


**Commentary Article**

## A Commentary on the Negative Impacts on Patient Diagnoses and Management from the Lack of Magnetic Resonance Imaging (MRI) Services at the Ho Teaching Hospital (HTH) in Ghana

Seth Kwadjo Angmorterh<sup>1\*</sup>, Kafui Kossi Kekessie<sup>1</sup>, Elizabeth Dzidzornu<sup>1</sup>, Sonia Aboagye<sup>2</sup>, Patience Nyamekye Agyemang<sup>1</sup>, Nathaniel Awentiirin Angaag<sup>1</sup>, Eric Kwasi Ofori<sup>1</sup>

### Abstract

Magnetic Resonance Imaging (MRI) is a useful medical imaging tool in the diagnoses and management of several disease conditions including multiple sclerosis, prostate and breast cancer, epilepsy and seizure disorders, soft tissue joint disorders and vertebral spine disorders. MRI is also very useful in diagnosing breast disorders especially in younger women and following inconclusive breast ultrasound scans and mammograms. Pancreaticobiliary duct disorders like choledocholithiasis, acute and chronic pancreatitis are also well investigated with MRI. MRI services are unavailable at the Ho Teaching Hospital (HTH), a major referral hospital, and one of the five teaching hospitals in Ghana. The clinical implication of this is that patients who need MRI services have to travel long distances to other hospitals to access MRI services. The lack of MRI services at the HTH makes the diagnoses of critical medical conditions difficult, and in some cases, impossible. This commentary draws attention to the importance of MRI in the diagnoses and management of common medical conditions seen at the HTH and the lapses in diagnosing and managing patients with such conditions at the hospital.

**Keywords:** Magnetic resonance imaging; MRI services; Accessibility; Radiology; Ho Teaching Hospital; Ghana

### Introduction

Magnetic resonance imaging (MRI) is a useful medical imaging modality in diagnosing and managing several disease conditions. It is non-ionizing, non-invasive and has high soft tissue sensitivity [1,2]. Due to the usefulness of MRI in the management of patients, several hospitals worldwide have invested in MRI machines. However, access to MRI services in Ghana is very limited, as only 14 operational MRI machines are available in the country, resulting in an MRI to population ratio of 0.5 per million people [3]. The Ho Teaching Hospital (HTH), a major referral hospital in Ghana, does not have an MRI machine. This commentary seeks to highlight the clinical implications of the lack of MRI services at the HTH and how the absence of MRI services is negatively impacting patient management at the hospital. The commentary focuses on seven disease conditions: prostate and breast cancer, diseases and disorders of the spine, joint disorders, seizure disorders and epilepsy, jaundice and pancreaticobiliary ductal system disorders, and multiple sclerosis.

### Prostate Cancer

The lack of MRI at the HTH is negatively affecting the diagnoses and

### Affiliation:

<sup>1</sup>Department of Medical Imaging, School of Allied Health Sciences, University of Health and Allied Sciences (UHAS), Ho, Ghana

<sup>2</sup>Department of Speech, Language and Hearing Sciences, School of Allied Health Sciences, University of Health and Allied Sciences (UHAS), Ho, Ghana

### \*Corresponding Author:

Seth Kwadjo Angmorterh, Department of Medical Imaging, School of Allied Health Sciences, University of Health and Allied Sciences (UHAS), Ho, Ghana.

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management of prostate diseases in the hospital. The prostate is an organ found in men and it is located at the base of the urinary bladder with its primary function being the secretion of semen. Normal prostate sizes are essential for a healthy life. However, in men aged over 40 years, there may be a slight increase in prostate size as it increases with age [4]. Roehrborn and Rosen [5] indicated that 50% of men aged 60 years have prostatomegaly and its prevalence by age 90 is 90%. Prostate cancer, benign prostate hyperplasia and prostatitis are common causes of prostatomegaly with benign prostate hyperplasia being the commonest cause of prostatomegaly. Clinically, it is important to rule out possible prostate cancer as early as possible because it can be fatal and it is the second leading cause of cancer death in men [6]. Early diagnosis of prostate cancer is therefore essential for successful treatment. At the HTH, the current protocol for prostate cancer diagnosis involves two main steps. First, the patient must undergo a transabdominal ultrasound to investigate possible prostate enlargement, and a laboratory test to ascertain if the Prostate-Specific Antigen (PSA) is higher than 4 ng/mL. If the result of the transabdominal ultrasound indicates that the prostate is enlarged, and PSA is higher than 4 ng/mL, the patient is required to undergo a transrectal ultrasound-guided biopsy. Currently at the HTH, an average of one prostate biopsy is carried out per week for 1,050 Ghana cedis (US\$70) making it expensive and inaccessible. Since biopsy is an invasive procedure, patients must be fit to undergo the examination. Prostate biopsy examination is associated with pain, discomfort, haematuria, haemospermia, infection, and acute urinary retention. Despite the role of transrectal ultrasound (TRUS) in diagnosing prostate diseases, it has limitations in terms of sensitivity and specificity, ranging between 40-50% for detecting prostate cancer [7]. Aside ultrasound, there is no other medical imaging modality available at the HTH to evaluate the prostate size post-treatment.

MRI is a potent non-invasive medical imaging modality for diagnosing prostate cancer and it is particularly useful in negative biopsy patients with persistently high PSAs [8]. Follow-up treatment is also best done with multiparametric-MRI (mp-MRI) to rule out cancer recurrence [9]. Patients from the HTH who need mp-MRI have to travel long distances, often by public transport, to other cities to access mp-MRI services. In addition to the cost of transportation, they are confronted with accommodation challenges. Therefore, travelling to these cities to access mp-MRI services may cause inconveniences to patients as they have to stop frequently on the way to pass urine. This results in huge revenue losses to the HTH as it is the receiving hospitals and diagnostic centres that benefit from such investigations. The use of MRI is not only limited to the diagnoses and follow-up treatment of prostate cancer but it can also be used to diagnose benign prostate hyperplasia and prostatitis while ruling out prostate cancer. Adding MRI services to the

regimen for patients with prostatomegaly will be convenient and useful for both patients and clinicians. This suggests that having MRI services at the HTH could promote effective and convenient management of patients with prostate diseases, especially prostate cancer.

## Breast Cancer

The female breast is prone to several diseases and disorders. Many women who seek treatment at the HTH present with breast complaints such as painful breasts, nipple discharge and breast lumps. Common breast disorders include mastalgia, mastitis, benign breast lumps (usually fibroadenomas) and breast cancer [10]. Occasionally, men also present with either unilateral or bilateral breast lumps and enlargement or engorgement with the commonest diagnosis being gynecomastia [11]. Studies have shown that, breast cancer is the commonest cancer among Ghanaian women both in terms of incidence and mortality [12,13]. Hence, it is vital to make diagnoses during the early stages of the disease when treatment is most effective. Breast diseases, including breast cancer, are generally investigated with ultrasound scans, mammograms, MRI and biopsies. The use of MRI in the management of breast diseases is not widespread in Ghana. Currently at the HTH, ultrasound scans, mammograms and biopsies are the typical investigations employed to diagnose breast cancer. Biopsies are usually planned and completed at least a week after consultations for suspicious lesions (BIRADS 4 and 5) with the biopsy report taking at least two weeks to be ready. The anxiety of patients as they wait for their reports can be unbearable, impacting negatively on their mental health. Access to MRI, a relatively quicker investigation, could facilitate diagnoses within minutes in most cases thereby enhancing early detection of breast pathologies.

Since MRI services are unavailable at the HTH, younger women with negative ultrasound breast findings are usually asked to repeat the scans after two months instead of doing a breast MRI. Mammography is not a suitable medical imaging modality for investigating breast disorders in younger women because they have denser breasts mainly composed of fibroglandular tissues [14]. This makes them very sensitive to radiation damage and the incidence of carcinogenesis [15]. Women younger than 40 years typically undergo ultrasound scans but these are not very sensitive in detecting small breast lesions making MRI a more appropriate alternative [16-18]. The usefulness of dynamic contrast-enhanced MRI in present-day breast imaging cannot be overemphasized. MRI is a well-established method in breast imaging, with diverse clinical applications, including the non-invasive differentiation between benign and malignant breast lesions, preoperative staging, detection of scar versus recurrence, implant assessment, and the evaluation of high-risk patients [19]. Having an MRI machine and services at the HTH will

greatly aid in the diagnoses, treatment and follow-up of patients with breast cancer.

## Diseases and Disorders of the Spine

*“Doctor I have severe low back pains”*

*“Doctor I have severe pains in my back radiating to the back of my thighs”*

*“Doctor I have neck pains radiating to my shoulders and arms!”*

These are examples of common complaints patients present with at the HTH. Typical causes include spondylosis and degenerative disc disease of the spine at various levels. Spondylosis and degenerative disc disease of the spine are among the top five most common diagnoses at the HTH and they are usually seen in the elderly. These disease conditions are usually suspected in patients with any of the aforementioned complaints. Initial imaging protocols for the diagnoses of spondylosis and degenerative disc disease of the spine at the HTH consists of anteroposterior (AP) and lateral plain x-rays of the affected part. The global standard is that, upon review of the x-rays, patients with positive findings for these disease conditions are investigated further with MRI for a detailed assessment of the intervertebral discs, spinal cord and nerve roots. This is because MRI has superior soft-tissue resolution over plain x-rays and Computed Tomography (CT) scans in evaluating spinal disorders [20]. However, since there is no MRI machine at the HTH, patients are often given analgesics to manage the pain associated with spondylosis and degenerative disc disease of the spine. A few patients are referred to hospitals in other cities (several kilometres away) for MRI scans. The long-distance travelling by already debilitating patients is likely to aggravate their conditions and cannot be deemed as ideal patient management.

Spinal trauma secondary to road traffic accidents (RTAs) is commonly encountered at the HTH. The increasing use of unregistered motorbikes popularly called “*okada*” and tricycles popularly called “*Mahama can do*” with unlicensed riders as commercial means of transportation in Ho is a major contributor to spinal trauma secondary to RTA. When patients present with such clinical history, those who need MRI are transported in pain over long distances on bad roads to other cities for MRI. Patients with traumatic spinal injury should not be moved frequently as such movements could actually worsen the original injury. To move such patients into vehicles for trips that could last hours on poorly maintained roads is very risky. Some trauma patients do not have the financial means to travel for an MRI since it costs about 620 Ghana Cedis (US\$41) to transport a patient by the national ambulance services for an MRI service from Ho to the nearest city. The doctors may be left unsure of how to proceed with the management of such patients. Having an MRI at the HTH would therefore be of great benefit to

the management of patients presenting with spinal trauma secondary to RTA.

## Joint disorders

A joint is the point of connection of two bones in the body which links the skeletal system into a functional whole, allowing for different degrees and types of movements [21]. There are between 250-350 joints in the human body. Joint disorders are among the common disease conditions seen at the HTH. Common cases include joint infections such as septic arthritis, autoimmune diseases like rheumatoid arthritis, degenerative diseases like osteoarthritis, metabolic diseases like gout and trauma. Osteoarthritis is by far the commonest joint problem diagnosed at the HTH with knee involvement being the most frequent. Osteoarthritis is common in both males and females aged 50 years and over, and presents with knee pains, stiffness and swelling resulting in difficulty in walking [22]. The morbidity, social and financial implications associated with this disease burden are huge. There is therefore the need for early and comprehensive diagnoses to ensure effective treatment. Diagnoses for osteoarthritis can be made using plain radiographs in its late stages. MRI is superior in visualizing disease-related changes in the bone at a very early stage [23]. According to Oo et al. [24], MRI is the medical imaging modality of choice in evaluating the different roles of structural disorders in incident knee osteoarthritis. However, the unavailability of MRI services at the HTH means that clinicians are unable to use MRI to compare the predictability of individual features of semiquantitative scores for knee replacement and to formulate different disease progression models. The absence of an MRI machine deprives patients presenting with symptoms of osteoarthritis and healthcare professionals from having optimal investigations for early diagnoses. This may result in some diagnoses being made at a late stage of the disease process leading to greater disability and, in some cases, morbidity.

The treatment of joint traumas at the HTH would be greatly enhanced with MRI. When patients present with joint trauma, the primary imaging modality is plain radiography which is usually adequate in diagnosing fractures and dislocations. While some traumas present with negative radiological findings on plain radiographs, there may be serious cartilage, tendon, capsule or meniscus injuries that should be investigated with MRI since it has superior soft-tissue sensitivity. The lack of MRI services at the HTH therefore makes it difficult, and in some instances, impossible to accurately diagnose patients presenting with soft tissue injuries as a result of joint trauma. The clinical implication of this is that, it is difficult for a more targeted and accurate treatment to be offered to patients presenting with this disease condition. Rheumatoid arthritis is another common joint disease that is seen at the HTH. Gioia et al. [25] defines rheumatoid arthritis as a chronic autoimmune multisystemic



inflammatory disease with mostly musculoskeletal manifestations. It primarily attacks synovial tissues hence joints are commonly affected. Rheumatoid arthritis may also present with joint pains and stiffness with reduced joint movement or inability to use the affected joint. Plain radiography is usually the primary investigation employed for diagnoses. As rheumatoid arthritis is a disease that primarily affects synovial tissues, soft tissue manifestations present early but are easily missed by plain radiographs. MRI readily picks up these early changes for early diagnoses and treatment. The unavailability of MRI at the HTH means that it is difficult for early diagnoses of rheumatoid arthritis which can contribute to increased disability and morbidity.

Septic arthritis is a common joint disorder seen at the HTH. It is a destructive arthropathy caused by an intra-articular infection, and commonly presents in children especially those with sickle cell disease [26]. Presentation is usually painful swelling of the affected joint. Initial diagnosis is usually made using the clinical history of the patient, physical examination and plain radiographic findings. However, for subtle and initial septic arthritis, MRI is highly recommended because it is sensitive in diagnosing small joint fluids/effusions and detecting early cartilaginous damages [27]. The lack of MRI services at the HTH makes it difficult to detect small joint fluid/effusions in patients presenting with septic arthritis. As a result, accurate diagnoses in relation to this disease condition are often not made, and consequently, treatment provided may be inappropriate and ineffective. The absence of MRI services at the HTH also impacts negatively on the diagnoses and treatment of avascular necrosis of the hip. In Martí-Carvajal et al.'s review [28], avascular necrosis is a joint disorder with a high prevalence and incidence rate among patients, particularly those with sickle cell disease. The presentation is usually pain in the affected hip with reduced movement. Currently at the HTH, diagnoses are made at the latter stages of the disease where it might have advanced with more detrimental effects on patients. It is difficult to diagnose avascular necrosis at an early stage at the HTH because diagnoses are solely reliant on conventional radiographs of the pelvis (hip joint). Conventional radiographs provide very little information and are not really useful for the diagnosis of avascular necrosis. Rather, accurate diagnosis of the disease must be based on an MRI of the affected hip joint. MRI is the gold standard for detecting early stages of avascular necrosis, with excellent specificity and sensitivity when compared against histologic examination or subsequent imaging [29].

### Seizure disorders and epilepsy

Seizure disorder is a very common disease condition seen at the HTH and its diagnosis and treatment are negatively affected by the lack of MRI services in the hospital. A seizure is a sudden uncontrolled electrical disturbance in the brain, commonly presenting as an uncontrollable jerking

movement of the upper and lower limbs [30]. It can be associated with loss of consciousness and awareness, staring spells, temporary confusion, and cognitive or emotional symptoms such as fear and anxiety. Epilepsy is a chronic disorder that causes unprovoked, recurrent seizures and it is the fourth most common neurological disorder affecting people of all ages [31]. Epilepsy can be drug-induced or caused by fever, head trauma, stroke, cerebral palsy, meningitis, mesial temporal sclerosis, brain tumours and vascular malformations. However, about 50% of adult-onset epilepsies have unidentifiable causes [32]. Some common causes of epilepsy are peculiar to children. These include genetic disorders, developmental anomalies such as chromosomal disorders seen in children suffering from down syndrome and developmental cortical abnormalities such as focal cortical dysplasia [33]. For effective treatment, the cause of epilepsy must be known to aid appropriate management. MRI is the medical imaging modality of choice for accurate diagnoses and presurgical evaluation of epilepsy. There are several MRI protocols for epilepsy evaluation. The application of epilepsy-tailored MRI protocol followed by expert radiological evaluation is very useful in early diagnoses of epilepsy [34]. However, comprehensive and accurate diagnoses of epilepsy is difficult at the HTH due to the absence of an MRI machine. The absence of an MRI machine deprives patients and clinicians of useful diagnostic information that can help in patient management. Patients suffering from epilepsy who present at the HTH are usually referred for MRI services in other cities. However, a large number of patients referred from the HTH for MRI services are unable to do so due to its scarcity, cost, and time involved. The clinical implications are that patients do not get access to the most effective and accurate diagnoses and management. Consequently, treatment will not be based on a detailed knowledge of the cause of the condition. This situation is frustrating to both patients and health professionals as this delays treatment.

### Jaundice and pancreaticobiliary ductal system disorders

Jaundice is a very common disease encountered at the HTH, both in paediatrics and adults. It is the manifestation of hyperbilirubinemia leading to the yellowing of the skin and conjunctiva [35]. The causes of jaundice vary, hence the need for thorough investigations and diagnoses to facilitate proper treatment. Diseases of the liver, gallbladder, biliary duct and pancreatic head are the typical causes of jaundice. Abdominal ultrasound scan is the primary medical imaging investigation for evaluating jaundiced patients at the HTH. Ultrasound scans can facilitate the identification of some causes of jaundice such as hepatomegaly in acute and chronic hepatitis, cirrhosis, hepatic tumours, gallbladder diseases like cholelithiasis and cancers of the head of the

pancreas. Irrespective of the benefits of ultrasound, it has several limitations. For example, ultrasound is limited in diagnosing the cause of dilated intra and/or extra hepatic ducts. Possible causes of dilated intra and/or extra hepatic ducts include choledocholithiasis, biliary stricture, and cholangiocarcinoma [36]. To accurately diagnose these causes, magnetic resonance cholangiopancreatography (MRCP) is highly recommended. MRCP is an MRI procedure that produces detailed images of the hepatobiliary and pancreatic systems, including the liver, gallbladder, bile ducts, pancreas and pancreatic ducts [37]. MRCP is useful in evaluating patients with pancreatitis to detect the underlying cause. In patients suffering from pancreatitis, an MRCP may be performed using secretin to assess for long-term scarring and to determine the amount of healthy pancreatic function and secretions. MRCP is superior in diagnosing a possibly anatomic alteration in the biliopancreatic duct like pancreatic divisum [38]. One major advantage of MRCP is that it provides a non-invasive alternative to endoscopic retrograde cholangiopancreatography (ERCP). The lack of MRI services at the HTH means that MRCP cannot be performed. The clinical implication of this is that clinicians and patients are deprived of the vital role MRCP can play in the diagnoses and clinical management of patients suffering from diseases of the hepatobiliary and pancreatic systems.

## Multiple sclerosis

Multiple sclerosis (MS) is a relatively common acquired chronic relapsing demyelinating disease involving the central nervous system (CNS) [39]. It is mainly diagnosed using MRI. It is rarely seen at the HTH. This could be attributed to two main factors – MS is uncommon in equatorial regions like Ghana, but more importantly, the disease may be under-diagnosed due to the unavailability of MRI at the HTH. Characteristically, MS is disseminated not only in space (i.e., multiple lesions in different regions of the brain) but also in time (i.e., lesions occur at different times) [40]. The presentation is usually between adolescence and the sixth decade, with a peak at approximately 35 years of age. There is a strong, well-recognised female predilection with a female to male ratio of 2:1. Clinical presentation is both highly variable acutely, as a result of varying plaque location over time. Examples of common clinical features include ataxia and gait disturbances, optic neuritis, upper limb motor neuron sign, limb paraesthesia and vertigo. In a study by Sarbu et al. [41] approximately half of the affected individuals will no longer be independently ambulatory after 20 years. Though there is no single accurate and reliable diagnostic test, MRI of the brain remains a key investigation tool in the diagnoses of MS [42]. Not only has MRI revolutionized the diagnoses and surveillance of patients with MS but also, follow-up scans can assess response to treatment and help determine the disease pattern. Diagnoses of MS at the HTH is not possible because

of the lack of MRI services. Patients presenting with signs and symptoms such as numbness or weakness in one or more limbs, electrical-shock sensations that occur with certain neck movements, especially bending the neck forward (Lhermitte sign), tremor, lack of coordination or unsteady gait, vision problems, slurred speech, fatigue, dizziness, tingling or pain in parts of the body, problems with sexual performance, bowel and bladder function which are suggestive of MS are not recognised as MS and may be treated under other disease protocols. An MRI service at the HTH would be beneficial in that clinicians could request for brain MRI to rule out MS among patients presenting with signs and symptoms of MS.

## Conclusion

MRI is a non-invasive radiological modality that is valuable in imaging soft tissues. It complements other investigations in most clinical settings, but it is critical for the diagnoses and treatment of specific diseases such as MS, jaundice and pancreaticobiliary ductal system disorders, seizure disorders and epilepsy, joint disorders, diseases and disorders of the spine, prostate and breast cancer. Patients presenting with these disease conditions at the HTH will benefit immensely from the availability of MRI services. To improve access to the benefits of MRI, it is recommended that the government of Ghana invests in the acquisition and installation of an MRI machine at the HTH because having MRI services at the HTH will go a long way to improve patient diagnoses and management.

## Competing interests

The authors declare no competing interest.

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