Research Article

Overview of Cervical Cancer Prevention Services in Khartoum State – December 2018: A Case Study

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Editor-in-Chief:
Prof. Mohammad A. M. Ibnouf

Abstract

Background: Although cervical cancer is largely preventable, it continues to be an important cause of morbidity and mortality in Sudan, due to the lack of national control programs. This study aimed to evaluate the availability of cervical cancer prevention services and assess the facility readiness in Khartoum state, as a base for future plans.
Methods: This study was an observational, mixed-method, health service research. Purposive sampling method was used to select focal persons to explore the current situation and the available services qualitatively. Observation through standardized checklists of screening and colposcopy centers was conducted, and service providers were interviewed. Thematic analysis and descriptive statistics were used to analyze data.
Results: Based on the qualitative interviews, Khartoum Oncology Hospital is the only specialized center providing chemotherapy and radiotherapy services for the state. Although six screening and nine diagnostic centers were surveyed, services were not available in most localities. Reasonable but unutilized resources in the secondary level exist at the time of the study, primary-level efforts to control cervical cancer are uncoordinated and ineffective, with no linked efforts at the community level. Since initiatives to reduce cervical cancer mortality need to adopt a holistic approach to the disease continuum, a comprehensive model was suggested and explained, the gaps and challenges were discussed.
Conclusion: Cervical cancer prevention still remains a highly unaddressed need in Sudan. Sustainable financing of robust programs is necessary to achieve elimination. Contextually relevant devices must be selected to improve resource allocation. These results might be useful for the establishment of cervical cancer control in Sudan.

1. Introduction

Uterine cervix cancer is one of the most common cancers in women worldwide, of which almost 90% of the cases occur in developing countries, where it is a leading cause of

How to cite this article: Amira Burhan (2021) "Overview of Cervical Cancer Prevention Services in Khartoum State – December 2018: A Case Study," *Sudan Journal of Medical Sciences*, vol. 16, Issue no. 1, pages 81–100. DOI 10.18502/sjms.v16i1.8940

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women's death from cancer [1, 2]. Most patients in low-income countries present at an advance stage of disease with bad prognosis and little hope for cure [3]. The disease affects women in middle age, in their late 40s, at a time of life with higher social and economic productivity (4).

The two important facts about cervical cancer (CC) are that, firstly, persistent infection with Human Papilloma Virus (HPV) is a necessary cause for the disease development and secondly, there is a recognized premalignant stage, which can be treated in safe, effective, inexpensive, and acceptable ways [5]. There is also ample time, >10 years, between the appearance of the precancerous lesion and its progression to invasive cancer which enables detection. Many developed countries achieved a significant drop in the disease incidence and mortality as a result of extensive programs of cervical screening followed by treatment of precancerous conditions [1, 6]. Moreover, vaccination against HPV proved its safety and effectiveness in primary prevention of the disease and is now widely available [4, 7].

CC while largely preventable continues to be an important cause of morbidity and mortality in Sudan, notably due to the lack of national screening and vaccination programs. In a study by Husain *et al.*, CC ranked second after breast cancer in the country. Although there is limited evidence about the distribution of stage at diagnosis, at least 72% of CC cases in Sudan were diagnosed with advanced disease that had spread beyond the cervix, and more than half were diagnosed at stage IV [8].

Cytology-based screening has been proved successful in high-resource settings, however, it has not been effectively applied in low-resource ones, due to its complex demanding nature and low sensitivity which necessitates short screening intervals and robust recall systems [9, 10]. Given the challenges of implementing cytology-based screening in low-resource settings, simple visual approaches to screening have been studied extensively [11]. Studies have consistently shown that visual inspection with acetic acid (VIA), followed by treatment of precancerous lesions is a simple, accurate, and cost-effective prevention strategy which together with HPV testing may have the greatest impact on reducing the burden of CC in resource-constrained countries [3, 6] and has been recommended for use by the World Health Organization (WHO) [12].

The standard strategy for women who screen positive is to perform a colposcopic examination and be treated when a significant pre-malignant change has been confirmed. Treatment modalities include cryotherapy, thermocoagulation, cold knife conization (CKC), and loop electrosurgical excision procedure (LEEP) [5]. Alternatively, in remote areas where colposcopic facilities are not available, a see-and-treat approach using cryotherapy is proved effective in reducing CC burden [13].

Decisions on which screening and treatment approach to use in a particular country should be based on a variety of factors, including cost, benefits and harms, acceptability, potential for women to be lost to follow-up, and availability of the necessary equipment and human resources [12].

1.1. Rationale and justification

Cervical Cancer Prevention & Research Unit has been established at the Soba University Hospital as the first to provide such services in Sudan. The goals of the unit include screening of women in a targeted age group, with an effective and acceptable screening test (VIA at the time), and ensuring appropriate treatment of all test-positive women. However, the overarching goal is to make the experience and knowledge gained available to other centers and bodies that share the same goal, and to act as a nucleus for a national CC prevention program providing policy-makers with training materials, trainers, and more importantly local evidence. In the long term, these efforts are meant to create research facilities that collect information, synthesize knowledge, design guidelines and protocols, and disseminate the results and may also act as a monitoring body demonstrating academic leadership in the field of CC control.

We believe that one of the preliminary steps toward implementing a screening program is to analyze the local situation to understand what is actually being delivered, to make effective use of the existing resources and expertise [14]. Therefore, this work was planned to generate reliable evidence on the availability and facility readiness or capacity to deliver CC prevention services in Khartoum state, in order to support the effectiveness of future plans. The study is a health systems research that could improve the health of the community by enhancing the efficiency and effectiveness of the health system through the study of the provision, effectiveness, and use of health services [15]. The study may also aid collaboration between experts, motivated and funding agencies in this field. National health decision-makers, program managers, and health administrators could make use of the outcomes to plan a systematic coordinated program, able to reduce the incidence and mortality from CC.

1.2. Study objectives

1.2.1. General objectives

•To establish a baseline of CC-specific service availability and facility readiness in Khartoum state.

1.2.2. Specific objectives

- To identify the primary cervical screening, secondary diagnostic and treatment (colposcopy), and tertiary-level centers in Khartoum state according to their geographic distribution.
- To determine the availability of service and the workload in the identified facilities.
- To determine the readiness of each center to provide CC-specific services.

2. Materials and Methods

This cross-sectional exploratory health service study used a qualitative interview and quantitative survey methods for data collection. The study approach was mixed methodological using different complementary methods in two phases, where qualitative findings in the first phase enhanced quantitative survey by understanding and identifying the relevant study population for the second phase [16]. The study was conducted in December 2018.

2.1. Study area

Khartoum state, as shown in Figure 1, is divided into seven localities namely, Khartoum (capital), Omdurman, Khartoum North, Jabal Awliya, Karari, Om Badda, and Sharq an-Nil. It is the most populated state, encompassing around 20% of Sudan's population, of which around 1,088,408 are females aged 30–60 years (the targeted population for CC screening) [17]. The public sector health services in Khartoum state as in all states of Sudan are organized in three levels: primary, secondary, and tertiary.

2.2. Study participants

•Key informants in the field of CC prevention participated in the qualitative inquiry.
•Centers that provide cervical screening service.
•Health providers in those centers.

2.3. Sampling technique

Phase I: Purposive sampling was used to select focal persons and experts in the field as key informants who nominated the health centers with possible CC prevention services.

Phase II: All centers identified as providing CC prevention services were assigned for survey together with the health service providers within these centers.
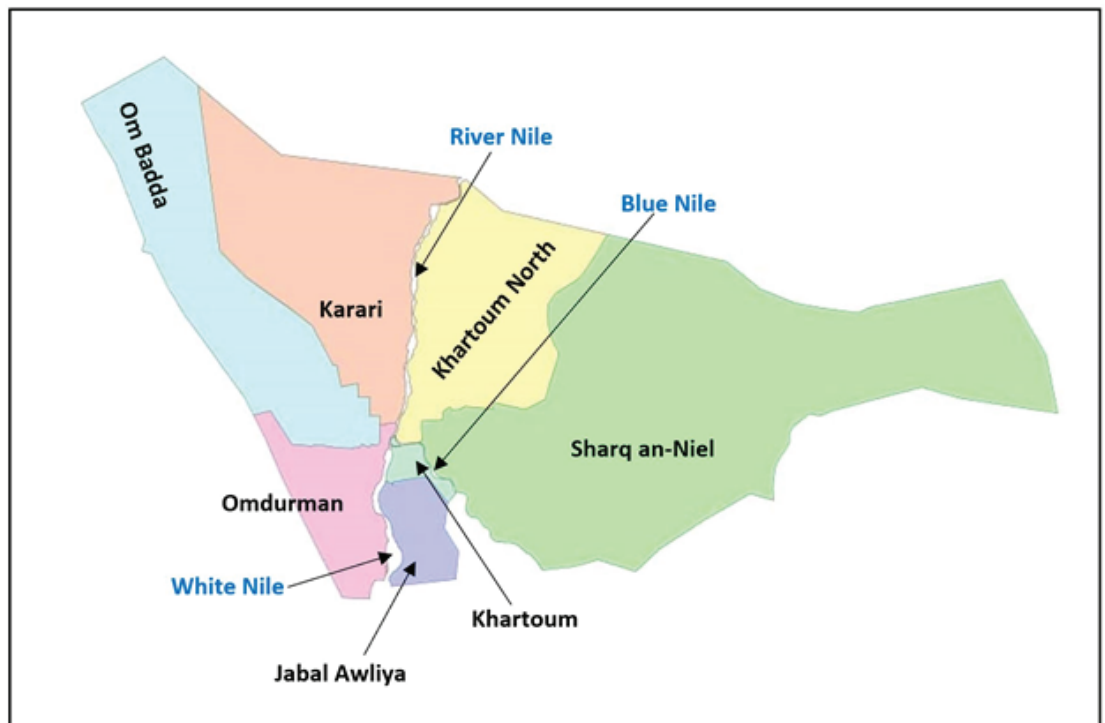

Figure 1: Khartoum state – seven localities.

2.4. Description of data collection

Individual qualitative elite interviews of four focal persons in the field was used to achieve exploration of the current situation and gather information about the available services and centers assigned to deliver CC services in Khartoum state. Visits for assessment of all public and private centers identified by the interviewee were arranged adopting facility census methodology. Two checklists, one for cervical screening centers and another for colposcopy centers, were developed to collect direct observation data and records review of each center (document analyses). Direct interviewing of service providers using structured questionnaire technique was also used. The pertinent information gathered from each center was compiled in a specifically designed worksheet in an excel format.

The themes and items of checklists and questionnaires were based on "Improving data for decision-making: a toolkit for cervical cancer prevention and control programmes" [18]. This toolkit follows a methodology built upon non-disease-specific previous approaches such as service availability and readiness assessment (SARA) [14]; however, it provides the full set of indicators specified for CC prevention at the facility level. With few contextual modifications, we covered two types of indicators and include 10 categories:

I. **Service availability indicators**, including two categories:

1. Facility is providing CC prevention services.

2. Facility is meeting screening and treatment service targets (No. of client/year).

II. **Facility readiness indicators**, including eight categories:

1. Infrastructure: Facility with the basic infrastructure to provide services (private examination area, handwashing area, space for confidential counselling, storage space for equipment).

2. Staffing: Facility with sufficient number of trained staff providing services.

3. Equipment: Facility with minimum equipment necessary to provide services are available and functional.

4. Supplies: Facility with minimum supplies necessary to provide services are continuously available.

5. Infection prevention: Facility with minimum equipment and supplies required for infection prevention are continuously available and functional.

6. Referral mechanisms: Facility with clearly defined, functional referral mechanisms, referral forms, and guidelines available.

7. Policies and guidelines: Facility with current national policies and guidelines are readily available and widely understood.

8. Community Sensitization and Mobilization: Facility conducting awareness generation and education activities, using a variety of materials.

A detailed scoring guide was designed for each category including the relevant items in a checklist (available on request) to help determine the degree to which the facility meets the standard. Performance indicators were not included because quality of the provided service was outside the scope of this study.

2.5. Data analysis

The recorded interviews were converted into written format and analyzed using thematic analysis. Systematic aggregation of the gathered data was performed through calculation of the indicators for CC-service availability and facility readiness using Excel 2013. The availability analyses depended on two categories, service provision and workload. A geographic analysis of identified centers within the seven localities was performed to enhance service and equipment deployment planning, and help inform equitable access and distribution of services.

The facility readiness calculation shown in Figure 2 was conducted through scoring items within each of the eight categories. It was based on how well they meet the standard using scoring scale of: 0, 1, 2; then determining the category readiness score by calculating the average of all items scores in a category. Calculation of the mean of the eight categories readiness scores determined the facility readiness summary score which ranged from: 0.0–2.0, and was translated into a status (ready: 1.8–2.0; needs improvement: 1.7–0.9; not ready: 0.0–0.9). The facility readiness status provides the facility's overall readiness to provide CC prevention services [18].
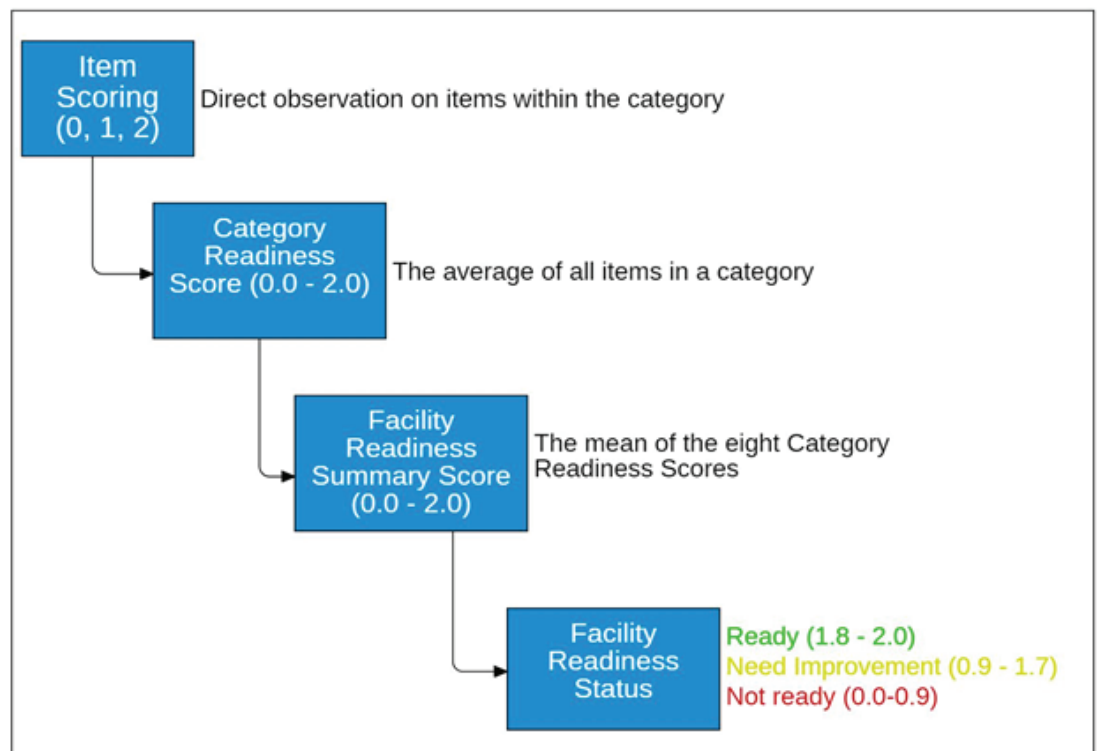

Figure 2: Process of facility readiness status evaluation.

3. Results

3.1. Phase I: Summary of the qualitative findings

Khartoum Oncology Hospital (KOH) is the only specialized cancer center providing chemotherapy and radiotherapy services for the state and most of the country. It provides some diagnostic services and almost no surgical services. Surgery for invasive cancer is mainly provided at different public and private hospitals mostly by general gynecologists who provide cancer surgery out of necessity. All interviewed experts agreed that most cases present late and receive suboptimal care as there is no satis- factory screening services at any levels, no vaccination services, and no comprehensive tertiary care for women with gynecological malignancy, nor mentionable palliative care. The following quotes were cited:

"We are continuously losing women unnecessarily, due to unavailability of preventive services."

"Universities, some private and public hospitals, and few local NGOs, in an uncoor- dinated manner, provide some cervical pathology services in Khartoum state but never preventive."

"They come very late to the extent that we just watch them suffering but even if they come early they could not find appropriate management."

According to the interviewees, six screening centers and nine diagnostic centers should be assigned for survey. The screening centers are well-distributed between the localities, although the diagnostic centers are not. Four out of nine diagnostic centers are located in Khartoum locality, three in Omdurman locality, and one in each of Om Badda and Sharq an-Nil while none in Khartoum North, Jabal Awliya or Karari localities. Figure 1 shows the distribution of functioning and non-functioning screening, diagnostic, and cancer treatment centers in the seven localities of Khartoum state.

3.2. Phase II: Summary of the survey findings

Analysis of the data collected from the centers revealed that CC prevention services are not available in most screening centers (non-functioning) (Table 1). During the study period, only one center in the state was delivering cervical prevention service, and was seeing few cases/month. Five out of six centers were not ready to deliver CC prevention services, Table 2 shows the distribution of screening centers according to the readiness scores of each category and the facility readiness summary scores.
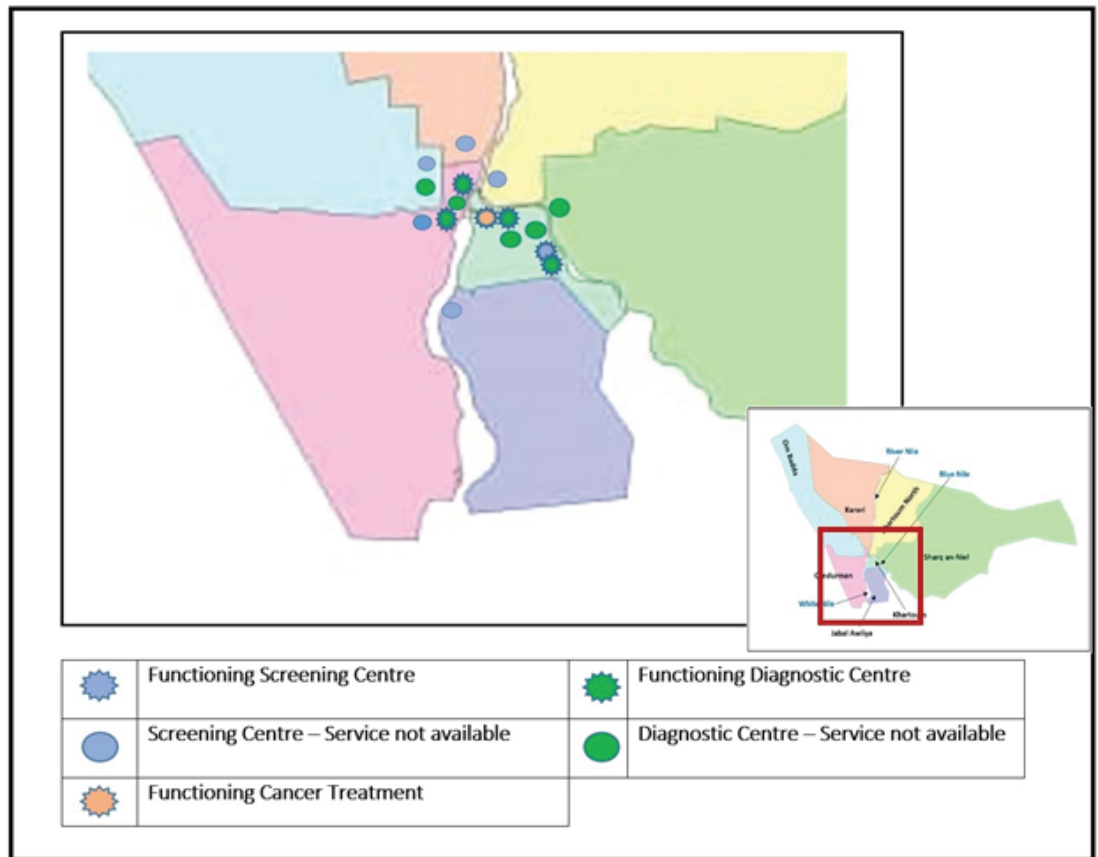
Figure 3: The geographic distribution of cervical cancer services centers in Khartoum state' seven localities and the availability of service.

TABLE 1: Distribution of cervical cancer centers according to facility readiness category scores: Screening centers.

Readiness Indicators Category	Ready Facilities (1.8-2.0)	Need Improvement (1.8-2.0)	Not Ready Facilities (1.8-2.0)	Total No. of Facilities Surveyed
Infrastructure	5	1	0	6
Staffing	1	0	5	6
Equipment	1	0	5	6
Supplies	0	6	0	6
Infection Prevention	6	0	0	6
Referral Mechanisms	1	0	5	6
Policies and Guidelines	1	0	5	6
Community Sensitization	0	0	6	6
Facility Readiness Summary Score	**1**	**0**	**5**	**6**

Concerning the diagnostic clinics, >50% were non-functioning (Table 1). Five centers need few improvements to be designated as ready; Table 3 shows the distribution of diagnostic centers according to the readiness scores of each category and the facility

readiness summary scores. The functioning diagnostic centers are mainly dealing with cervical pathologies other than cancer, the prevention services delivered were always opportunistic and limited.

TABLE 2: Distribution of cervical cancer centers according to facility readiness category scores: Diagnostic/treatment (colposcopy) centers.

Readiness Indicators	Ready Facilities (1.8-2.0)	Need Improvement Facilities (1.8-2.0)	Not Ready Facilities (1.8-2.0)	Total No. of facilities assessed
Infrastructure	6	0	3	9
Staffing	4	0	5	9
Equipment	6	0	3	9
Supplies	6	0	3	9
Infection Prevention	6	2	1	9
Referral Mechanisms	1	0	8	9
Policies and Guidelines	1	0	8	9
Community Sensitization	0	0	9	9
Facility Readiness Summary Score	1	5	3	9

To summarize, screening services are available in Khartoum (Capital) only, colposcopy services are available in Khartoum (capital) and Omdurman localities. Neither screening nor diagnostic services were available in Khartoum North, Om Badda, Jabawlia, Karari, or Sharq an-Nil localities at the time of the study. Table 4 shows the geographic distribution of the centers according to their readiness status. Noticeably, no efforts are made for community awareness about the disease, its prevention, and the presence of these services in all centers.

4. Discussion

Health services research is concerned with the relationship between the provision, effectiveness, and efficient use of health services and the health needs of the population [19]. It aims to produce valid and reliable research data to base appropriate, effective, cost-effective, efficient, and acceptable health services at the different levels of care. The research knowledge acquired needs to be translated into action to be of value, hence research and development [15].

The globally evident longstanding inequities in CC incidence and mortality between LMICs and HICs have galvanized the urgent need for action. WHO global strategy toward the elimination of CC as a public health problem within the century called for focused actions across the continuum of care, including increased coverage of HPV vaccination,

TABLE 3: The geographic distribution of cervical cancer centers in Khartoum state according to the facility readiness status.

Facility Readiness Status	Locality	Ready Facilities (1.8-2.0)	Need Improvement (1.8-2.0)	Not Ready Facilities (1.8-2.0)	Surveyed facilities
Screening Facilities Readiness Status	State Level	1	0	5	6
	Khartoum	1	-	-	1
	Omdurman	-	-	1	1
	Khartoum North	-	-	1	1
	Jabalawlia	-	-	1	1
	Om Badda	-	-	1	1
	Karari	-	-	1	1
Diagnostic Facilities Readiness Status	State Level	1	5	3	9
	Khartoum	1	2	1	4
	Omdurman	-	3	1	4
	Sharq an-Nil	-	-	1	1

increased coverage of screening and treatment of pre-cancer lesions, increased early diagnosis and treatment of invasive cancer and palliative care [20]. The WHO strategy proposed an approach to put all countries on the path to reach elimination [21], this approach suggests reaching the global targets by 2030; one of these is:

•70% of women to be screened with a high-precision test at 35 and 45 years of age by 2030.

To achieve this target and move toward the global elimination goal, an effective large-scale organized, population-based screening program and configuration of appropriate pathways is required [22]. A comprehensive model is suggested here as an example.

Certain primary health centers in each locality should be developed as CC screening centers with facility readiness to screen 70% of 1,088,408 (the target population of Khartoum state) women in Khartoum state at least once by 2030. The screening centers should be linked to context-specific and culturally appropriate demand-creation strategies and awareness activities in the surrounding communities. Diagnostic centers should be located in secondary-level health facilities, and should ensure ready-to-provide confirmation of screen-positive cases as well as first line management, and linked to a tertiary-level health facility for referral and also for mentoring and support [23]. The model will require a matching increase in the capacity for treatment of the detected lesions, as screening women without access to treatment is unethical. Timely assessment and referral of women with suspected or confirmed CC to tertiary level are crucial. Comprehensive management of invasive disease requires well-equipped, appropriately

qualified health providers and access to pathology, imaging, surgical, multidisciplinary decision-making, radiotherapy, and chemotherapy services [24]. Expanding surgical capacity is vital to provide patients diagnosed in early stages with access to safe, effective, and timely cancer surgery as CC can often be cured by surgery alone in these stages. The tertiary level should also be ready to conduct high-quality research in order to provide local evidence on the subject. Figure 3 shows configuration of a logical pathway starting from the community up to the tertiary services.
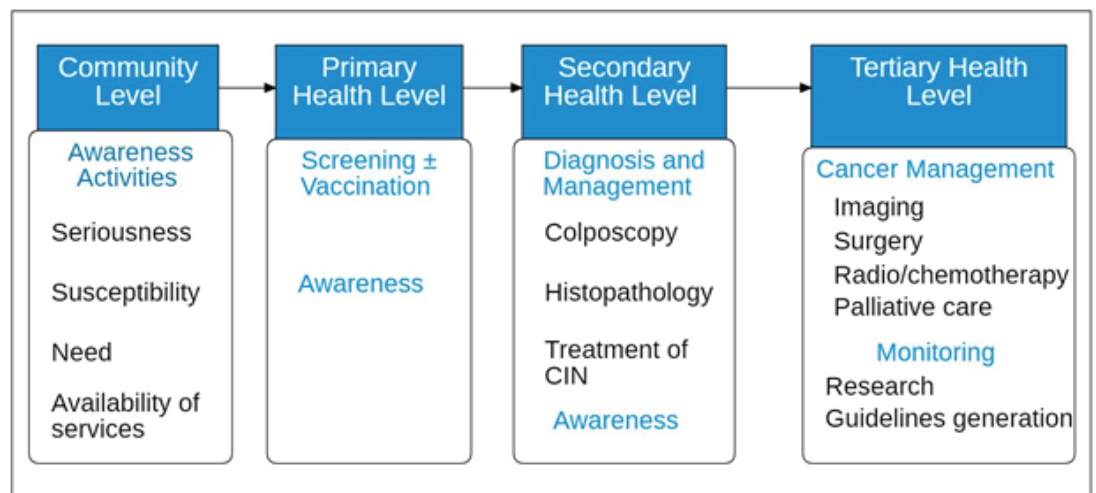

Figure 4: Configuration of cervical cancer services with distribution of services to the community level, primary, secondary, and tertiary health levels.

4.1. Way to fill the gaps

Success of CC control program couldn't be achieved by investing in one activity or one set of technologies alone. Considering the substantial risk of technology misalignment, the program should avoid wasting resources in available medical devices. The system should work at the four mentioned linked levels; the community level, the primary health level, secondary level, and tertiary level. Several screening centers could be served by a ready single diagnostic center as shown in Figure 4. Supporting the existing diagnostic centers by deployment of resources is definitely more cost-effective than creating new services [25]. Efforts to improve community awareness are crucial, this should create demand in the surrounding community and allow women to make use of the available resources.

The research findings revealed nine colposcopy centers that could be embowered and utilized for diagnosis and treatment of cervical premalignant conditions, one was ready, five were well-equipped but need improvement to be ready to deliver the required
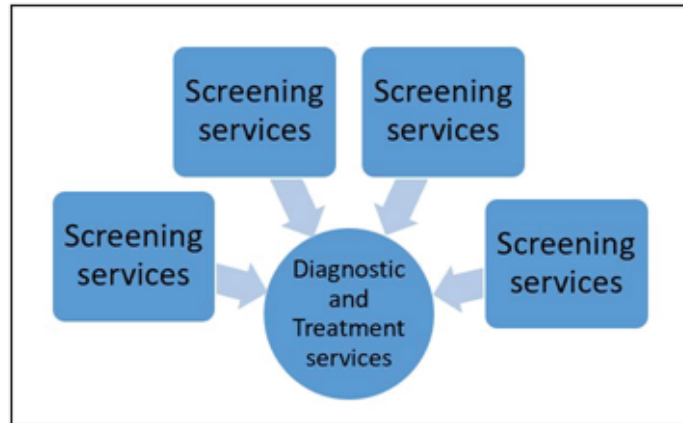
Figure 5: Link between primary and secondary care levels.

service, and the other three need capacity building and support. We should invest in establishing screening facilities, each diagnostic center could be attached to 10 screening centers making a total of 90 primary centers, which if maximally utilized and well-distributed could screen >90,000 ladies per year (i.e., 1,000 clients/center or 25 clients/week/center), which will even exceed 761,885 (70% of 1,088,408: the targeted population of Khartoum state) well before 2030. Targeted women could be screened at least once, twice screening per lifetime as proposed by the WHO may need 15 years. The capacity of these diagnostic centers should be built to match the increased demand. Each center should be capable to serve 25 patients per week, as around 10% of screened women will need further workup and management. Scaling up of the services by creating new diagnostic centers should be considered once these prove efficient by frequent surveys.

Efforts must be made to facilitate accessing screening for women living in remote regions, with limited access to screening services, for example, via mobile health units with availability of screen-and-treat facilities, or screening and arranged referral to diagnostic centers. The screening centers could provide HPV vaccination in the future, which is a logical long-term solution especially for countries struggling to implement screening programs [26].

A single dedicated high-quality tertiary-level center should serve the suggested model, as the health system will be challenged by the effect of increased uptake of cancer cases, and has to meet the increased demand created as a result of screening [6]. This will need considerable allocation of resources to overcome the lack of comprehensive treatment of invasive CC and other gynecological cancers in Sudan. It should be supported by highly functional surgical infrastructure, readily available anesthetic services, intensive care units, blood banking, and modern imaging and

laboratory platforms, as well as chemotherapy and radiotherapy. The set-up will allow launching gynecological oncology fellowship education and also related disciplines with gynecological subspecialties, such as medical oncologist, pathologist, radiologists, nurses and palliation therapists, who are urgently needed in the country [27]. The gynecological oncologic subspecialty could involve multi-year training within accredited program, using focused, North–South twinning partnerships with experienced certified gynecological oncologic surgeons. The tertiary center will also allow the development of local research and studies of the contextually appropriate and cost-effective interventions, including patients' acceptance, perceptions and satisfaction, hence the development of clear strategies and local protocols on the actions and evidence-based interventions at all levels. Investment in such a center would draw significant benefits, as beside saving lives and alleviate sufferings for women in Khartoum state, it can serve the whole country by being the referral center first, then the mother center that enhance development of similar centers in different regions as a demonstration, training, monitoring, and experience-generating center. High-level political commitment and accountability, supported by collaborative partnerships, should drive and guide implementation of this comprehensive model to achieve accessible service delivery platforms.

4.2. Challenges

The most important key factor for such implementation will be the prioritization of CC control in national cancer control plans with strong political will and concerted actions [23]. Necessary equipment, supplies, and trained and supervised staff at all levels of healthcare facilities should be ensured for successful running of the program [28]. Considerable investments in CC control is needed, however, the global trend to overcome the huge disparities in CC incidence and mortality would open chances for collaboration and encourage key stakeholder groups and donors interested in saving women lives [22]. Further challenges will be the gaps in health infrastructure and the fragile health system which could represent a barrier to implementation. The lack of awareness about the magnitude of the current and future cancer burden among the public will play a critical role in reducing the screening uptake among asymptomatic women [11]. There are still a lot of challenges ahead, one of which is determining the appropriate cost-effective and point-of-care screening and triaging strategy which should be answered through research.
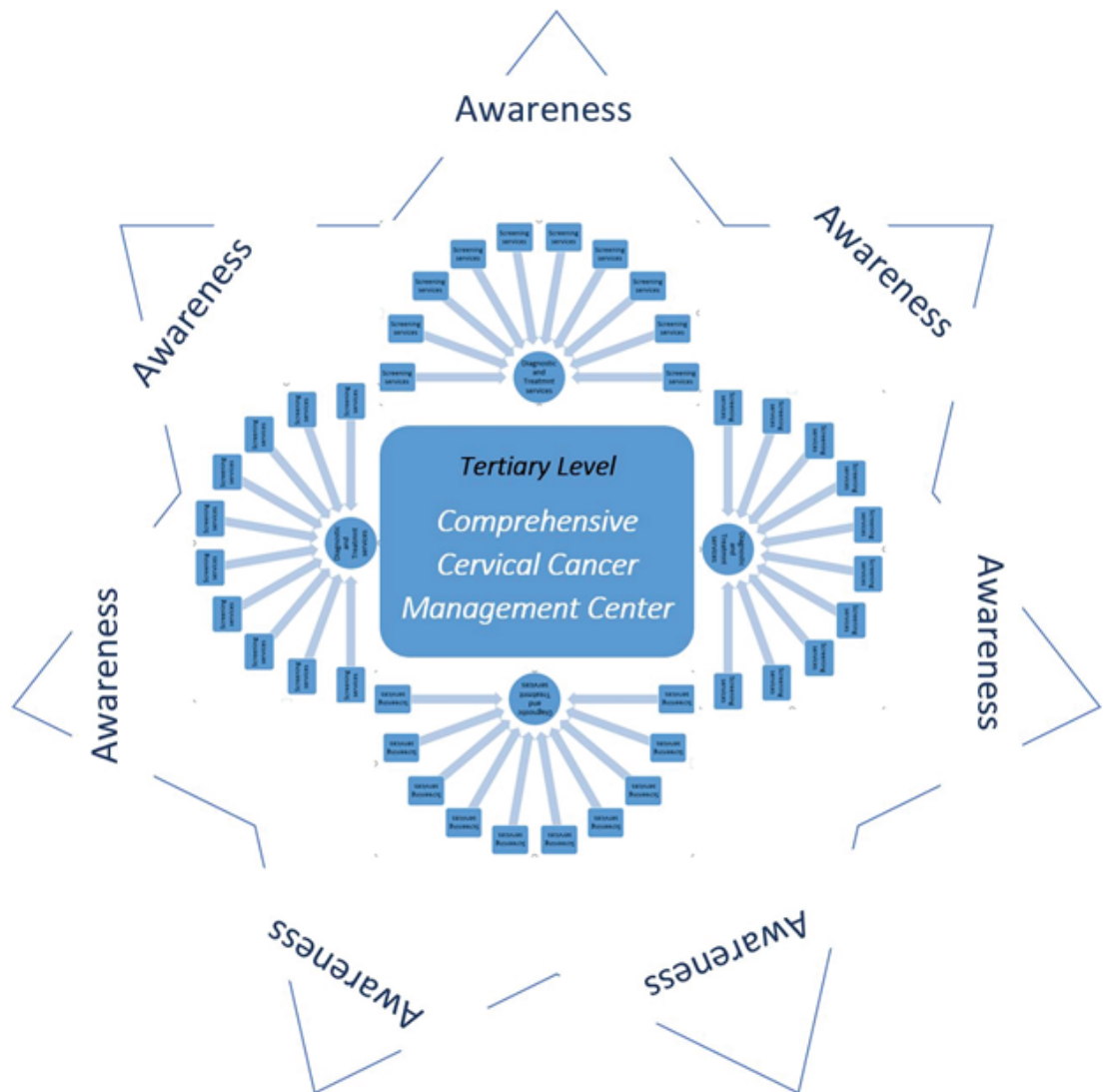
Figure 6: Link between community, primary, secondary-level units and tertiary unit.

5. Conclusion

CC is an important cause of morbidity and mortality within middle-aged Sudanese women. In the absence of a national prevention and control program, these deaths will likely increase. WHO strongly called for actions to eliminate CC within the century. To achieve cervical elimination, high-coverage targets for HPV vaccination, screening and treatment of pre-cancerous lesions, and management of cancer must be reached by 2030 and maintained at this high level for decades. CC prevention is still a highly unaddressed need in Sudan. The purpose of this study was to systematically review the current situation in Khartoum state, to understand the way forward, and draw well-informed conclusions that may be of use in shaping future strategies.

The situation in Khartoum state concerning CC control services at the time of study were as follows:

- Minimal uncoordinated, mostly ineffective efforts at the primary level.

- Reasonable but yet uncoordinated and unutilized efforts at the secondary level.

- Effort to control CC at the community level and at the tertiary level are non-existing.

- Vaccination against HPV is non-existing.

Initiatives to reduce CC mortality need to adopt a holistic approach to the disease continuum, involving community, primary, secondary, and tertiary levels' interventions. A comprehensive model was suggested and explained. The gaps and the required areas for improvements are identified as well as the expected challenges. Contextually relevant interventions and devices must be selected to improve resource allocation, depending on the local needs and resources available. Efforts to organize an effective CC screening program will require adequate financial resources and development of infrastructure, manpower, training, and surveillance mechanisms. Coordination between ministry of health and interested bodies is important.

This study provides the understanding required to plan appropriate CC control services in Khartoum state. Our results may inform the development of CC strategy across the country and together with the exercise could be useful for countries with similar context.

Recommendations

Policy-makers, and health managers in Sudan are encouraged to utilize health system surveys for informed practice and resource allocation, and ultimate benefit of the community.

Supporting existing diagnostic centers seems more appropriate than establishing new centers. Investing in creating matching number of well-distributed cervical screening services is needed to allow appropriate utilization of the existing colposcopy centers.

Limitations

The study has examined CC services in Khartoum state only and did not investigate other states. This was because at the time of the study no services were delivered at any level in other states. Since a program funded by the Italian agency for development in

collaboration with UNFPA is going on in four states, we suggest similar surveys including these states to be arranged.

Acknowledgements

The authors acknowledge all who participated in the study and those who allowed this survey to take place.

Ethical considerations

Ethical approval was considered from the state Ministry of Health, and permission was obtained from the heads of the surveyed centers. Experts and service providers were consented for voluntary participation. Information was collected and analyzed anonymously.

Competing interests

None declared.

Availability of data and material

Data and data tools for this study are available on reasonable request from the authors.

Funding

This study was supported by funding from the Italian Agency for Development Co-operation (AICS).

Authors' contributions

Burhan planned the concept and design and supervised the data collection and data entry, and also performed the data analysis and interpretation. She also wrote the first draft of the manuscript, revised the manuscript, and approved the final manuscript.

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