CHALLENGES IN MEDICAL IMAGING IN TSHOPO PROVINCE (DRC): ADDRESSING THE NEED FOR EQUIPMENT AND STAFF TRAINING IN LOW-RESOURCE SETTINGS

ABSTRACT

Introduction: Medical imaging is an important specialty, essential in the practice of modern medicine.

By 2022, most sub Saharan countries have modern medical imaging equipment and qualified medical personnel in the field. However, this is not the case in the eastern part of the Democratic Republic of Congo particularly in the Tshopo Province. The objective of this study is to make an inventory of imaging services in the main health facilities in the Tshopo province.

Material and methods: This was a cross-sectional descriptive study conducted between June and August 2024 in the form of a survey of chiefs of health zones and radiology practitioners in the main health institutions of the Tshopo Province.

Results: The results are as follows: 1 radiologist, 3 senior technicians with degrees in radiology, 0 reference personnel in radiation protection and maintenance of radiological installations. In 23 health zones and their main health facilities, 5 X-ray machines,13 ultrasound machines, 1 CT scan were recorded. Mammography machines, and magnetic resonance imaging machines were not included in the imaging equipment.

Conclusion: In the Tshopo Province, the field of medical imaging faces many challenges from every point of view. The supply of diversified imaging equipment and the training of dedicated medical and paramedical staff are imperative to guarantee quality care to the population of the Province of Tshopo.

Keywords: Radiology, Insufficient, Unqualified Staff, Tshopo, Democratic Republic Congo

1. INTRODUCTION

The German physicist Wilhelm Conrad Röntgen announces the discovery of the rays he names X in December 28, 1895. This date marks the beginning of the practice of radiology that then spread throughout the world [1].

Medical imaging is a pivotal specialty, essential in the practice of modern medicine [2]. By 2022, most sub-Saharan African countries already had modern medical imaging equipment and qualified medical personnel in this field [3,4]. This is not the case in the eastern part of the Democratic Republic of Congo in general, and the province of Tshopo in particular. No imaging studies have been carried out in this part of the country in terms of equipment and staff.

The objective of this study is to identify the medical imaging facilities available in the main health areas of the different health zones of the province of Tshopo and to study the profile of the imaging staff assigned to them.

2. MATERIALS AND METHODS

This was a cross-sectional descriptive study carried out between June and August 2024 in the form of a survey of the 23 health zones chiefsin the Province of Tshopo and imaging practitioners from the main health facilities.

The Province of Tshopo has an estimated population of 3,102,477 inhabitants over an area of 197,657 km2 [5]and is the result of the administrative dismemberment of the former Oriental Province. The other provinces that resulted arelturi, Bas-Uélé and Haut-Uélé. The city of Kisangani is the capital of the Province of Tshopo.

Was eligible in this study, all staff familiar with the practice of imaging in our context, which means doctors, technicians and nurses working in the main health institutions. Any health staff with no experience in this field were excluded.

Data collection was carried out through the use of two questionnaires:

1. Inventory of the various functional imaging equipment (standard radiographymachines, ultrasoundmachines, mammography, CT Scan, magnetic resonance imaging machines) completed by the chiefs doctors of those health areas.

2. Profile of personnel assigned to imaging services (age, gender, professional qualification, home institution). This form was delivered in person to be filled by the service providers.

Data entry and coding was done using Office Word 2016 applications.

3. RESULTS

Qualified staff working in medical imaging departments and different equipment within the main health facilities in the Tshopo Province

N°	HEALTH AREA	X-Ray	Staff	US	Staff	CT Scan	Staff
1	BAFWAGBOGBO	0	0	0	0	0	0
2	BAFWASENDE	1	0	0	0	0	0
3	BANALIA	0	0	1	0	0	0
4	BASALI	0	0	0	0	0	0
5	BASOKO	0	0	0	0	0	0
6	BENGAMISA	0	0	1	0	0	0

7	ISANGI	**0**	**0**	**0**	**0**	**0**	**0**
8	KABONDO	**1**	**0**	**1**	**0**	**0**	**0**
9	LOWA	**0**	**0**	**0**	**0**	**0**	**0**
10	LUBUNGA	**1**	**0**	**1**	**0**	**0**	**0**
11	MAKISO= KIS	**2**	**2**	**4**	**0**	**1**	**1**
12	MANGOBO	**0**	**0**	**1**	**0**	**0**	**0**
13	OPALA	**0**	**0**	**1**	**0**	**0**	**0**
14	OPIENGE	**0**	**0**	**0**	**0**	**0**	**0**
15	TSHOPO	**0**	**0**	**1**	**0**	**0**	**0**
16	UBUNDU	**0**	**0**	**1**	**0**	**0**	**0**
17	WANIERUKULA	**0**	**0**	**0**	**0**	**0**	**0**
18	YABAONDO	**0**	**0**	**0**	**0**	**0**	**0**
19	YAHISULI	**0**	**0**	**0**	**0**	**0**	**0**
20	YAHUMA	**0**	**0**	**0**	**0**	**0**	**0**
21	YAKUSU	**0**	**0**	**0**	**0**	**0**	**0**
22	YALEKO	**0**	**0**	**1**	**0**	**0**	**0**
23	YALIMBONGO	**0**	**0**	**0**	**0**	**0**	**0**
TOTAL		**5**	**2**	**13**	**0**	**1**	**1**

Table I distributed the staff and imaging equipment of the main health facilities in the 23 health zones of the province of Tshopo. These staff were as follows: 1 radiologist, 3 graduate senior radiology technicians, 0 maintenance technicians. As for the equipment, 5 X-ray machines, 13 ultrasound machines were recorded, 1 CT Scan. There were no mammography or magnetic resonance imaging (MRI)machinesavailable anywhere.

4. DISCUSSION

Like most low and middle income countries, the DRC in general and particularlythe Province of Tshopo face serious challenges as farasequipment and qualified personnelin the sector of health imaging is concerned.

With an estimated population of 3,102,477 inhabitants over an areaof 197,657 Km^2area, 7 times largerthan Rwanda, and 6 times largerthanBelgium, Tshopo Province in its main health centershas only 5 X-ray machines, 13 ultrasound machines, 1 CT Scan and no mammography or MRI machines. It shouldbenotedthatthese few workingtools are handled by a staff consisting of 1 radiologist,3 qualifiedradiologytechnicians (3 train in the handling of radiography machines and only one of themtrained to use a CT Scan) and that the rest of the providers are represented by unqualified personnel. There were no maintenance technician and no referent in radio protection.

Kouandongui B.S in his study on the status of radiology in the Chu of Bangui and Bimbo in the Central African Republic found that the staff was made up of 4 radiologists, 7 senior technicians in radiology and medical imaging, there were no personnel in matters of radiation protection and maintenance of

radiological installations. The radiological equipment consisted exclusively of standard radiography and ultrasound. MRI and CT scan were not among the radiological facilities.[6].

Agoda-KoussemaLK for his part, in his study about the status of radiology at the Saint Jean de Dieu hospital in Afagnan in Togo, noted that all of the radiology staff were unqualified and that the radiology department only had 50% of existing medical imaging techniques[7].

The Province of Tshopo, in its capital city Kisangani,has a Faculty of Medicine within the official University of Kisangani. This faculty trains general practitioners and specialists (obstetrician, pediatrician, surgeon and internist). It was only in June 2024 that new departments were officially opened, including the department of radiology and medical imaging.

In the same city, there is also a Higher institute of Medical Technique which started a medical imaging course in 2023with the aim of training radiology technicians. The delay in opening of specific training schools for medical imaging at all levels explains the shortage of qualified staff within the Medical Imaging departments of the different main health institutions in this province.

If medical specialists and medical imaging technicians are essential for the performance and interpretation of examinations [8], the availability of a maintenance technician is also important. Indeed, maintaining the technical platform in a state of functionality ensures the durability of imaging examinations. The setting up and maintenance of equipment are real challenges for developing countries [9].

A radiation protection referent within an imaging department is also essential. It contributes to the observance of the principles of radiation protection, which is a regulatory obligation according to the International Atomic Energy Agency [10]. Indeed, radiation protection aims to protect practitioners, patients and the environment from the harmful effects of ionizing radiation.

There is an important contribution of medical imaging to modern medicine and it extends to diagnosis, prevention, treatment monitoring, pharmacology and medical research in terms of understanding diseases [2].

Many Sub-Saharan African countries have made significant progress in modernizing and diversifying their technical platforms [3].

They are certainly very expensive, but they can be a source of benefits. Indeed, an accurate and rapid diagnosis allows an appropriate and real-time referral of patients in their appropriate care pathways, thus avoiding unnecessary medical procedures and hospitalizations. It will also make it possible to avoid unnecessary medical transfers, which are very expensive or too late.

The current state of medical imaging in the Tshopo province of the DRC is very far from meeting the requirements of modern medicine.

Analog imaging is very restrictive. It requires chemical treatment for image development on an analog film. The quality of the image depends on the quality of the baths. Digital imaging has the advantage of being able to process and enhance the image before printing, thus eliminating film scrap [3,11].

It would also allow the exchange of medical imaging data between institutions in order to establish a remote and rapid diagnosis without necessarily having to wait for the visit of a specialist [12].

The unavailability of mammography is a handicap for a policy of systematic screening for breast cancer. This lack of means of exploration could be responsible for the late diagnosis of breast cancers [13], mammography being the only means of imaging that allows the diagnosis of precancerous lesions [14]. Its effectiveness is proven, cost-effective and acceptable due to its high sensitivity and specificity [15].

Ultrasound complements mammography and vice versa, without one replacing the other. It is for this reason that we speak today of the mammo-ultrasound couple. The use of medical imaging tests such as CT scanand MRI is increasingly common during the management of patients inall medical fields. CT Scan is a highly solicited procedure to such an extent that the number of examinations carried out each year continues to increase [16], which explains the need for this technology in almost all African countries south of the Sahara [17-18-19].

The unavailability of this technology (Ultrasound coupled to Doppler, Mammography and MRI) in the province of Tshopo has negative repercussions not only in terms of medical practice, but also in terms of medical training. Indeed, the quality of training depends on the vocation of the imaging students.

5. CONCLUSION

This study highlights the alarming weaknesses of the technical platform and the shortage of qualified personnel in medical imaging in the province of Tshopo. The coverage of imaging services in this province involves strengthening the supply of imaging equipment, the strengthening of facilitators of postgraduate imaging training courses in local universities and the organization of medical imaging technique sections and equipment maintenance sections in the higher institutes of medical techniques in Kisangani.

The government and the health authorities of Democratic Republic of Congo must invest more to strengthen the radiological park with equipment which will provide suitable internship locations for radiology technicians in training, it should also grant scholarships study for doctors wishing to specialize in radiology and medical imaging. This policy will cover the needs of the entire Democratic Republic of Congo in terms of radiology personnel and the sustainability of radiology examinations. It will also align Tshopo's imaging services with national and global health objectives, as suggested by the World Health Organization about medical imaging standards.

Ethical approval:Institutional ethical committee approval was obtained, ethic and deontology rules were respected during data collection.

COMPETINGINTEREST

The authors declare that they have no links or conflicts of interest for the publication of the article.

AUTHORS' CONTRIBUTIONS

All the authors contributed to the bibliography, reading and correction. All authors have read and approved the final version of the manuscript.

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1.

2.

3.

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