reachability (65.2% vs. PC: 52.2%; $p < 0.01$), while PC demonstrated higher rates for screening scheduling (53.4% vs. letter: 14.4%; $p < 0.01$), testing (33.9% vs. letter 11.7%; $p < 0.01$), and examination coverage (17.6% vs. letter 7.6%; $p < 0.01$). The urban areas consistently outperformed the rural areas across all steps ($p < 0.05$ or $p < 0.01$). Age-related differences were noted for scheduling, testing, and examination coverage, which were all higher in younger women (<34 years) ($p < 0.01$).

3.1.3. Morocco

In Morocco (Table 2), the usual care involved an opportunistic FF invitation for women that attended local healthcare centers, while the intervention strategy employed IMM, inviting women by phone, and with FF visits if they were not reachable.

In Morocco, a random sample of women from the vaccination archives were selected for the intervention strategy (IMM), whereas an equal number of women that accessed health centers for other reasons formed the opportunistic group. Due to the nature of this comparison, randomization was not feasible.

A total of 1854 women participated, which were distributed across Kenitra (32.4%), Marrakech (35.3%), and Tangier (32.4%). The recruitment was comprised of 947 women (51.1%) through opportunistic FF and 907 (48.9%) with IMM.

No significant differences were observed for screening scheduling between FF (93.7%) and IMM (92.8%). All women that were reached through IMM were tested, thus ensuring congruence between the intention and the actual participation. The examination coverage was high, with no disparities by the recruitment strategy (FF: 93.7% vs. IMM: 92.8%; $p > 0.10$).

3.2. Questionnaires on barriers or facilitators

The subjects were presented with either a barriers' questionnaire if they declined the screening invitation or a facilitators' questionnaire if they accepted. The demographic characteristics of the respondents are delineated in Table 3.

3.3. Barriers' survey

In the context of the barriers' survey, the participants were instructed to complete the form directly during the recruitment process (either through PC or FF interactions), while those that received the

invitations by letter underwent a secondary contact phase via phone. Among individuals that declined the screening invitation, the questionnaire acceptance rates were 35.3% in Albania, 31.9% in Montenegro, and 80.0% in Morocco, which was notably higher. While no disparities in the questionnaire return were discerned in Albania and Montenegro concerning the recruitment strategy and age, a conspicuous discrepancy in the setting was evident in Montenegro (urban: 7.5% vs. rural: 52.2%, $p < 0.01$).

The respondents to the barriers' questionnaire exhibited marked distinctions across countries concerning socio-demographic features, including education, marital status, and health insurance (Table 3). In Montenegro, the predominant cited barrier was recent testing (87.0%), with other reasons being infrequently mentioned. In Morocco and Albania, the prevalent refusal factors included fear of testing positive (43.9% and 37.8%, respectively), a limited risk perception (35.6% and 37.8%, respectively), and embarrassment (42.0% and 22.4%, respectively). Across all countries, a negligible percentage of women (<5%) declined the screening due to their husband's advice, health problems, or concerns about fertility. Notably, irrespective of screening refusal, the invitation strategies were highly esteemed (>90%) in all settings.

Table 2. Cervical cancer screening pathway by country and type of recruitment.

Country	Usual care n (%)	Intervention strategy n (%)	p*
Albania (n = 1996)	Face-to-face	Phone call	
Target population	1285	711	
Women reached	1245 (96.9)	480 (67.5)	<0.01
Women accepting	1224 (98.3)	418 (87.1)	<0.01
Women tested	1119 (89.9)	328 (68.3)	<0.01
Examination coverage	1119 (87.1)	328 (46.1)	<0.01
Montenegro (n = 1758)	Phone call	Invitation letter	p*
Target population	876	882	
Women reached	457 (52.2)	575 (65.2)	<0.01
Women accepting	244 (53.4)	83 (14.4)	<0.01
Women tested	155 (33.9)	67 (11.7)	<0.01
Examination coverage	155 (17.7)	67 (7.6)	<0.01
Morocco (n = 1854)	Face-to-face	Invitation made in Morocco	p*
Target population	947	907	
Women reached	947 (100)	907 (100)	>0.10
Women accepting	887 (93.7)	842 (92.8)	>0.10
Women tested	887 (93.7)	842 (92.8)	>0.10
Examination coverage	887 (93.7)	842 (92.8)	>0.10

*Note: $p < 0.01$, reported in bold are considered statistically significant.

Table 3. Socio-demographic information of women refusing or accepting the invitation for cervical cancer screening.

	Women refusing screening n. (%)			Women accepting screening n. (%)		
	Albania (n = 195)	Montenegro (n = 107)	Morocco (n = 100)	Albania (n = 1495)	Montenegro (n = 219)	Morocco (n = 839)
Recruitment						
Usual care	105 (53.8)	105 (85.4)	68 (68.0)	1104 (77.5)	153 (72.5)	412 (49.1)
Intervention	90 (46.2)	18 (14.6)	32 (32.0)	321 (22.5)	58 (27.5)	416 (49.6)
Setting						
Urban	153 (78.5)	11 (10.6)	55 (55.0)	545 (38.2)	151 (72.2)	386 (46.0)
Rural	42 (21.5)	93 (89.4)	45 (45.0)	880 (61.8)	58 (27.8)	453 (54.0)
Age (years)	40.7 ± 3.2	33.0 ± 2.1	38.0 ± 5.0	40.8 ± 3.2	31.7 ± 2.2	38.4 ± 6.2
Education						
Elementary school or less	36 (25.4)	11 (10.3)	74 (74.8)	552 (37.5)	15 (6.9)	605 (74.1)
High school	86 (60.6)	68 (63.6)	20 (20.2)	624 (42.4)	87 (39.7)	158 (19.3)
College/University	20 (14.1)	28 (26.2)	5 (5.1)	296 (20.1)	117 (53.4)	54 (6.6)
Marital status						
Married	137 (92.6)	90 (84.1)	80 (82.5)	1391 (94.0)	135 (61.9)	754 (98.1)
Separated/divorced	3 (2.0)	5 (4.7)	8 (8.2)	31 (2.1)	10 (4.6)	28 (3.6)
Single	1 (0.7)	11 (10.3)	6 (6.2)	21 (1.4)	71 (32.6)	14 (1.7)
Widowed	7 (4.7)	1 (0.9)	3 (3.1)	37 (2.5)	2 (0.9)	4 (0.5)
Health insurance						
None	36 (25.3)	2 (1.9)	32 (33.7)	862 (58.3)	5 (2.4)	185 (23.0)
Private	20 (14.1)	33 (30.8)	2 (2.1)	291 (19.7)	48 (22.6)	26 (3.2)
Social	86 (60.6)	72 (67.3)	61 (64.2)	325 (22.0)	159 (75.0)	594 (73.8)

3.4. Facilitators' survey

The screened women were tasked with completing a facilitators' questionnaire, with acceptance rates of 98.5% in Albania, 98.6% in Montenegro, and 45.2% in Morocco. No discernible differences in the questionnaire return were identified in Albania and Montenegro based on setting ($p > 0.10$) and age ($p > 0.10$). However, in Montenegro, a pronounced disparity by recruitment method was observed (PC: 98.7% vs. letter: 79.1%, $p < 0.01$).

Similar to the barrier's questionnaire, the respondents to the facilitators' survey displayed notable disparities by country concerning socio-demographic features (i.e., education, marital status, and health insurance) (Table 3). Common facilitators included awareness of the importance of cancer prevention (over 94% in all countries), understanding the impact of early treatments to improve the prognosis (Albania: 69%, Montenegro: 95%, Morocco: 98.1%), and trust in the local healthcare systems (Albania: 80%, Montenegro: 77%, Morocco: 85%). Self-perception of CC risk was low in Balkan countries (Albania 21.9%, Montenegro 10.7%), but more substantial in Morocco (56.1%), particularly among non-schooled women (60.0% vs. 51.0%; $p < 0.01$) and in urban areas (68.7% vs. 43.0%; $p < 0.01$). The experienced invitation strategies were highly regarded, even among the screened women (>95%). Additionally, the respondents favourably evaluated organizational factors (e.g.,

waiting time, facilities, cleanliness) and the healthcare professionals' skills (as technical and communication). The majority expressed an inclination to participate in CC screening again if invited (Albania: 97.3%, Montenegro: 94.0%, Morocco: 99.6%).

4. Discussion

This study delved into locally-adapted recruitment strategies in regions characterized by notable CC epidemiology, with a prerequisite of at least a pilot CC screening presence [10]. The selection of tested approaches prioritized feasibility and affordability. Given the recognized impact of the methodologies on uptake [12–14], the testing of alternative strategies and the comprehensive evaluation of barriers and facilitators in LMICs became crucial to ensure the equitable provision of screening services.

It is noteworthy that the majority of studies that explored CC screening recruitment methods have predominantly focused on HICs [12–14], with a limited number of experiences conducted in LMICs, outlying mixed results [15,16]. In HICs, the effectiveness and widespread use of invitation letters have been well documented [12,13,17]. While this strategy has been demonstrated to be feasible and effective in some LMICs [15], the current absence of randomized trials has introduced a notable gap [18].

In the current study, the implementation of invitation letters was found to be scarcely feasible, primarily due to the shortage of up-to-date population registries, impeding the identification and the contact of the complete target population. In particular, in Albania, the local providers highlighted that women were not accustomed to receiving healthcare letters through home mail, whereas phone numbers had been more readily available for previous engagements with the local healthcare system [10]. Similarly, in Morocco, previously reliable phone numbers were accessible from the most recent national tetanus vaccination lists. Consequently, in Albania and Morocco, uncertainty regarding the accuracy of the addresses would likely have resulted in many undelivered letters. For these reasons, PC was deemed as a more practicable option. In contrast, in Montenegro, where a population screening program involving PC was already in place, the acceptability and feasibility of implementing a more structured recruitment strategy, such as using letters of invitation, has been considered a viable alternative approach.

As anticipated, a prevalent barrier encountered in our study was the unavailability and poor update of various contact details, encompassing both phone numbers and addresses. This finding aligns with a recent Armenian study wherein only 60% of eligible women could be successfully reached [15]. In Albania, the incorrectness of over 20% of the phone numbers accounted for the observed imbalance between the two study groups, which is a trend similarly noted in Montenegro, where more than 12% of the contact details were missing. In contrast, Morocco exhibited a less severe occurrence of missing information, attributed to the existence of a comprehensive national tetanus immunization registry with a coverage exceeding 95%.

Defining the study population is a crucial step that can impact the success of the study. In our trial, the preselection within the eligible population was unavoidable due to the constraint of only reaching women with accurate contact information, even though this may have hampered the equity of the program. In Morocco, the usual care arm employed an opportunistic FF approach, wherein CC screening was exclusively offered to women already visiting healthcare centers. This selection criterion could elucidate the notably high acceptance observed in this setting. However, the process of randomization ensured the reliability of the comparisons, although generalizations should be approached with caution.

Considering reachability, the most effective approaches were FF in Albania and invitation letters in Montenegro; alternatively, in Morocco, no discernible differences emerged. The limitations of PC included incorrect contact details and the inability to reach a substantial portion of the population. In Montenegro, despite invitation letters yielding better outcomes, the results were sub-optimal, with approximately 35% of letters remaining undelivered. In Morocco, IMM, which primarily involved phone contacts, demonstrated promising results by reserving the more expensive FF contacts exclusively for unreachable women (less than 5%).

Intentions for CC screening were higher for FF in Albania, PC in Montenegro, and were equivalent in both arms in Morocco. The decline from intention to actual testing remained consistent in the PC groups (Albania: -18.8%; Montenegro: -19.5%), irrespective of the available reminders and the option for rescheduling appointments. This parameter exhibited variations among countries, with more favorable outcomes in Albania (82.3%) and Morocco (93.3%), while being significantly lower in Montenegro (18.8%).

Regarding the actual participation, the most effective strategies were as follows: FF in Albania (90% vs. PC: 68%; $p < 0.01$) and PC in Montenegro (34% vs. letter: 12%, $p < 0.01$); and in Morocco, no significant differences were observed, with both groups surpassing 90%. The success of the FF strategy in Albania was anticipated, given the interpersonal trust established through contacts with healthcare professionals, which was a trend corroborated by a recent study in Brazil [19].

The observed differences in the indicators between the urban and rural settings aligned with previous literature that outlined such disparities [20,21]. The recruitment approaches played a substantial role in shaping these variations. In Albania, better outcomes were identified in rural areas, likely linked to the trusting relationships with healthcare professionals in these communities [20,21]. Conversely, in Montenegro, higher participation rates were found in urban areas, potentially attributable to a greater CC awareness [20,21]. Notable differences in the women's attendance rates between the rural and urban settings highlighted the need for practical solutions to increase the screening utilization and reduce barriers in rural areas.

The examination coverage varied among the different recruitment strategies: FF demonstrated a higher coverage in Albania (FF: 87.1% vs. PC: 46.1%), PC showed a higher coverage in Montenegro (PC: 17.6% vs. letter: 7.6%; $p < 0.01$), and no significant differences were seen in Morocco. The efficacy of FF, in achieving a higher examination coverage, underscores the importance of direct communication with healthcare professionals, particularly for women with limited CC awareness. However, the cost associated with FF remained a challenge [22]. In this context, PC emerged as a promising strategy to enhance both the participation and the affordability, albeit requiring an update of archives to achieve an optimal coverage.

While both tested modalities (FF vs. IMM) proved effective in Morocco, limiting invitations to women already visiting healthcare centers raised equity concerns. However, IMM could offer an encouraging solution to reach all eligible women. The low experienced coverage in Montenegro, albeit consistent with national data [9,10], emphasized the necessity for additional awareness initiatives.

The qualitative questionnaires revealed an overall satisfaction and favorable attitudes toward CC screening in all countries. The identified facilitators and barriers aligned with those found in investigations across other LMICs [23–25]. Given the established role of CC education programs to increase the screening knowledge and participation [26], the implementation of similar initiatives should be considered.

The strengths and limitations of the study should be acknowledged. A notable strength lies in the testing of recruitment strategies in countries where screening services were in their early stages. All protocols were adapted to the context and collaboratively developed with local stakeholders and healthcare professionals. Despite challenges in the data collection, the study rigorously analyzed the recruitment strategies through multiple step-by-step assessments, providing a comprehensive evaluation for optimizing screening. Lastly, the common membership of the involved countries to a shared screening network can be instrumental in disseminating findings across the Mediterranean area.

However, certain limitations need to be considered. A common challenge was the lack or limited updating of the information archives, resulting in a significant portion of the study's sample being unreachable, limiting the generalizability and undermining the equity of the proposal. Furthermore, obtaining reliable data in LMICs is challenging, which is exacerbated by the information systems' scarcity and the reluctance of local healthcare professionals to collect and provide data to monitor the healthcare processes. Finally, the study exclusively tested traditional contact modalities (letter, PC, or FF), while the exploration of new technologies could be beneficial, particularly in LMICs [27,28].

5. Conclusions

The pursuit of a uniform recruitment strategy for all LMICs appears both impractical and unfeasible, given the complex interplay of diverse local factors that necessitate careful consideration. Invitation strategies facilitating direct contact with healthcare professionals (FF and PC) have shown better outcomes. These approaches provide comprehensive and reliable information, building trust and encouraging women to engage in screening, particularly in regions with limited awareness of CC prevention. However, their sustainability is questionable, especially for the FF approach, which considered time, economic, and personnel constraints to scale up the efforts. Therefore, while these strategies may not be viable for the entire target population, it could be reserved for hard-to-reach groups.

For these reasons, a sustainable approach could foster collaborations with professionals across different healthcare sectors, specifically those specialized in women's health, including maternal and child health. In this direction, family physicians could play a crucial role in informing and sensitizing women about CC prevention. Moreover, a partnership with prominent voluntary associations to sustain awareness on CC and broader women's health issues could actively promote health education and support women grappling with this cancer.

Attaining higher cancer screening coverage and participation in these regions demands a robust political commitment coupled with a multidisciplinary approach. A fundamental prerequisite to foster equity in these contexts is the establishment of complete and regularly updated population registries. Population-based registries are pivotal to enhancing patient care programs. Consequently, it is imperative for LMICs to prioritize investment in the planning and development of such registries, facilitating the implementation of modern and effective screening initiatives.

Furthermore, the integration of new technologies, such as mobile health interventions and leveraging social media platforms, warrants careful assessments due to their inherent attributes of cost-effectiveness and expansive reach. These technological innovations present promising avenues for promoting increased participation in cancer screening initiatives.

In this endeavor, international networks can play a pivotal role by offering substantial support to cancer screening providers. These networks facilitate the exchange of knowledge among their

members and contribute to the capacity building efforts, thus enabling the implementation of more contextually appropriate and effective screening services. These synergies are instrumental in navigating the complex and heterogeneous landscape of CC screening in LMICs, addressing the unique challenges posed by diverse regional contexts.

Use of AI tools declaration

The authors declare they have used an Artificial Intelligence (AI) tool (ChatGPT) in the creation of this article for improving the English language.

Author contributions

Camussi Elisa: statistical analysis, writing, review & editing; Jaramillo Lina: study design, statistical analysis, writing; Castagno Roberta: writing, review & editing; Dotti Marta: writing; Ferrante Gianluigi: writing, review & editing; Belakhel Latifa: study design, writing, review & editing; Chami Khazraji Youssef: study design, writing, review & editing; Ylli Alban: study design, writing, review & editing; Filipi Kozeta: study design, writing, review & editing; Ostojić Đurđjica: study design, writing, review & editing; Stanisić Milica: study design, writing, review & editing; Bisanti Luigi: writing, review & editing; Giordano Livia: study design, validation, writing, review & editing, supervision. All authors have read and approved the final version of the manuscript for publication.

Conflict of interest

The authors report there are no conflicting interests to declare.

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