

# Mammography Services in Zambia

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## Abstract

Breast cancer is the second most common cancer after cervical cancer and the leading causes of death in women in Zambia. To overcome this challenge, a national early diagnosis of breast cancer programme has been established by the Ministry of Health which includes offering mammography services. This paper aims to review the status of the mammography services in Zambia. The availability of mammography services has significantly improved the diagnosis of breast cancer in this country. However, the delivery of services is being humped by numerous challenges such as lack of awareness, the inconsistent supply of consumables, limited human resources, and lack of education and training programs. There is a need to improve the delivery of mammography services by establishing a well-structured and specialized workforce and bringing services closer to the community.

**Keywords:** Breast, Cancer, Mammographer, Mammography, Zambia

## Introduction

Breast cancer is the most common cancer and the leading cause of deaths caused by cancer in women worldwide.<sup>1</sup> Approximately, 58% of deaths from breast cancer occur in developing countries, including Zambia.<sup>2</sup> According to the National Cancer Registry, breast cancer is the second common cancer after cancer of the cervix in women in Zambia.<sup>3</sup> Most breast cancer patients in Zambia are under 50 years.<sup>4</sup> It is estimated that the incidence of breast cancer in Zambia is 19.9 cases per 100, 000 women, and the mortality rate is 8.5 deaths per 100, 000 women.<sup>1</sup> To overcome this health challenge, the Ministry of Health has established a national early diagnosis of breast cancer programme which includes three methods: breast health awareness, clinical breast examination and imaging examinations, such as mammography, Ultrasonography (US) and Magnetic Resonance Imaging (MRI).<sup>3</sup> However, mammography is the most effective imaging method for the early diagnosis of breast cancer.<sup>5-7</sup> Mammography is an imaging examination of the breast using X-radiation. The breast X-ray images are often called mammograms (Figures 1 and 2).

## Healthcare Delivery System in Zambia

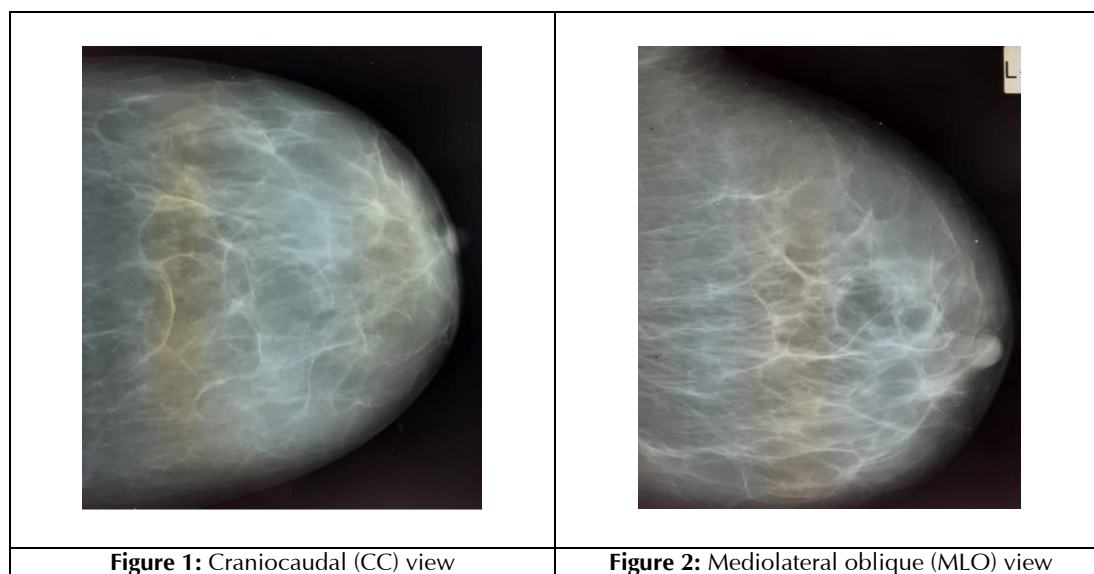
Zambia is in the southern part of the Sub-Saharan African continent. Based on the Worldometer elaboration of the latest data, the current population of Zambia is 17.5 million.<sup>8</sup> The healthcare system is run by the Ministry of Health with the headquarters based in Lusaka, the Capital City. There are four main healthcare providers: government, church, mining companies, and private investors. However, most healthcare facilities are owned by the government, followed by the church, then private investors, and lastly mining companies.<sup>9</sup>

The healthcare delivery in Zambia is offered at five levels: health posts, health centres, first-level referral hospitals, second-level referral hospitals, and third-level referral hospitals.<sup>3</sup> The lowest level of healthcare delivery starts at health posts which are managed by nurses. This level refers patients to health centres which are often managed by clinical officers or nurses. The health centres refer patients to first-level hospitals that are managed by medical doctors, nurses, and other healthcare professionals. This level refers patients to second-level hospitals which consist of medical doctors and other healthcare professionals with different specialties. The final level consists of

teaching hospitals that handle most of the complicated cases. Table 1 shows the features of each level of healthcare delivery.

This structured delivery system is aimed at providing

healthcare services as close to the family as possible.<sup>3,9,10</sup> In the context of this review, this means that mammography imaging services should be closer to the community at health post and health center levels.



**Table 1:** Zambian Healthcare Delivery System<sup>10</sup>

Level	Number	Description
Health posts	953	Serve small communities with populations of 3,500 people No mammography services
Health centres	1839	Service a population of between 30,000 and 50,000 people No mammography services
First-level referral hospitals	99	District hospitals and serve a population of between 80,000 and 200,000 people No mammography services
Second-level referral hospitals	34	Provincial hospitals and cover a population of between 200,000 to 800,000 5 of these provincial hospitals have mammography services
Third-level referral hospitals	8	Teaching hospitals and cover a population of more than 800,000 people 5 of these teaching hospitals have mammography services

**Table 2:** Proposed Mammography Clinical Positions Linked to Qualifications

	Proposed clinical position	Roles and responsibilities	Qualification in mammography
1	Assistant mammographer	Performing screening mammography.	Postgraduate certificate in mammography
2	Mammographer	Performing screening, diagnostic and surveillance mammography. Assisting in needle aspiration biopsies.	Postgraduate diploma in mammography
3	Clinical specialist mammographer	Reporting on mammograms. Performing needle aspiration biopsies. Involvement in education and training.	Masters in mammography
4	Consultant mammographer	Providing consultancy services. Conducting research and evaluation. Involvement in education and training.	Doctorate in mammography or Masters in mammography with five years' experience as clinical specialist mammographer

### **Mammographic Workforce in Zambia**

In Zambia, there are inadequate human resources trained in disciplines related to mammography services. It should be mentioned that an appropriate mammography workforce must be maintained to ensure that the quality is not compromised.<sup>11</sup> Ideally, the workforce in each radiology department should consist of three healthcare professionals: mammographers, radiologists, and radiology nurses.<sup>12</sup> Even with constrained resources, it is possible to have these specialists by establishment of local training programmes. The roles of each are briefly discussed.

Mammographers are generally responsible for imaging the breast. According to the *Zambian Organisation Structure Report for the Ministry of Health*,<sup>13</sup> there is currently one mammographer based at CDH. Other hospitals use non-specialised radiographers to undertake this role. This is in contrast with the practice of mammography abroad. In the United Kingdom, radiographers who undertake mammography receive specialised education and qualification, and their roles have expanded to perform advanced practice and consultancy roles.<sup>14</sup> It is estimated that 261 mammographers are employed in advanced practice and 47 in consultancy roles in the UK.<sup>12</sup> In the context of this review, advanced practice means mammographers reporting and performing breast biopsies.

Literature reports that advanced practice improves the quality of service delivery, reduces service costs, and patient morbidity.<sup>15,16</sup> It also leads to advanced career opportunities amongst radiographers which are linked to job satisfaction and professional recognition.<sup>15,17</sup> Due to a critical shortage of radiologists, Zambia can greatly benefit from the introduction of advanced practice. Therefore, the following radiography workforce 4-tier structure is proposed linked to specialised qualifications (Table 2). The proposed mammography structure is in line with the UK model<sup>11,12</sup> and suggested clinical positions in the radiography workforce in Zambia.<sup>18</sup>

Radiologists are medical doctors specialised in imaging; interpretation and reporting on radiographic images as well as performing interventional procedures such as breast biopsies. Currently, there is no radiologist in Zambia specialised in mammography. This is in contrast with the UK, where there are approximately 407 radiologists specialised in

breast imaging.<sup>12</sup> Due to a shortage of radiologists in Zambia, interventional breast procedures are performed by oncology surgeons who may lack imaging knowledge. For this reason, there is a need to have radiologists specialised in breast imaging to improve the delivery of services.

Radiology nurses offer nursing care to patients undergoing breast interventional procedures. In Zambia, there are no radiology nurses specialised in breast imaging.<sup>13</sup> Due to a shortage of radiology nurses specialised in mammography, the role is currently undertaken by oncology and general nurses who may lack imaging knowledge. Therefore, there is a necessity to have radiology nurses specialised in breast imaging to improve the care of patients.

### **Current Status of Mammography Services in Zambia**

The first mammography X-ray unit was installed in Lusaka at Theba private health facility in 1999, and in the public health sector in 2006 at the Cancer Diseases Hospital (CDH) of Lusaka. Since then, more units have been installed in both public and private health facilities across the country. Table 3 shows the health facilities offering mammography imaging services in Zambia.

The imaging of the breast is performed using specialised mammographic X-ray equipment. Figures 3 and 4 shows a mammographic equipment at CDH. A full description of the equipment is outside the scope of this review.

There are four mammography imaging services offered in Zambia: screening, diagnostic, surveillance, and needle aspiration biopsies. The cost of the mammography is K200 (\$10) per patient, except in October when screening is offered for free. Literature reports the cost of imaging as a barrier in the delivery of mammography services in developing countries.<sup>19</sup> This finding is similar to the Zambian situation where most people in rural areas live below the poverty line and cannot afford the user fees. However, the government has in place free services through the social welfare department for poor patients.

Screening mammography is used for the early detection of cancer in asymptomatic women.<sup>5</sup> The recommended age for screening mammography in Zambia is 40 which is adapted from the World Health Organisation.<sup>20</sup> All screening services are offered in

health facilities (Table 3). Studies show that screening mammography has been shown to reduce the breast cancer mortality rate between 30% and 40% through the effect of minimising the incidence of advanced and inoperative breast cancer with metastases.<sup>6</sup> In Zambia, there are no mobile mammography services. A review conducted by Li and Shao,<sup>21</sup> found a lack of mobile mammography as a barrier to screening breast cancer in developing countries. This agrees with the situation in Zambia where there are no screening mammography services at the health posts, health centers, and first-level referral healthcare delivery levels (Table 1).

Diagnostic mammography is for symptomatic patients referred from the screening services or referring medical practitioners.

Surveillance mammography is used to assess the recurrence of malignancy in women with known breast cancer.<sup>22</sup> These patients are normally booked for a follow-up appointment at mammographic centers across the country (Table 3). Most of the patients come back for follow up imaging, but a few fail because of distance and the cost involved in traveling to mammography centers.

Needle aspiration biopsy is used to obtain tissue samples from breast masses that appear suspicious on screening or diagnostic mammography.<sup>7,23</sup> This service is offered in teaching hospitals with breast clinics.

### Challenges for Mammography Services in Zambia

Zambia, like other sub-Saharan African countries is facing challenges in offering quality mammography services. These have been classified into six thematic areas (Table 4).

### Lack of Awareness about Mammography Services

The awareness levels amongst the Zambian population to screening mammography are low.<sup>23,24</sup> This inadequate knowledge and breast health awareness have also been acknowledged by the Ministry of Health as a challenge in the fight against breast cancer in Zambia.<sup>3</sup> A survey conducted in sub-Saharan African countries by McKenzie et al.,<sup>19</sup> found a delayed diagnosis of breast cancer to be associated with several factors, such as low breast health awareness levels, financial constraints, and limited formal education. This means that women with high incomes and education levels are more likely to attend for screening mammography than women of low socioeconomic status.<sup>21</sup> A lack of awareness can result in women presenting themselves to health facilities late in advanced stages of the disease.<sup>25</sup> Literature also shows that awareness programs and resources available for healthcare in developing countries are mostly concentrated on infectious diseases such as HIV/AIDS, tuberculosis, and malaria.<sup>26</sup> This results in less attention to screening mammography awareness programs.



**Figure 3:** Mammographic Unit (frontal view)



**Figure 4:** Mammographic Unit (side view)

**Table 3:** Health Facilities Offering Mammography Imaging Services in Zambia

No	Name of the health facility	Province	Category
1	Cancer Diseases Hospital, Lusaka	Lusaka	Public
2	Levy Mwanawasa University Teaching Hospital, Lusaka	Lusaka	Public
3	Ndola Teaching Hospital, Ndola	Copperbelt	Public
4	Livingstone teaching hospital, Livingstone	Southern	Public
5	Chipata Teaching Hospital, Chipata	Eastern	Public
6	Solwezi Teaching Hospital, Solwezi	North-Western	Public
7	Mansa General Hospital, Mansa	Luapula	Public
8	Kasama General Hospital, Kasama	Northern	Public
9	Kabwe General Hospital, Kabwe	Central	Public
10	Lewanika General Hospital, Mongu	Western	Public
11	Private Medland Hospital, Lusaka	Lusaka	Private
12	Fairview Hospital, Lusaka	Lusaka	Private
13	Italian Hospital, Lusaka	Lusaka	Private
14	CFB medical centre, Lusaka	Lusaka	Private
15	Forest Park Hospital, Lusaka	Lusaka	Private
16	Coptic Hospital, Lusaka	Lusaka	Private

**Table 4:** Challenges for Mammography Services in Zambia

No	Challenges
1	Lack of awareness about mammography services
2	Inconsistence in the supply of mammography consumables
3	Limited mammographic equipment and a lack of servicing and maintenance
4	Lack of trained mammographers and non-availability of postgraduate training course
5	Lack of radiologists to interpret and report on mammograms
6	Lack of research on mammography services

The authors have also observed the underutilization of mammography services due to a lack of awareness amongst referring medical practitioners and limited trained staff. There is a need for imaging professionals and Zambian Cancer Society (ZCS) to establish screening mammography awareness programs. According to the Ministry of Health,<sup>3</sup> awareness and educational interventions are instrumental in providing information about breast health and early signs of breast cancer, dispel misconceptions, and help individuals understand what actions to take. This also includes awareness of mammography services to nursing, medical practitioners, and other healthcare professionals. This is one of the objectives of this review paper which is to bring awareness about mammography services in Zambia to the members of the public and healthcare professionals.

#### **Inconsistence in the Supply of Mammography Consumables**

There is an inconsistent supply of imaging consumables in Zambian public health facilities such as X-ray films and processing chemicals. This challenge has been reported in the Ministry of Health's strategic plan of 2017 to 2021 as a barrier in the provision of quality imaging services in Zambia.<sup>10</sup> Other consumables include core biopsy guns and needles,

envelopes for packing the X-ray films and stationery. This brings about inconsistencies in the provision of mammography services. To overcome the inadequate supply of resources, there is a necessity for increasing funding for imaging consumables and investing in digital mammographic equipment which does not require X-ray films and processing chemicals.

#### **Limited Mammographic Equipment and Lack of Maintenance**

In Zambia, there are currently a total of 16 mammographic units: 10 in public hospitals spread across the country at second and third level hospitals and six in private health facilities (Table 3). However, more than 100 public hospitals have no mammography services. Mostly, these services are also concentrated in Lusaka, leaving rural areas with limited access. A lack of mammographic X-ray equipment is not limited to Zambia alone but occurs in other developing countries as well. For example, a survey conducted by Galukande and Kiguli-Malwade,<sup>26</sup> found only four mammographic X-ray equipment servicing 7 million women in Uganda. This lack of mammography facilities closer to the community's results in most of the patients being diagnosed with breast cancer at advanced stages of the disease, resulting in limited treatment options and high mortality rates.<sup>24</sup>

The other challenge associated with mammographic X-ray equipment is lack of maintenance and servicing of imaging equipment in Zambia. At the time of writing this article, six of the 10 and three of the six mammography X-ray units from the public and private hospitals respectively were not working. This challenge has been acknowledged by the Ministry of Health as a hindrance to the provision of quality imaging services in Zambia.<sup>10</sup> A lack of maintenance of imaging equipment in Zambia was also identified as a challenge in a review conducted by Bwanga and Chanda.<sup>27</sup> In the context of this article, fault and breakdown of mammographic X-ray units result in the disruption of services.

### **Lack of Trained Mammographers and Non-availability of a Training Course**

Radiographers who undertake mammography should have appropriate knowledge and skills in imaging the breast to provide diagnostic information.<sup>5</sup> The Zambian undergraduate radiography curricula include basic mammographic techniques.<sup>28-30</sup> However, mammography being a specialised imaging examination requires postgraduate specialised training.<sup>12,14,15,31</sup> Currently, there is only one radiographer who has undertaken a postgraduate course in mammography in South Africa under the support of the International Atomic Energy Agency (IAEA). Whilst the rest of the radiographers offering mammography services have been trained on the job. On job training lacks the scientific underpinning of education and the quality of the training varies according to the trainer's capacity.<sup>32</sup> For this reason, formal education and training are vital in acquiring appropriate knowledge, skills, and competence.

Postgraduate education and training enhance radiographers' professional competence and expertise in the practice of mammography and related research.<sup>12, 31</sup> It also allows mammographers to undertake advanced roles such as image interpretation and reporting on mammograms and perform consulatory roles.<sup>11,14,15</sup> Unfortunately, there is no postgraduate mammography course in Zambia to provide radiographers with knowledge and skills. This situation is different abroad. For example, in South Africa, the Republic of Ireland, and the UK, there are postgraduate courses in mammography offered up to

doctorate level.<sup>31,33,34</sup> A lack of a local training course hinders the delivery of mammography services.

### **Lack of Radiologists**

Mammography is a specialized radiological examination requiring advanced knowledge of breast anatomy and training in breast image interpretation.<sup>12</sup> This means that only radiologists and reporting radiographers should interpret and report on mammograms. In Zambia, there are currently five radiologists working in public health facilities.<sup>35</sup> This leaves five out of 10 public health facilities offering mammography imaging services without the onsite radiologist to interpret and report on mammograms and perform other interventional procedures. Currently, images undertaken at mammographic centres with no on-site radiologists are interpreted by the referring medical doctors or radiographers to give a primary diagnosis. Where further evaluation is required, the mammographic images are sent via courier to the teaching hospitals where radiologists are available for reporting. However, due to an increased workload of radiologists, this results in long waiting reporting times and associated delays in the management of patients. It should be mentioned that medical doctors and radiographers who assist in image interpretation have not received specialised image interpretation and reporting training. This can lead to misinterpretation and wrong diagnosis.<sup>35</sup>

The inadequacy of radiologists has continued to pose a negative impact on the utilisation of imaging services in Zambia. To alleviate the problem of radiologists' shortage, the Ministry of Health introduced a Specialty Training Programme (STP) in 2017 in partnership with the College of Radiologists of Zambia.<sup>38</sup> The duration of the radiology programme is four years and is housed in the main radiology department at the University Teaching Hospital (UTH). There are currently 13 student radiologists undergoing training. It is therefore anticipated that the provision of imaging services will improve with an increase in the number of radiologists. However, there is need for some radiologists to specialise in breast imaging. There is still a huge demand for image interpretation and reporting which require extending the scope of practice of radiographers to report on mammograms as proposed earlier.

### Lack of Research on Mammography Services

There is a lack of research on mammography services in Zambia. This may be due to lack of consultant mammographers with the role of conducting research on mammography services.<sup>14</sup> A review of literature conducted by Clarke and Reeves,<sup>37</sup> found several research studies conducted abroad on the experiences of women to mammography services. The findings from this review provided evidence-based information where to base policies formulations and training of mammographers that can improve the delivery of mammography services. This shows the importance of conducting research. Local research is required to understand the experiences of patients and healthcare professionals involved in mammography services. There is a need to encourage radiographers, radiography students, and radiologists through the schools of radiography and the Radiological Society of Zambia (RSZ) to conduct and publish research to improve the quality of imaging services.

### Recommendations

To overcome the identified challenges in this review, the following recommendations are made:

- To establish screening mammography awareness programmes that are closer to the community through the provision of both static and outreach activities. This can be achieved by implementing a well-coordinated awareness programme at each level of healthcare delivery with posters, brochures, drama/sketches, and talk shows with information in different local languages.
- To ensure rural population has got access to this imaging service, there is a necessity to establish free mobile screening mammography services that can be supervised at the district level and offered at health post and centres levels (Table 1). This can be achieved by acquiring mobile trucks fitted with mammography units which can be powered by generators to cater even for all those rural areas where there is no electricity.
- In the future, there is a need to consider procuring digital mammographic X-ray equipment which allows images to be transmitted via teleradiology for reporting to hospitals with radiologist services. Digital imaging also eliminates the cost associated with X-ray films and processing chemicals.
- To establish a postgraduate course in mammography

to equip radiographers with appropriate knowledge, attitudes, skills, and competence, including image interpretation and reporting. The training can be offered at four levels: postgraduate certificate, diploma, masters, and doctorate to match with the proposed clinical positions (Table 2). The scope of practice for radiographers should also be extended to match the current global practice and fill-up the gap created due to a critical shortage of radiologists.

- To establish national maintenance and servicing programme for imaging equipment as suggested in the Ministry of Health's strategic plan of 2017 to 2021 report.<sup>10</sup>

### Conclusion

This review has provided an overview of mammography services in Zambia that include screening, diagnostic, surveillance, and needle aspiration biopsies. However, mammography X-ray units are only in urban areas, leaving rural populations with limited access. The challenges identified in this review can be overcome by advocating for a comprehensive mammography service that should include functional equipment, easy access to mammography services, screening mammography awareness to both the public and healthcare professionals, trained personnel, and availability of consumables. The suggested recommendations if implemented, can improve the delivery of mammography services.

### Conflict of Interest

The authors declare no conflicts of interest.

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