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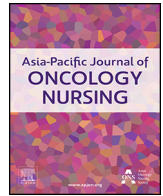
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Review

Roles and activities of nurses in cancer prevention and early detection in low- and middle-income countries: A scoping review

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ABSTRACT

Objective: Nurses play a crucial role in cancer control. Prior reviews presented the effectiveness of nursing interventions such as tobacco cessation counseling and cervical cancer screening but did not focus on low- and middle-income countries (LMICs). This scoping review addresses a gap in the literature by describing the roles and activities of nurses in cancer prevention and early detection in LMICs.

Methods: Following Arksey and O'Malley's scoping review framework, we searched seven databases using subject headings and keywords from 1990 to January 2021 and updated in April 2022. The reference lists of relevant studies were also searched. Two reviewers independently screened the relevance of studies through Rayyan, assessed full text articles, and extracted data using a Google Form. Conflicts were resolved by a third reviewer.

Results: A total of 180 studies were included, representing all six World Health Organization regions and 48 LMICs. The largest number of studies were from the African region ($n = 72$), the Americas ($n = 49$), and South-East Asia region ($n = 29$). The main nursing roles featured were patient/community education ($n = 113$), history taking and cancer risk assessment ($n = 63$), performing screening exams ($n = 136$), care coordination ($n = 57$), and training other healthcare professionals ($n = 9$).

Conclusions: This scoping review provides a comprehensive picture of nurses' role in cancer prevention and early detection in LMICs, across all six World Health Organization regions. Additional cancer workforce data sources at the country level are needed to fully understand the activities of nurses in cancer prevention. Future research is also needed to measure the impact of nursing educational and other interventions in both primary and secondary cancer prevention.

Introduction

In 2020, there were over 19 million people diagnosed with cancer and nearly 10 million deaths attributable to cancer globally.[1] In low-and middle-income countries (LMICs), where cancer incidence is expected to grow by 60% by 2030,[1] and where availability of cancer treatment is limited, prevention and early detection of cancer is especially critical. LMICs are classified by the World Bank based on gross national income. These classifications as of 2021 included 28 low-income countries, 54

low-middle income countries, and 54 upper middle-income countries.[2] In 2020, the most frequent cancers in LMICs were breast, cervical, colorectal, lung, liver, stomach, and oral cancers, with prevalence varying by sex and income settings.[1] Given the growing burden of cancer in LMICs, and an emphasis on preventable cancers, nursing interventions for primary prevention (ie, lifestyle changes, vaccination, etc.) and secondary prevention/early detection (ie, screening and early diagnosis) of cancer are an essential part of cancer control. According to the State of the World's Nursing 2020 report, nurses make up approximately 59% of the

health workforce globally.[3] An effective nursing workforce is essential to achieving the Sustainable Development Goals 3.4 and 3.8, focused on reducing the burden of NCDs, including cancer, and achieving universal health coverage, respectively.[3] There is growing attention to the need for an effective and skilled global oncology nursing workforce in hospital settings,[4] but this role is underdeveloped in LMICs compared to high-income countries (HICs) due to limited access to specialized training. Globally, much of nurses' contribution to cancer control and care is at the community and primary level of care and outside of the oncology nurse specialist role. Given worldwide nursing shortages, which disproportionately impact people and health systems in LMICs,[3] there is a need to maximize the effectiveness of current generalist nurses, alongside efforts to grow and retain a skilled oncology nursing workforce in low-resource settings.[3],[5].

The State of the World's Nursing Report, produced by the World Health Organization (WHO) in 2020, cites evidence of the effectiveness (in terms of patient satisfaction and health outcomes) of health services delivered by nurses in improving outcomes for both noncommunicable diseases (NCDs) and communicable diseases. Nurses impact patient outcomes through critical clinical decision-making in direct care to patients as well as through activities in health promotion and disease prevention in their communities and primary health facilities.[3] At the same time, the report highlights the global shortage of nursing, which is especially dire in LMICs, and the need to support existing nurses with adequate education and training and ongoing workplace support. The report includes cancer among NCDs in terms of targets for improving health outcomes but has relatively little detail with regard to cancer. Nurses' role is mentioned in cervical cancer prevention through delivering HPV vaccine and performing cervical cancer screening.[3]

Early in the COVID-19 pandemic in 2020, in recognition of the WHO-designated Year of the Nurse and Midwife, a Lancet series showcased global oncology nursing.[6] Young et al. presented an overview and case exemplars of nurse roles and responsibilities across the cancer care continuum in both HIC and LMIC settings. The authors presented evidence of the effectiveness of nursing interventions such as tobacco cessation counseling and in cervical cancer screening but were not focused exclusively on prevention nor on LMICs. To address this gap in the literature, the purpose of this scoping review was to describe the roles and activities of nurses in cancer prevention and early detection in LMICS.

Methods

Design

The objective of this review was to identify the gaps in the existing literature of nurses' roles and activities in cancer prevention and early detection in LMICs. To achieve this goal, we conducted a scoping review, following Arksey and O'Malley's methodological framework, as scoping reviews are commonly used to determine research gaps in existing literature.[7] The Arksey and O'Malley methodological framework provides a comprehensive and systematic approach to scoping reviews, which can help ensure that the review is conducted in a rigorous and transparent manner. It has been widely used in scoping reviews and has been found to be adaptable to a range of research questions and contexts.[8] Thus, to ensure the rigor of this scoping review, we followed the five stages of Arksey and O'Malley's methodological framework, namely, (1) identifying the research question, (2) identifying relevant studies, (3) selecting studies, (4) charting the data, and (5) collating, summarizing and reporting the findings.[7] This scoping review was registered with OSF (protocol#: OSF.IO/AP6ZE; https://doi.org/10.17605/OSF.IO/AP6ZE).

Identifying the research question

The following research question guided this scoping review: What is known from the existing literature about the roles and activities of nurses in the prevention and early detection of cancer in LMICs?

Identifying relevant studies

In consultation with authors EL, OG, and WKWS, DV, a senior medical librarian trained in systematic review methods, developed a search strategy of subject headings and keywords. The search terms "nurses," "prevention," "detection," "cancer," and "low- and middle-income countries" were combined in each database using both free-text terms and Medical Subject Headings (MeSH) where available. PubMed/Medline (Ovid), Embase, the Cochrane Library, the Cumulative Index to Nursing and Allied Health (CINAHL), Global Health (Ovid), APA PsycInfo, and Web of Science Databases were searched from 1990 to January 2021, and updated in April 2022. An extensive PubMed search was constructed and then adapted to run across each of the database platforms for databases listed above (Supplementary file: Search Strategy). Citation tracking was conducted from included references.

Inclusion criteria were that studies must (1) discuss the role of nurses, (2) include cancer, (3) include cancer prevention or early detection, and (4) include an LMIC. There were no language limits; Google translate was used to translate articles published in languages other than English. Studies were excluded if they focused on health professionals other than nurses (nurse-midwives were included), involved aspects of the cancer care continuum other than prevention (treatment, survivorship, symptom management, palliative care), or if they were focused only on HICs. Review papers were also excluded but reference lists were reviewed for relevant studies.

We devised a search strategy to find published studies or reports that featured nurses' (at any level of preparation due to the diversity of settings) activities in prevention and early detection of cancer in LMIC settings. Primary prevention of cancer is defined as any measures that help people choose healthy behaviors to lower their risk of developing cancer such as education and counseling activities related to cancer prevention as well as administering vaccines. Secondary prevention of cancer refers to any tests to detect a cancer in its earliest stage such as regular examination, cancer screening, and early diagnosis as well as treatment of precancers.

Selecting studies

Data were exported from EndNote to Rayyan, a web-based systematic review management program. The updated search was managed using Covidence, a more robust systematic review program. After removing the duplicates, all data were screened by a minimum of two authors (EL, DV, SO, RS, BX, QC, MA, and AA), and EL and DV resolved all conflicts. All records that met the first round of inclusion criteria by screening the titles and articles were transferred to Excel, and two authors were assigned to assess full-text articles against the inclusion and exclusion criteria. Regularly scheduled meetings were held to discuss any conflicts related to the screening, and consensus was reached after discussions and consultations with a senior expert.

Charting the data

The Google Form was used to extract the data. After discussion among the research team, the following data from the included studies were presented in an extraction table (Supplementary Table 2): study country/ies, study setting, article type, cancer type, level of prevention, the type of primary or secondary prevention, and the roles of nurses. Each included article was extracted by two authors independently. The data from the Google Form were then transferred to Google Sheets for comparison and clean-up of extracted results. Any issues or discrepancies related to the data extraction were resolved during the regularly scheduled meetings.

Collating, summarizing, and reporting the findings

Based on the extracted data, we summarized the characteristics of the included studies, including the WHO region to which the study country

belongs, the article type, the study setting, cancer type, and level of prevention. Regarding the nurses' roles, we summarized an overview of nurses' roles in primary and secondary prevention of cancer in LMICs. Moreover, given the predominant focus on nurses' role in secondary prevention in the reviewed studies, we sought to categorize in more detail the description of nurses' roles in cancer screening and early detection. Nurses' roles in training and research were also summarized. We reported this scoping review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation.[9]

Results

Search results

The PRISMA diagram showing the flow of the literature search is presented in Fig. 1 (see also Supplementary file: Prisma ScR Fillable Checklist). A total of 10,820 records were retrieved. After removing 1934 duplicates, we excluded 8462 records by screening titles and abstracts and 244 by reviewing full texts. Finally, 180 studies were included in this scoping review.

Characteristics of the included studies

Table 1 presents the characteristics of the included studies. The largest number of studies were from the African region ($n = 72$), followed

by the Americas ($n = 49$) and South-East Asia ($n = 29$). The majority of included studies were empirical: 76 quantitative studies, 44 feasibility/pilot studies, 24 qualitative studies, and 8 mixed methods studies. Among 111 studies that noted a specific geographic setting, 51 studies were conducted in urban/periurban areas, 39 studies in rural areas, and 20 studies involved both urban and rural settings. A variety of cancer types were included, but the majority of studies focused on cervical cancer ($n = 120$) or breast cancer ($n = 43$). The majority of studies featured nurses' role in secondary cancer prevention ($n = 153$), while only a few studies featured the role of nurses in primary cancer prevention ($n = 13$) or both ($n = 11$). Supplementary Table 2-1, 2-2, 2-3 provides a comprehensive overview of all included studies that were conducted in 48 LMICs. Given the large number of included studies, individual studies are not cited directly in the narrative but are cited in Supplementary Table 2-1, 2-2, 2-3 with a list of references directly following the table.

Overview of nurses' role in primary and secondary prevention of cancer

Supplementary Table 2-1, 2-2, 2-3 outlines individual study findings regarding the roles of nurses in primary (Supplementary Table 2-1 and 2-3) and secondary prevention (Supplementary Table 2-2 and 2-3) of cancer in the different regions. Of the comparatively few studies that focused on primary prevention, 23 studies discussed nurses' roles in community and patient education, three focused on tobacco cessation counseling, and nine on administering HPV vaccine. The main nursing roles/activities featured in the studies overall were patient/community
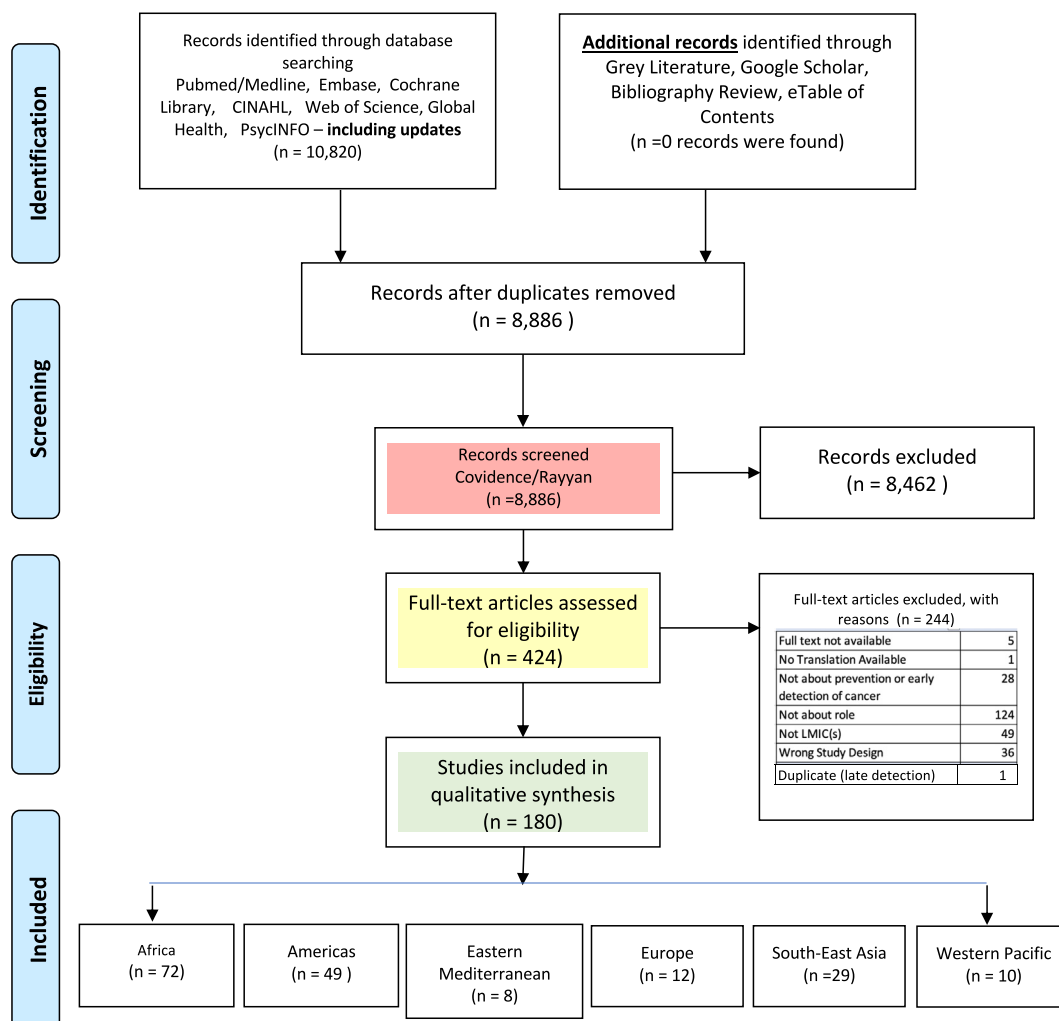

Fig. 1. PRISMA flow diagram.

Table 1
Summary of the study characteristics (*N* = 181).

Characteristics	*n* (%)
WHO region	
Africa	72 (40)
Americas	49 (27)
Eastern Mediterranean	8 (4)
Europe	12 (7)
South-East Asia	29 (16)
Western Pacific	10 (6)
Article type	
Quantitative studies	76 (42)
Feasibility/pilot studies	44 (24)
Qualitative studies	24 (13)
Mixed methods studies	8 (4)
Program reports	24 (13)
Discussions/commentaries	4 (2)
Study setting	
Urban/peri-urban areas	51 (28)
Rural areas	39 (22)
Both urban and rural settings	20 (11)
Not specify	70 (39)
Cancer type[a]	
Cervical	120 (66)
Breast	43 (24)
Skin	8 (4)
Colorectal	5 (3)
Oral	4 (2)
Prostate	2 (1)
Lung	1 (0.5)
Pediatric cancer	2 (1)
Hereditary cancers	3 (2)
Not specify	6 (3)
Level of Prevention[b]	
Primary cancer prevention	13 (7)
Secondary cancer prevention	153 (86)
Both primary and secondary cancer prevention	11 (6)

WHO, World Health Organization.
[a] *n* > 180 as some studies featured multiple cancer types.
[b] *n* = 177 as some studies had multiple manuscripts.

education (113 studies), history taking and cancer risk assessment (63 studies), performing screening exams (136 studies) and coordination of care, such as referral and follow-up (57 studies). Nine studies featured nurses' role in training other healthcare professionals. Nurse's role in performing treatment for cervical precancerous lesions differed by region; it was featured in 22 studies in the African region, five studies in the South-East Asia region, two studies from Central American countries in the Americas region, and only one study in Vietnam in the Western Pacific region. These differences correspond to those LMIC settings in which the "single-visit approach" is the predominant model for cervical cancer prevention, with same day visual inspection with acetic acid (VIA) screening and treatment with cryotherapy or thermal ablation.

Nurses' role in screening and early detection

Nurses' roles are presented by region, aggregating the information gathered from individual studies within countries, rather than presenting individual study findings (Table 2). We describe the nurse's role before, during, and after screening, and throughout the screening or early detection process. We also describe nurses' roles in research, featured in a few studies.

Before screening

Studies emphasized the importance of nurses as health educators and role models in the community. Nurses educate members of the community, whether through home visits or in community venues, or via telephone in some settings, about cancer and how to recognize cancer warning signs, such as abnormal vaginal bleeding or a palpable breast abnormality. Nurses help identify those in the community who are eligible for cancer screening and educate them about the availability and

purpose of cancer screenings. Nurses, because of their proximity to their communities, can help identify individual and health system barriers to cancer screening. If cervical cancer screening is being offered via self-collected human papillomavirus (HPV) tests, nurses play a role in distributing tests and instructing women on self-collection as well as next steps.

During screening

Once the patient reaches the health center, the nurse assesses their health history, whether they are due for screening, and assesses for cancer risk factors and for symptoms of cancer, in particular for cervical and breast cancer. Here, we include both early diagnosis of cancer, that is, identification of cancer warning signs, as well as screening of asymptomatic women. For many of the country settings in which studies were conducted, programs of early detection involve both of these aspects of care and are an important role for nurses. Nurses are involved in the full range of cervical cancer screening modalities, including Pap smear collection, visual inspection with acetic acid (VIA), augmented in some settings by digital cervicography, and also clinician-collected HPV sampling. Clinical breast examination is now being conducted by nurses and midwives across all regions, whether the woman comes because of an abnormality she has noticed or because breast cancer screening is being offered. Skin cancer screening is being done by nurses in Turkey and Brazil. Oral cancer screening is being done by nurses in South Africa, Thailand, and India; one study discussed a specialist dental nurse role in Thailand.[10] And in some UMICs, such as Brazil, Morocco, Turkey, and Thailand, nurses have begun distributing fecal testing (FOBT or FIT) for colorectal screening. One study mentioned the role of nurses in prostate cancer screening in multiple sub-Saharan African countries,[11] and one study in Mexico.[12]

After screening

Following screening exams, nurses play an important role in again educating the patient and coordinating ongoing care. The nurse delivers the result of the screening test and explains the next steps if the screening test is abnormal, and when to repeat screening if the test is normal. In some settings, nurses are trained to perform diagnostic tests or treatment following abnormal screening tests. For example, nurses perform colposcopy for an abnormal cervical screening in Uganda, Costa Rica, India, and perform breast ultrasound for an abnormal clinical breast exam in Rwanda, South Africa, Democratic Republic of Congo, or additional diagnostic procedures such as fine-needle aspiration or core needle biopsy in the Democratic Republic of Congo. In the single-visit approach for cervical cancer screening, nurses perform treatment following a positive (abnormal) VIA exam, with either cryotherapy or thermal ablation. This was notable particularly in the African region. In some settings, nurses might refer patients for screening tests such as mammography (eg, Brazil, Colombia, Turkey), or for further diagnostic evaluation such as colposcopy or colonoscopy or breast imaging and biopsies. Nurses also refer patients to further care for any suspicion of malignancy on cervical exam.

Throughout

Throughout the screening process, nurses play an important role in coordinating care. There were only two studies (in Turkey and Malaysia) that reported formal nurse navigation roles. However, many of nurses' roles in patient tracking and follow-up to remind patients of appointments and to check that they attended their follow-up appointments are aspects of helping patients to navigate the screening and diagnostic pathway.

Training and research

Nurses have also played a role in training fellow nurses and other healthcare professionals. In the included studies, those that described this role in Cameroon, Nigeria, Ghana, and India were focused on training healthcare professionals in VIA and cryotherapy (Table 2). A few

Table 2

Descriptions of nurses' role in cancer screening and early detection.

Before/during/after screening	Role	Description	Africa	Americas	Eastern Mediterranean	Europe	South-East Asia	Western Pacific
Before	Education and counseling	Home visits or phone counseling to motivate for cancer screening			Iran, Jordan	Turkey	India	
		Community outreach to identify those eligible for screening	Zambia	Brazil		Turkey	Indonesia, India, Thailand	
		Explore beliefs about cancer; Identify barriers to cancer screening	Eswatini, Nigeria, South Africa, Tanzania		Jordan	Turkey		
		Educate patients re: cancer screening:						
		● Cervical cancer screening	Ethiopia, Kenya, South Africa, Uganda, Zambia	Guatemala			India, Thailand, Bangladesh	Malaysia
		● HPV test self-collection	Ethiopia	Mexico				
		● Breast cancer early detection (warning signs & screening)	Kenya, Democratic Republic of Congo (DRC), Eswatini			Gaza, Tajikistan, Turkey	Sri Lanka	China
		● Teach breast self-examination	DRC, Ethiopia	Brazil, Mexico	Egypt	Gaza, Turkey		China
		● Colorectal cancer screening		Brazil	Morocco	Turkey	Thailand	
		● Skin cancer screening		Colombia		Turkey		
	Health assessment	Identify clients who are eligible for screening	Ethiopia, Uganda, South Africa, Zambia	Brazil	Morocco		Indonesia, Thailand, India	China, Malaysia
		Assess cancer risk factors, including tobacco use	Kenya, South Africa	Mexico	Egypt, Iran, Morocco, Sudan		Indonesia, Thailand, India	Malaysia
		Identify signs of cancer:	Kenya, Malawi, Nigeria				India	
		● History of palpable lump or other breast abnormality	Kenya, DRC, Eswatini			Gaza		
		● History and pelvic exam for abnormal vaginal bleeding	Kenya					
		● Assessing signs/symptoms of pediatric cancers		Brazil				
During	Screening exams	Cervical cancer screening:						
		● Pap smear	Eswatini, Kenya, Nigeria, Zimbabwe, South Africa	Belize, Brazil, Colombia, Costa Rica, Guatemala, Honduras	Egypt, Iraq, Tunisia	Turkey	India, Thailand	
		● Visual inspection (VIA/VILI)	Angola, Botswana, Cameroon, DRC, Eswatini, Ethiopia, Ghana, Malawi, Nigeria, South Africa, Tanzania, Uganda, Zambia, Zimbabwe	Belize, Colombia, El Salvador, Guatemala, Honduras,	Egypt, Sudan		India, Thailand, Bangladesh	Vietnam
		● Digital cervicography	Ghana, Nigeria, South Africa, Eswatini, Zambia					
		● HPV testing	Cameroon, Mozambique, Tanzania	Costa Rica, Guatemala			India, Nepal	
		Breast cancer screening: Clinical Breast exam (CBE)	Cameroon, DRC, Eswatini, Kenya, Malawi, Nigeria, Rwanda	Brazil, Colombia	Tunisia	Gaza, Tajikistan, Turkey	Indonesia, India,	China, Philippines
		Skin cancer screening		Brazil		Turkey		
		Oral cancer screening (OVE)	South Africa				India, Thailand	
		Colorectal cancer screening: distribute Fecal occult blood tests (FOBT) or FIT		Brazil	Morocco	Turkey	Thailand	
		Prostate cancer screening (PSA, DRE)	Multiple African countries	Mexico				
After	Counseling on results and follow-up	Counsel patients on CBE findings, VIA results, etc. and when to return if normal, next steps if abnormal	Cameroon, DRC, Eswatini, Kenya, Uganda, Zambia	Guatemala	Sudan	Turkey	Indonesia, India, Bangladesh	China

Table 2 (*continued*)

Before/during/after screening	Role	Description	Africa	Americas	Eastern Mediterranean	Europe	South-East Asia	Western Pacific
		Interpret FOBT or FIT tests; Explain colonoscopy procedure		Brazil	Morocco		Thailand	
	Diagnostic Exams	Perform colposcopy	Uganda	Costa Rica			India	
		Perform breast ultrasound	DRC, Rwanda, South Africa					
		Perform ultrasound-guided FNA and core needle biopsy	DRC					
	Precancer treatment	Perform cryotherapy/thermal ablation for precancerous cervical lesions	Angola, Botswana, Cameroon, Eswatini, Ghana, Mozambique, Tanzania, Uganda, Zambia	El Salvador, Guatemala			India, Thailand	Vietnam
	Referral	Refer for colposcopy or pap smear			Sudan	Turkey	India	
		Refer for cryotherapy					India, Bangladesh	
		Refer for suspicion of cervical cancer	Zambia	Guatemala				
		Refer for mammography screening	DRC	Brazil, Colombia		Turkey		
		Refer for colonoscopy		Brazil	Morocco	Turkey	Thailand, India	
		Refer for diagnostics for abnormal CBE	DRC, Eswatini			Gaza		
	Follow-up	Patient tracking (registry/chart review) Appointment reminders	Botswana, Eswatini, Ghana, Kenya, Malawi, Mozambique, Tanzania Nigeria, South Africa, Uganda, Zambia, Zimbabwe	Brazil	Morocco	Turkey	Thailand	Malaysia
		Confirm patients attend appointments	Eswatini	Brazil	Iran			
Throughout	Patient navigation	"nurse navigation program," Patient tracking and call reminder systems, family counseling, health education and decision aids				Turkey		Malaysia
Training		Training healthcare personnel in VIA and cryotherapy	Cameroon, Nigeria, Ghana				India	
Research		Cervical cancer studies (recruitment, perform VIA, pap smear, biopsy, HPV testing)	Cameroon, Ethiopia, Mozambique South Africa, Uganda	Colombia, Costa Rica, Mexico			India	
		Men's perceptions of HPV vaccine and cervical cancer: administered surveys	Uganda					
		Breast Health Education Study-delivered educational intervention		Mexico				
		Skin cancer prevention study- delivered educational intervention		Colombia				

VIA, visual inspection with acetic acid; HPV, human papillomavirus; VILI, visual inspection with Lugol's iodine.

studies explicitly described nurse roles in conducting research, with several examples in the African region and the Americas.

Discussion

This scoping review aimed to describe the roles and activities of nurses in cancer prevention and early detection in LMICs. We found that the majority of included studies, featuring some aspect of nurses' role in cancer prevention in LMICs, focused on early detection of cervical and breast cancer. The main roles described were providing patient education regarding cervical and breast cancer and the availability of screening tests and performing screening exams. The focus on cervical cancer screening and breast cancer early detection reflects the growing incidence and mortality from these cancers in many LMICs. For 46 of the 48 countries (96%) included in this review, cervical and breast cancer are among the top three cancers among women and men by cancer incidence; and for 39 of the 48 countries (81%), they are also among the top three causes of cancer-related mortality.[1] The large number of studies on cervical and breast cancer also reflects the increasing attention to cancers for which most deaths are considered preventable, that is, if everyone had equitable access to evidence-based interventions for primary or secondary prevention/early detection and treatment.[13–15] It is however notable that other common cancers that are either preventable, through primary prevention interventions, such as lung cancer (via tobacco control education/smoking cessation), liver cancer (via hepatitis B vaccination), and colorectal cancer, the latter which is amenable to early detection/screening, featured in very few studies even though they are among the top causes of cancer and cancer death in many of the countries included in this review. Across LMICs (not limited to countries included in this review), lung cancer ranks second in cancer incidence for men and

women (representing 11.9% of all new cancer cases), colorectal cancer ranks third (9.7% of new cases), and liver cancer ranks fifth (6.2% of new cases).[1]

There was comparatively little focus on primary prevention of cancer in the included studies, despite the clear evidence regarding the effectiveness of tobacco cessation counseling to decrease risk for lung, oral and other cancers,[16] HPV vaccination for primary prevention of cervical cancer and other HPV-related malignancies.[17,18] A systematic review showed the effectiveness of nursing interventions on successful smoking cessation in HICs,[16] and the WHO supports the role of nurses in tobacco cessation counseling in LMICs as well.[19] And we know that increasing numbers of LMIC countries have implemented HPV vaccination programs,[20,21] yet the role of nurses in HPV vaccination programs did not feature prominently in the included studies. Future research is needed to explore studies that have measured the effectiveness of nursing interventions on HPV vaccine knowledge and acceptability in communities and nurses' impact on successful implementation and scale-up of HPV vaccination programs at the local and national level.

This scoping review provides a comprehensive view of the landscape of nurses' role in cancer prevention and early detection in LMICs, across all six WHO regions. A previous commentary by Challinor et al.[22] highlighted the existing and potential roles nurses in LMICs can play in cancer research, education, and care across the cancer continuum. This systematic scoping review adds to the literature a more detailed description of nurses' roles in the community and primary level of the cancer health system, in the prevention phase of the cancer care continuum. Details regarding nurses' cancer screening roles, from community education and patient assessment to evaluation, referral, and coordination of care, may be useful for LMICs that have not yet established cancer screening programs or defined nursing scope of practice for cancer screening. Similarly, these findings can inform planning regarding nurses' potential roles and necessary competencies as countries expand their cancer prevention and screening programs to include other types of cancer such as lung, liver, and colorectal cancer.

This review is limited by what is available in the published peer-reviewed literature and as such does not fully capture country-specific information on nurses' scope of practice nor the full extent of nurses' roles in cancer prevention. Nonetheless, to the extent that the published literature reflects the relative priorities of various health conditions and public health issues, it is likely a reasonable reflection of where nurses' efforts in cancer prevention have been concentrated across countries in LMICs. In the same way, it is difficult to know whether the volume of manuscripts published in a particular country is an indication of greater nursing roles in those countries, or more so that a given program that involves nurses has garnered more attention in the published literature, such as the Family Health Strategy in Brazil.[23] The strength of this descriptive review is in its broad global scope and in the questions it may generate for further investigation. Future research in specific countries or regions might allow more detailed exploration of country-specific and contextual factors (cultural, health system, organizational, etc.) affecting nurses' practice in cancer prevention and early detection.

Conclusions

This review provides a broad overview of nurses' roles and activities in cancer prevention and early detection across LMICs, based on the information available in the published literature. Our findings highlight gaps in the literature regarding nurses' contributions to cancer prevention efforts in LMICs, reflecting a relative invisibility of the work that nurses do in this field. In future publications, intentional reporting of the role of nurses in cancer prevention planning and implementation at local and national levels would increase the visibility of nurses' contributions. Additional cancer workforce data sources at the country level are needed to fully understand and catalog the roles and activities of nurses in cancer prevention. Future research is also needed to measure the impact of nursing educational and other interventions in both primary and secondary prevention. More broadly, nurses' knowledge of their local communities and of cancer health systems should be leveraged to inform efforts to improve cancer prevention and screening efforts within and across countries.

CRediT author statement

Erica Liebermann: Conceptualization, Methodology, Data extraction, analysis, Writing – original draft, Reviewing and editing. **Ruth Sego:** Conceptualization, Data extraction, Writing – reviewing and editing. **Dorice Vieira:** Methodology, Data management, Data extraction, Data analysis. **Qinqin Cheng:** Data extraction, Writing–reviewing and editing. **Binbin Xu**: Data extraction, Writing–reviewing and editing. **Maureen Arome:** Data extraction. **Alexandra Azevedo:** Data extraction, Data visualization. **Ophira Ginsburg:** Conceptualization, Writing – reviewing and editing. **Winnie K. W. So:** Conceptualization, Data analysis, Writing – original draft, Reviewing and editing. All authors had full access to all data in the study, and the corresponding author had final responsibility for the decision to submit for publication. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Declaration of competing interest

All authors have none to declare. The last author, Prof. Winnie K.W. So, is Editor-in-Chief of *Asia-Pacific Journal of Oncology Nursing*. The article was subject to the journal's standard procedures, with peer review handled independently of Prof. So and their research groups.

Disclaimer

The opinions expressed by the authors are their own and this material should not be interpreted as representing the official viewpoint of the U.S. Department of Health and Human Services, the National Institutes of Health, or the National Cancer Institute.

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Ethics statements

Not required.

Data availability statement

All data relevant to the study are included in the article or uploaded as supplementary information.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.apjon.2023.100242.

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