Volume 1, Issue 1

Journal of Advanced in Medicinal, Pharmaceutical and Biomedical Research

Journal homepage: https://www.jampbr.com

A Systematic Review of Radiology and Radio Oncology Evaluations in Patients with Thoracic and Pelvic Cancers based on Radiological Images

Sannar Sattar Albuzyad[1*], Mohammed Kasim Jawad[2]

[1]Radiologist, Tehran University of Medical Sciences, Tehran, Iran
[2]Diagnostic and Interventional Radiologist, Al Yarmouk Teaching Hospital, Baghdad, Iraq
Email:dr.mk.jawad@gmail.com, ORCID: 0000-0003-2488-0439

Article info
Received: 01.01.2025
Accepted: 02.02.2025
Available Online: 05.02.2025
Checked for Plagiarism: Yes

Keywords:
Radiology, Radio Oncology, Cancer, Pelvic, Medicine

ABSTRACT

Introduction: Early detection of cancer can significantly increase the likelihood of successful treatment, and imaging tests can have a significant impact on cancer diagnosis. Early cancer treatments are simpler and cheaper than advanced treatments.

Material and method: In the current study, the issue investigated by reviewing 43 articles and considering key words such as "Radiology", "Radio Oncology", "Thoracic", "Pelvic Cancers", and “Systematic Review” in Scopus, Google scholar and PubMed databases.

Results: It should be noted that X-rays can cause changes in DNA, which can lead to cancer in the decades or years to come, but this risk is very small. Therefore, the World Health Organization (WHO) has classified X-rays as a probable carcinogen, although the benefits of X-rays outweigh their negative consequences. According to estimates, 0.4% of cancers in the United States are caused by CT scans, and this figure could increase with the increase in the use of CT scans. On average, at least 62 million CT scans were performed in the United States in 2007.

Conclusion: Early detection helps doctors detect abnormalities in cancer-prone tissues that may develop into malignant cancers and prevent their spread by using cancer treatments.

Introduction

When the tumor is large, it can cause significant airway obstruction or can lead to fluid accumulation around the lungs. It can also lead to chest pain or shortness of breath [1-3].

Pelvic pain is a common problem for women, which can be due to premenstrual syndrome or serious diseases such as cancer [4]. The feeling of pain or pressure that is felt in the area below the navel is pelvic bone pain, which is sometimes accompanied by symptoms such as back pain, vaginal discharge and vaginal bleeding [5-7]. Pelvic bone pain can also be the first signs of genital cancer, especially ovarian cancer in women, and usually occurs in advanced stages of cancer, of course, not all pelvic bone pain is necessarily a sign of this disease [8].

Since the main cause of this disease is not known, it is not easy to talk about methods of preventing this disease. Genetic and hereditary factors, radiation and radiotherapy are the main causes of this disease that have been mentioned to date. Currently, the best way to prevent this type of disease is to pay attention to the prognostic signs and early diagnosis and to have a bone health check-up [9-11].

Tumors (also called neoplasms) are masses of cells and can be benign (non-cancerous) or malignant

Corresponding Author:* ***Sannar Sattar Albuzyad*
Email: sattarsannar@gmail.com, ORCID: 0009-0009-0086-1939

(cancerous). Mediastinal tumors are tumors that develop in the area of the chest between the lungs. This area, called the mediastinum, is surrounded by the breastbone in front, the spine in back, and the lungs on each side [12-14].

Your mediastinum includes your heart, aorta, esophagus, thymus, thyroid, trachea, lymph nodes, and nerves. Your thymus is an organ that is part of your immune system. Your lymphatic system, or lymphatic system, is also part of your immune system and helps protect your body. Mediastinal tumors include thymuses, lymphomas, germ cell tumors, and cysts, among others. They are masses of cells that appear in the space between the lungs, called the mediastinum. These tumors can be malignant (cancerous), but they are usually benign (non-cancerous). Surgery is the most common treatment. Mediastinal tumors are a rare type of tumor that grows in the mediastinum. These tumors can be benign (noncancerous) or malignant (cancerous). The mediastinum is the area in the middle of the chest between the sternum and the spine, separating the lungs. This area contains the heart, esophagus, and trachea. Mediastinal tumors can grow in three different areas: Anterior mediastinum:

- An area in front of the mediastinum Middle mediastinum [15]
- An area in the middle of the mediastinum Posterior mediastinum
- An area behind the mediastinum although mediastinal tumors are rare, they can be very serious. These tumors can grow and put pressure on the heart, lungs, esophagus, trachea, and spine.

Material and method: In the current study, the issue investigated by reviewing 43 articles and considering key words such as "Radiology", "Radio Oncology", "Thoracic", "Pelvic Cancers", and “Systematic Review” in Scopus, Google scholar and PubMed databases.

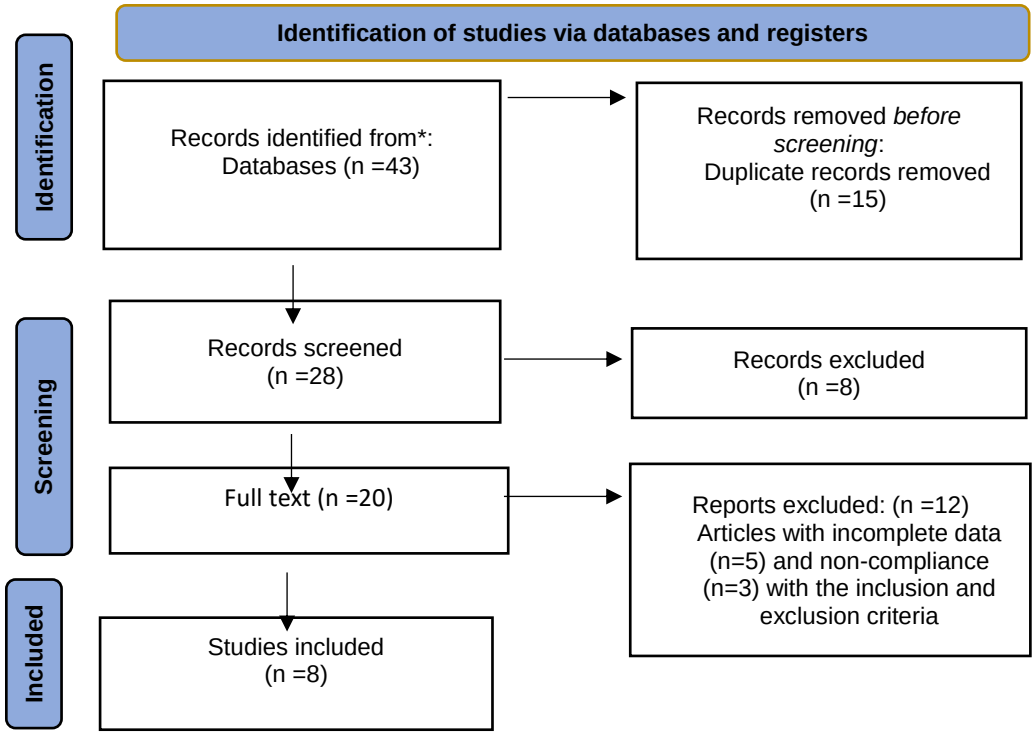

Fig 1. Flow PRISMA 2020 of included subjects

Results

Blood vessels, whether arteries or veins, that are blocked in the heart, legs, or lungs may be opened and treated with interventional procedures. Narrowing or blockage of the coronary arteries may be treated with angiography, angioplasty, and stent placement. In these procedures, a wire is inserted into the artery and a balloon is used to open the narrowed artery. Alternatively, a clot-busting drug may be injected to open the artery instead. A stent may then be inserted to keep the artery open and allow blood to flow to different parts of the heart. If the artery is severely blocked in the heart or limbs, a clot-busting drug may be injected to first open the artery and then a stent may be placed if needed (Table 1).

Table 1. The included subjects

Raw	Study	Year		Proportion Wight 98%		Weight %
1	Ibrahim et al.	**2020**		0.92	**[0.39 – 1.06]**	5.03
2	Jiahua et al.	**2020**		0.87	**[0.54 – 1.02]**	6.02
3	Kalantari et al.	**2020**		0.88	**[0.63 – 1.01]**	5.57
4	Karampela et al.	**2019**		0.60	**[0.25 – 1.08]**	6.13
Heterogeneity t^2=0.02, I^2= 0.00, H^2=1.02				0.95	**[0.22 – 1.07]**	
Test of Ɵ= Ɵ, Q (4) =5.55, P= 0.74						

Movement is a characteristic of human life and has a motivation and root in his nature and is a factor for his growth, health and vitality. Humans need movement and, in other words, are inevitably moving. Preventing humans from moving not only stops growth but also causes depression and loss of enthusiasm and vitality in their lives. Today, science has made significant progress in all aspects, and physical education and sports, which are considered extensive and advanced sciences, are no exception to this rule. On the other hand, one of the most effective factors in the development and progress of sports science is a better understanding of the body and how it functions. Also, if physical activities are not carried out on a correct basis and with scientific principles and standards, they will not only not be positive and beneficial, but will also endanger human life. In other words, by strengthening the musculoskeletal system correctly and systematically, many body ailments can be prevented [16].

The spine is a multi-part structure [1] with high mobility that is susceptible to being affected by many reaction forces resulting from different body positions, muscle contractions and external forces. The spine has four arches, including the cervical, thoracic, lumbar, and sacral arches, which increase the resistance of the spine to vertical forces, including body weight. If these curves are displaced from their original position, functional abnormalities of the spine will occur. In addition to a full range of motion, the spine requires sufficient stability during movements in different planes. The lumbar, pelvic, and sacral regions are of great importance as the central region [2] of the body. Not only is the anatomical location of the body's center of gravity located in this region, but it also acts as a link between the upper and lower limbs [17].

Today, exercises related to strengthening and increasing the stability of the central region have found many audiences and enthusiasts in various fields, and over the past several years, the number of users of this training method has increased, so that it is used to achieve various goals, including improving sports performance, rehabilitation and recovery from injuries, and improving health and motor fitness. Therefore, sports experts and trainers have turned their attention to the use of this type of exercise along with other training methods and considering the effects of these exercises in the field of pathology, rehabilitation and performance improvement. Yoga is an ancient discipline that increases physical fitness, relieves muscle tension (by eliminating spasms), coordinates the body and balances the body, reduces restrictions in movement, increases flexibility, endurance, controls and reduces fatigue, increases tolerance to heat, improves blood circulation and breathing, improves organ function (intestines and bladder), and reduces stress and a feeling of freshness [18]. Given that yoga, according to research, has more than 70 types of benefits and advantages, this discipline has gained particular popularity, so that today the use of yoga in Western and Eastern societies for the treatment of many diseases has increased (Table 2).

Table 2. The included subjects

Raw	Study	Year		Proportion Wight 98%		Weight %
1	Ibrahim et al.	**2020**		0.92	**[0.39 – 1.06]**	5.03
2	Jiahua et al.	**2020**		0.87	**[0.54 – 1.02]**	6.02
3	Kalantari et al.	**2020**		0.88	**[0.63 – 1.01]**	5.57
4	Karampela et al.	**2019**		0.60	**[0.25 – 1.08]**	6.13

Heterogeneity t^2=0.02, I^2= 0.00, H^2=1.02		0.95	**[0.22 – 1.07]**	
Test of Ɵ= Ɵ, Q (4) =5.55, P= 0.74				

When the human skeletal structure is in equilibrium, the lever system is at maximum efficiency and minimum energy. The body is a long structure that is balanced on a relatively small support surface and its center of gravity is located in a higher area, which challenges the body's physiological balance [19]. Balance and postural control are one of the important aspects of physical fitness that athletes benefit from to improve their sports performances, so that there are few sports in which balance and postural control do not play a role.

In addition, balance and postural control are considered one of the important parts of rehabilitation programs for sports injuries, which is unfortunately often ignored by coaches and athletes, delaying the athlete's return to the sports field. A comprehensive look at the concept of balance and postural control will reveal its broad meaning and application, as it plays a prominent role wherever the human body is concerned [20].

Activities performed in the workplace and daily tasks such as walking, running, and climbing stairs all require balance and correct postural control. Balance is a condition that describes the tendency to move the center of gravity (COG) [3] within the range of the base of support (BOS) [4] to the desired level. Since postural stability disorders, muscle spasms, and tone are one of the biggest problems for balance, mobility, and performing daily activities in MS patients. Balance disorders are also one of the important factors for falls in MS patients. Balance and postural control are doubly important in patients with multiple sclerosis [21]. Given the growth and spread of this disease and the increase in the number of people with multiple sclerosis in the world (2.5 million people) and in Iran 40-60 thousand, and given that women are more susceptible to MS (72% of women and 28% of men), the importance of diagnosing and preventing these patients' problems to promote and improve the quality of independent life becomes more apparent. Therefore, investigating and diagnosing the factors affecting changes in posture and balance control in people with MS, in order to increase safety in performing daily physical activities and sports and prevent injuries caused by falls among this group of people, is an important and necessary issue [22].

Doctors use imaging tests for cancer in several ways:

✓ To detect cancer in its early stages, when it is still small and has not spread and has no signs or symptoms.

✓ Look for a lump or tumor when symptoms are present. They can also see if cancer is the cause of the symptoms, or if something other than cancer is causing them.

✓ Determine whether a tumor is potentially cancerous and whether a small tissue sample needs to be removed and analyzed to determine this.

✓ See where the tumor is in the patient's body, even if it is deep inside the body.

✓ Determine what stage the cancer is in and whether it has spread to other parts of the body.

✓ Plan treatment [23].

✓ Determine whether the tumor has grown, shrunk, or stayed the same size. This helps the doctor know if the treatment is working or if the treatment plan needs to be changed, and whether the cancer has come back after treatment (Table 3).

Table 3. The included subjects

Raw	Study	Year		Proportion Wight 98%		Weight %
1	Ibrahim et al.	**2020**		0.92	**[0.39 – 1.06]**	5.03
2	Jiahua et al.	**2020**		0.87	**[0.54 – 1.02]**	6.02
3	Kalantari et al.	**2020**		0.88	**[0.63 – 1.01]**	5.57
4	Karampela et al.	**2019**		0.60	**[0.25 – 1.08]**	6.13
Heterogeneity t^2=0.02, I^2= 0.00, H^2=1.02				0.95	**[0.22 – 1.07]**	
Test of Ɵ= Ɵ, Q (4) =5.55, P= 0.74						

Types of Imaging Tests for Cancer Diagnosis and Their Benefits

What tests are done to check for and diagnose cancer?

Different types of cancer scans include:

Computed Tomography (CT) scan to diagnose cancer: The doctor uses a CT scan to take pictures of the inside of the patient's body from different angles using X-rays. The computer then converts the images into a 3D image to identify any tumors or

abnormalities. In some cases, the technician will give you a special dye called contrast agent before the scan, as directed by your doctor, so that more details can be seen in the image. This dye is injected into a vein or taken as a liquid or pill [24].

A) Benefits of CT Scan: A CT scan helps your doctor:

✓ Determine the stage of your cancer. Once your doctor knows this, he or she can choose the best course of treatment and may even predict your chances of recovery.

✓ Determine the right area for a biopsy.

✓ Plan for radiation therapy.

✓ Evaluate the effectiveness of your treatment during follow-up visits.

✓ Evaluate the success of your treatment after it is completed and during follow-up care.

Magnetic resonance imaging (MRI) to diagnose cancer: An MRI scan uses radio waves and powerful magnet energy to produce detailed, computerized images of the body. Doctors also use it to measure the size of a tumor. There is a narrow, tunnel-like opening on a standard MRI machine. MRI machines in some centers have a wider opening that is more suitable for people who are claustrophobic.

Claustrophobia, also known as claustrophobia, is an anxiety disorder in which a person is afraid of being in a closed environment, of being trapped in it, and this irrational fear can eventually lead to a panic attack. MRI does not use X-rays or other radiation. Therefore, it does not cause fertility problems in men or women. It is safe even during pregnancy. Doctors use MRI to take pictures of the spine, bone marrow, chest, abdomen, and breasts [25].

Ultrasound to diagnose cancer: Ultrasounds are imaging tests that are also called sonography or ultrasonography. Ultrasound uses high-frequency sound waves to create images of internal organs. These sound waves hit your organs and bounce back with force to a device called a transducer. The transducer captures the sound waves and converts them into computer images. When these waves bounce off abnormal and healthy tissue, they reflect in a unique way, helping the doctor detect a possible tumor [26].

Ultrasound tests do not use X-rays, so they are safe to use during pregnancy. Ultrasound helps doctors see tumors in specific areas of the body that cannot be seen on X-rays. Doctors often use ultrasound to guide a needle during a biopsy. Ultrasounds are usually quick and do not require any special preparation. They are often done on an outpatient basis, and the patient usually does not feel any pain during the ultrasound. Ultrasounds are an effective way to tell the difference between solid tumors and fluid-filled cysts because of the different reflection patterns.

Nuclear medicine scans for cancer: Nuclear medicine scans produce images based on the chemistry of the patient's body, rather than taking pictures of the body's physical form. The scans use liquid substances called radionuclides, radiopharmaceuticals, or tracers that release small amounts of radiation. Tissues affected by certain diseases, such as cancer, may absorb more or less of the tracer than normal tissue. Special cameras use patterns of radioactivity to produce images to show the doctor where the tracers are moving and where they are concentrated. If cancer is present, the tumor will appear as a hotspot [27].

A hotspot is a point of increased tracer uptake and cell activity. Depending on the type of scan, the tumor may appear as a cold spot. A cold spot is an area of less cell activity or decreased tracer uptake. Depending on the type of organ, the doctor will determine the type of nuclear scan. Several common nuclear scans are used for cancer:

✓ PET scan.

✓ Bone scan.

✓ Gallium scan.

✓ Thyroid scan.

Nuclear scans may not detect small tumors and cannot always show whether a tumor is cancerous or not. Nuclear medicine scans help doctors detect tumors and determine how far cancer has spread in a patient's body. They are also effective in determining the treatment method. These tests are painless and usually performed on an outpatient basis [28]. The tests that the doctor recommends may depend on several different factors, including:

✓ The location and type of tumor.

✓ Gender, age, and general health.

✓ Need for a biopsy or not.

✓ Cost.

✓ Balance between complications and side effects and expected benefits.

✓ Patient preference.

Multiple sclerosis (MS) is one of the most common diseases of the central nervous system (CNS). [6] In this disease, the myelin sheath of the axons of nerve fibers is destroyed. Therefore, the conduction of electrical currents in the brain and spinal cord is impaired and the symptoms of MS appear. Researchers know this disease as a chronic autoimmune, inflammatory, progressive, non-communicable and disabling disease of young and active adults [29].

As a result of this disease, numerous plaques and inflammatory lesions are formed in the white matter of the brain, spinal cord and optic nerves. These white and hardened tissues are the same myelin sheath that is separated in the brain, spinal cord and cerebellum and cause damage to the nervous system. The severity and complications of this disease vary depending on the extent and location of the damage. For this reason, the symptoms of the disease vary from person to person. This damage causes

symptoms such as imbalance, staggering, lack of coordination, numbness and paralysis of different parts of the body, fatigue, visual disturbances (blurred vision and double vision), speech disorders, muscle weakness, swallowing disorders, defecation disorders, bladder control disorders (urinary control), chronic and acute pain (face and back), sexual disorders, anxiety and depression in these patients [30].

Scientists have not yet found the real cause and definitive treatment for this disease. However, causes such as a weak immune system, inactive lifestyle, geographical and environmental factors, infectious agents such as viruses, malnutrition, especially vitamin B and D deficiency, genetic weakness, dehydration, enzyme deficiency, vaccines and toxins are considered common causes of this disease.

Most patients die from viral infections (secondary infections in the lungs and bladder). The treatments that can be used in these patients include drug treatments: interferon beta (Beta Seron, Avonex, Rebif), glatiramer (Copaxone), corticosteroids, amantadine, modafinil, pemoline, etc. Nutritional treatment: consumption of omega-6, omega-3, essential fatty acids, consumption of vitamins B and D, and physical treatments such as physiotherapy, aerobic exercise, swimming, and yoga. This disease is 2-3 times more common in women than in men, 3 times more common in whites than in blacks, and more common in cold and temperate regions than in tropical regions [31].

And has been seen in the elderly. Symptoms of this disease occur most often between the ages of 25 and 45, but it also occurs rarely in people under 15 and over 65. The best tool for diagnosing this disease is MRI, but other laboratory tests such as evoked potentials and cerebrospinal fluid examination are also used. 75% of these patients have a normal life expectancy, but the longest life expectancy for these patients is 25 years and the shortest life expectancy for women is 7 years and for men is 11 years. This disease is not hereditary, but if there is a family history of the disease and a predisposition to this disease, the incidence of this disease in close relatives doubles. Studies have shown that one of the most common areas involved in this disease is the cerebellum, which causes movement disorders, balance, and reduced control of posture, and as a result of these disorders, the quality of independent life of these patients decreases. Balance and control of posture are complex motor skills that control the dynamics of the body's posture [32].

Describes in preventing falls. Posture and balance control is one of the controversial concepts of the sensory-motor system. Posture and balance control can be examined from three aspects; the physiological and biomechanical aspects, respectively, consider different levels of balance control mechanisms and the ability to maintain and return the center of gravity within the range of stability without falling. From a functional perspective, balance is divided into three areas: static, dynamic, and semi-dynamic [33].

Good posture depends on the effective functioning of muscle, bone, and joint structures. Balance control requires the production and coordination of forces to create effective movements to control posture in space. The central nervous system produces, coordinates, and regulates these forces in various ways when standing still and when balance is disturbed. There are two main factors in creating balance in a standing position: the first factor is the alignment of body parts relative to each other, which maintains balance with the least energy consumption and reduces the effect of gravity [34].

The second factor is muscle tone, which prevents balance from being disturbed and falling due to the pull of gravity. Three important factors in muscle tone: the inherent stiffness of the muscles themselves, the underlying muscle tone present in normal muscles, and the postural tone (anti-gravity muscle activity).

Considering the role of trunk stability (the ability to keep the trunk stationary during the movement of a body part), which is also called the core stability of the body, in the body's stability and ensuring the body's balance during the movement of the limbs, strengthening the main muscles involved in this stability (transverse abdominal muscles, multifidus and pelvic floor) helps to maintain more balance and stability of the trunk in daily activities [35].

Also, the role of yoga exercises in maintaining muscle strength and relieving muscle fatigue and cramps, increasing flexibility and improving balance, maintaining joint flexibility and improving their range of motion, facilitating blood flow and nerve currents in the body, preventing secondary symptoms of MS such as: weight loss, muscle wasting and contraction, strengthening the immune system, helping to control weight, and considering the increasing spread of MS in the world and Iran, due to the decrease in balance and control of posture, weakness of the deep muscles of the trunk (transverse abdominal muscles, internal obliques external, multifidus, and pelvic floor) in reducing trunk stability and functional ability of the body and in the absence of definitive treatment, these patients experience many problems and limitations in performing their daily activities (Table 4).

Table 4. The included subjects

Raw	Study	Year		Proportion	Wight 98%	Weight %
1	Ibrahim et al.	**2020**		0.92	**[0.39 – 1.06]**	5.03
2	Jiahua et al.	**2020**		0.87	**[0.54 – 1.02]**	6.02
3	Kalantari et al.	**2020**		0.88	**[0.63 – 1.01]**	5.57
4	Karampela et al.	**2019**		0.60	**[0.25 – 1.08]**	6.13
Heterogeneity t^2=0.02, I^2= 0.00, H^2=1.02				0.95	**[0.22 – 1.07]**	
Test of Ɵ= Ɵ, Q (4) =5.55, P= 0.74						

Discussion

Radiology refers to a variety of imaging methods from inside the body using X-rays, magnetic fields, or sound waves [36-38]. When referring for radiology of different parts of the body, it must first be determined which imaging method should be used. The use of imaging methods using CT scans, MRI, radiography, and ultrasound are different types of radiology, each of which is effective in its own place, and it is the doctor who determines which imaging method the patient needs. In radiology, very small amounts of X-rays are used for imaging to show internal problems and fractures, and the imaging time is very short [39].

Accurate diagnosis of infectious diseases is the cornerstone of effective treatment and prevention of serious complications. While various laboratory and clinical methods are used in this field, radiology, as an advanced imaging tool, plays an increasing role in the diagnosis and management of infectious diseases [40].

To better understand the application of radiology in diagnosing infections, we must first become familiar with the nature of this science. Radiology is a branch of medicine that uses various energy waves, including X-rays, radio waves, ultrasound waves, and magnetic fields, to create images of the internal structures of the body. These images allow radiologists to examine bones, muscles, organs, blood vessels, and other tissues of the body and detect the presence of possible abnormalities, including infection [41].

There are different types of radiological methods to examine infections in different parts of the body. Here are some of the most common:

1- X-ray: This simple and relatively inexpensive procedure provides images of the bones and internal organs, such as the lungs and abdomen. A chest X-ray can be helpful in diagnosing lung infections such as pneumonia [42].

2- CT Scan: This procedure uses X-rays to create highly detailed cross-sectional images of the entire body. CT scans can help diagnose infections in the bones, joints, abdomen, pelvis, and other organs. CT scans can also be a good option in cases where a simple X-ray does not provide definitive results.

3- Magnetic Resonance Imaging (MRI): MRI uses radio waves and a strong magnetic field to create highly detailed images of the body's soft tissues. This method is used to diagnose infections of the central nervous system (brain and spinal cord), joints, and soft tissues (such as muscles).

4- Ultrasound: Ultrasound uses high-frequency sound waves to create images of internal organs. This method is radiation-free and is used to examine infections in the abdominal organs, appendix, and liver, and pelvic infections in women [43].

5- Nuclear Medicine: This method uses radiopharmaceuticals to track metabolic activity in the body. Nuclear imaging helps diagnose infections by showing abnormal accumulation of radiopharmaceuticals in the infected area [44].

Providing detailed images of internal anatomy: Radiology can provide highly detailed images of bones, muscles, organs, blood vessels, and other tissues in the body. These images help doctors identify the exact location of the infection and determine its extent. Early and accurate diagnosis of the site of infection helps to choose the appropriate and timely treatment strategy.

Early diagnosis of infection: Radiology can detect changes caused by infection in the early stages of the disease, when there may be no specific clinical symptoms. For example, a simple chest X-ray can show the early signs of pneumonia before the onset of fever, cough, and sputum. Early diagnosis of infection leads to faster initiation of treatment and improved prognosis of the disease.

Diagnosis of abscesses and other purulent collections: Radiology can easily identify abscesses and other purulent collections caused by infection due to its ability to accurately display soft tissues. These collections may not be palpable or difficult to detect on physical examination. Radiology helps the doctor decide whether to treat with medication or need to perform pus drainage procedures such as needle aspiration [45].

Guide invasive procedures: Radiology can be used in some cases to guide invasive procedures such as

biopsy (sampling) or drainage (drainage tube). For example, CT scan can be used to guide a biopsy needle to take a sample of infected tissue in the lung or other organs. This helps to accurately diagnose the causative agent of the infection and select the appropriate antibiotic.

Assess response to treatment: Radiology can be used to assess the patient's recovery process and response to treatment for the infection. By repeating imaging at specific intervals, it is possible to observe a decrease or increase in the extent of the infection and, based on this, assess the effectiveness of the treatment. Along with its many benefits, radiology in the diagnosis of infectious diseases also has limitations that physicians and patients should be aware of:

Radiation exposure: All radiology procedures except ultrasound expose the patient to ionizing radiation. While the radiation dose used in some procedures, such as a simple chest x-ray, is relatively low, repeated exposure to radiation can pose potential health risks, especially in cases of high-dose imaging such as multiple CT scans. Therefore, physicians must carefully weigh the need for radiology against its diagnostic benefits to the patient.

Inability to diagnose all infections: Radiology may not be effective in diagnosing all infections, especially in the early stages or soft tissue infections. For example, simple radiology is not very effective in diagnosing urinary tract infections and often requires laboratory tests. Some viral infections may not be detectable by radiology in their early stages.

Cost: The cost of some radiology procedures, such as CT scans and MRIs, can be high. This should be considered alongside the necessity of performing radiology and the availability of other less expensive diagnostic methods [24].

Availability: Access to advanced radiology equipment, such as MRIs, may not be available in all healthcare facilities, especially in underserved areas. In such cases, physicians should consider alternative and available diagnostic methods. Given the advantages and limitations of radiology, physicians can optimize the use of this method in diagnosing infections by considering the following:

Choosing the appropriate radiology method: Based on the type of patient's symptoms and the probable location of the infection, the physician should choose the most appropriate radiology method. For example, a simple chest X-ray is sufficient to examine a lung infection, but a CT scan is needed to examine a bone infection [25].

Considering the patient's medical history: If the patient has a history of a specific underlying disease or is pregnant, the physician should be more cautious about the necessity of performing radiology and, if possible, use less risky or radiation-free methods such as ultrasound.

Interpreting radiology results along with other clinical and laboratory findings: Radiology alone cannot definitively determine the causative agent of the infection (Table 5).

Table 5. The included subjects

Raw	Study	Year		Proportion Wight 98%		Weight %
1	Zhang et al.	**2023**		0.64		3.02
2	Fazaeli et al.	**2020**		0.52		4.00
3	Fathi et al.	**2020**		0.96		6.32
4	Gazerani et al.	**2015**		0.65		5.12
Heterogeneity t^2=0.00, I^2= 0.00, H^2=0.9				0.55		1.23
Test of Θ= Θ, Q (4) =3.45, P= 0.77						
1	Malekzadeh et al.	**2021**		0.56		1.55
2	Mehrabian et al.	**2014**		0.66		4.33
3	Yavari et al.	**2015**		0.48		6.77
4	Irajian & Beheshtirooy	**2016**		0.64		3.03
Heterogeneity t^2=0.05, I^2= 0.07, H^2=0.78				0.82		
Test of Θ= Θ, Q (4) =3.01, P= 0.11						

Conclusion

Imaging tests are one of the methods of cancer diagnosis that can be very effective in early detection of cancer. If detected early, the probability of success of treatment methods also increases. Radiology is a valuable and non-invasive tool in the diagnosis and management of infectious diseases. By providing detailed images of the internal structures of the body, this method helps physicians in early diagnosis of infection, identifying its location and extent, detecting abscesses and purulent collections, guiding invasive procedures and assessing the response to treatment. However, it is important that physicians are aware of the limitations of radiology, such as radiation exposure, inability to detect all infections, high cost and unavailability of advanced equipment. Choosing the appropriate radiology method based on the type of suspected infection, considering the patient's medical history and interpreting radiology results along with other clinical and laboratory findings, are among the key measures to optimize the use of radiology and reduce its potential risks. Ultimately, radiology is a diagnostic tool that must be used rationally and in conjunction with other diagnostic methods to optimally manage infectious diseases.

Disclosure Statement

No potential conflict of interest reported by the authors.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

References

[1] Sara Hassani, Masih Rikhtehgar and Alireza Salmanipour, Secondary chondrosarcoma from previous osteochondroma in pelvic bone, GSC Biological and Pharmaceutical Sciences, 2022, 19(03), 248–252

[2] Z Chakeri, S Hassani, S bagheri, A Salmanipur, N Maleki, Child Thoracic Osteoid Osteoma; Case Presentation, Review of Radiology and Management Case Report, Journal of Clinical and Medical Images, 2022, 2 (3)

[3] A Maleki, M Noorbakhsh, A Farhoudian, S Hassani, SA Karladani, Functional Assessment of Challenging Behavior and Neurological & Cardio-Pulmonary Problem in Patients with Autism Syndrome: Diagnosis and Treatment, Journal of Pharmaceutical Negative Results 13, 4112-4136

[4] SR Ali, A Kouhi, S Hassani, M Shakiba, J Zebardast, H Ghanaati, Vascular Blush Size Reduction, Technical Success and Safety of Intra-Arterial Embolization for Glomus Jugular Tumors: A Retrospective Cohort Study, IJ Radiology 21 (1)

[5] A Rafati, H Ghanaati, B Asadi, F Mehrabi, A Rahmatian, S Hassani, Outcomes of the Fluoroscopically-Guided vs. Computed-Tomography-Guided Transforaminal Epidural Steroid Injection in Low Back Pain: A Propensity-matched Prospective Cohort وMedical journal of the Islamic Republic of Iran 37, 23

[6] MKH Tahernia, M Ghasemian, F Rostami, S Hassani, M Khalilizad وImaging Methods Applicable in the Diagnostics of Alzheimers Disease, Considering the Involvement of Insulin Resistance with Clinical Pharmacological Point, Pakistan Heart Journal 56 (3)

[7] AHM A Gholami,M Mohammadi,A Farhoudian,S Haassani, Investigation of medical services in patients with Diabetes, cardio-vascular and Rheumatology disease in ICU, journal of pharmaceutical Negative Results 13 (10), 4137

[8] A Jalali, S Hassani, S Albuzyad, A Moaddab, M Rajabzadeh, Investigation of Cardiopulmonary Complications in Patients with Infection and Prevalence of Intubation in ICU with Radiological Point, Pakistan Heart Journal 56 (2), 906-919

[9] Seyed Morteza Bagheri, Sara Hassani and Alireza Salmanipour, Aggressive Osteoblastoma in adolescents: Radiological case report, GSC Advanced Research and Reviews 11 (3), 101-105

[10] D Rahi, S Abbassi, N Tajbakhsh, Evaluation of Root Canal Morphology of Mandibular Bone Using Radiological Imaged a Systematic Review, Eurasian Journal of Chemical, Medicinal and Petroleum Research 3 (3), 993-1015

[11] B Vadiati Saberi, nejad shamsi P, Zamindar M, Rahi D. Determination of frequen-cy distribution of aggressive periodontitis in dental clinic of Rasht dental school in 2016-2017, Journal of Dentomaxillofacial Radiology, Pathology and Surgery 10 (1), 34-39

[12] B Vadiati Saberi, M Afravi, D Rahi, The oral health status and oral hygiene practice of senior dental students: A cross-sectional study, Journal of Dentomaxillofacial Radiology, Pathology and Surgery 11 (1), 1-6

[13] SAHM Jahanabadi, SM Sajedi, N Pouralimohamadi, H Ghazipoor, D Rahi, Examining the Principles of Oral and Dental Hygiene in Children and the Elderly with Burns and Facial Plastics Surgery: The Original Article, Tobacco Regulatory Science (TRS), 3198-3212

[14] M Milanifard, S Mehrabi, R Ahadi, M Nabiuni, SA Souteh, MT Joghataei, Vitamin D receptor gene polymorphisms in patients with relapsing multiple sclerosis, European Journal of Translational Myology

[15] M Milanifard, S Mehrabi, R Ahadi, M Nabiuni, SA Souteh, MT Joghataei, Evaluation relationship between VDR gene and clinical and inflammatory factors in patients with RRMS, European Journal of Translational Myology 34 (4)

[16] M Pouya, S Pakseresht, M Dahmardehei, A Jafarian, FM Milani, et al., Medical and Pharmacological Evaluation of Scar Formation in Plastic Surgery, Journal of Medicinal and Chemical Sciences 5 (4), 449-456

[17] M Milanifard, S Mehrabi, R Ahadi, M Nabiuni, SA Souteh, MT Joghataei, Evaluation relationship between vitamin D Receptor and clinical and inflammatory factors in patients with relapsing-remitting multiple sclerosis, European Journal of Translational Myology 34 (4), 12939

[18] F Mirakhori, Evaluation of Amyloid Plaques in the Nervous System of Alzheimer's Patients with Reference to Non-Pharmacological Treatments in Patients, International Neurourology Journal 28 (1), 804-820

[19] A Jalali, S Hassani, S Albuzyad, A Moaddab, M Rajabzadeh, Investigation of Cardiopulmonary Complications in Patients with Infection and Prevalence of Intubation in ICU with Radiological Poin, Pakistan Heart Journal 56 (2), 906-919

[20] FA Mirghaed, TN Ahmadi, SS Albuzyad, AA Khorram, F Mahshad, A Systematic Review of Molecular Expression and Genetic Mutations in Patients with Cystic Fibrosis and Alzheimer's Disease, International Neurourology Journal 28 (1), 773-786

[21] KH Mirzaei, M Shojaei, M Saboury, Application of Robotic Instruments in Hip Arthroplasty Surgery Based on Practical Tips a Systematic Review, Eurasian Journal of Chemical, Medicinal and Petroleum Research 3 (2), 593-609

[22] M Shojaei, CHAT-GPT and artificial intelligence in Medical Endocrine System and interventions, Eurasian Journal of Chemical, Medicinal and Petroleum Research 3 (1), 197-209

[23] M Shojaei, Alternative Systematic Review of Insulin Resistance and the Role of Sex Steroids on Leptin Levels, Eurasian Journal of Chemical, Medicinal and Petroleum Research 3 (1), 296-306

[24] MJ Rahimi, F Mirakhori, R Zelmanovich, C Sedaros, et al., Diagnostic significance of neutrophil to lymphocyte ratio in recurrent aphthous stomatitis: a systematic review and Meta-analysis, Dermatology Practical & Conceptual 14 (1), e2024046

[25] MA Hamed Rahmani Youshanouei,Hamed Valizadeh , et al., Mesenchymal Stem cells as a bright therapeutic strategy for SLE: A Comprehensive Review, NeuroQuantology 21 (Issue 5|), 334-364

[26] Sara Hassani, Masih Rikhtehgar and Alireza Salmanipour, Secondary chondrosarcoma from previous osteochondroma in pelvic bone, GSC Biological and Pharmaceutical Sciences, 2022, 19(03), 248–252

[27] Z Chakeri, S Hassani, S bagheri, A Salmanipur, N Maleki, Child Thoracic Osteoid Osteoma; Case Presentation, Review of Radiology and Management Case Report, Journal of Clinical and Medical Images, 2022, 2 (3)

[28] A Maleki, M Noorbakhsh, A Farhoudian, S Hassani, SA Karladani, Functional Assessment of Challenging Behavior and Neurological & Cardio-Pulmonary Problem in Patients with Autism Syndrome: Diagnosis and Treatment, Journal of Pharmaceutical Negative Results, 2022, 13, 4112-4136

[29] SR Ali, A Kouhi, S Hassani, M Shakiba, J Zebardast, H Ghanaati, Vascular Blush Size Reduction, Technical Success and Safety of Intra-Arterial Embolization for Glomus Jugular Tumors: A Retrospective Cohort Study, IJ Radiology, 2012, 21 (1)

[30] A Rafati, H Ghanaati, B Asadi, F Mehrabi, A Rahmatian, S Hassani, Outcomes of the Fluoroscopically-Guided vs. Computed-Tomography-Guided Transforaminal Epidural Steroid Injection in Low Back Pain: A Propensity-matched Prospective Cohort, Medical journal of the Islamic Republic of Iran, 2025, 37, 23

[31] MKH Tahernia, M Ghasemian, F Rostami, S Hassani, M Khalilizad وImaging Methods Applicable in the Diagnostics of Alzheimers Disease, Considering the Involvement of Insulin

Resistance with Clinical Pharmacological Point, Pakistan Heart Journal, 2023, 56 (3)

[32] AHM A Gholami,M Mohammadi,A Farhoudian,S Haassani, Investigation of medical services in patients with Diabetes, cardio-vascular and Rheumatology disease in ICU, journal of pharmaceutical Negative Results, 2022, 13 (10), 4137

[33] A Jalali, S Hassani, S Albuzyad, A Moaddab, M Rajabzadeh, Investigation of Cardiopulmonary Complications in Patients with Infection and Prevalence of Intubation in ICU with Radiological Point, Pakistan Heart Journal, 2023, 56 (2), 906-919

[34] Seyed Morteza Bagheri, Sara Hassani and Alireza Salmanipour, Aggressive Osteoblastoma in adolescents: Radiological case report, GSC Advanced Research and Reviews, 2022, 11 (3), 101-105

[35] D Rahi, S Abbassi, N Tajbakhsh, Evaluation of Root Canal Morphology of Mandibular Bone Using Radiological Imaged a Systematic Review, Eurasian Journal of Chemical, Medicinal and Petroleum Research, 2024, 3 (3), 993-1015

[36] B Vadiati Saberi, nejad shamsi P, Zamindar M, Rahi D. Determination of frequen-cy distribution of aggressive periodontitis in dental clinic of Rasht dental school in 2016-2017, Journal of Dentomaxillofacial Radiology, Pathology and Surgery, 2021, 10 (1), 34-39

[37] B Vadiati Saberi, M Afravi, D Rahi, The oral health status and oral hygiene practice of senior dental students: A cross-sectional study, Journal of Dentomaxillofacial Radiology, Pathology and Surgery, 2022, 11 (1), 1-6

[38] SAHM Jahanabadi, SM Sajedi, N Pouralimohamadi, H Ghazipoor, D Rahi, Examining the Principles of Oral and Dental Hygiene in Children and the Elderly with Burns and Facial Plastics Surgery: The Original Article, Tobacco Regulatory Science (TRS), 2022, 3198-3212

[39] M Milanifard, S Mehrabi, R Ahadi, M Nabiuni, SA Souteh, MT Joghataei, Evaluation relationship between VDR gene and clinical and inflammatory factors in patients with RRMS, European Journal of Translational Myology, 2024, 34 (4)

[40] M Pouya, S Pakseresht, M Dahmardehei, A Jafarian, FM Milani, et al., Medical and Pharmacological Evaluation of Scar Formation in Plastic Surgery, Journal of Medicinal and Chemical Sciences, 2022,5 (4), 449-456

[41] M Milanifard, S Mehrabi, R Ahadi, M Nabiuni, SA Souteh, MT Joghataei, Evaluation relationship between vitamin D Receptor and clinical and inflammatory factors in patients with relapsing-remitting multiple sclerosis, European Journal of Translational Myology, 2024, 34 (4), 12939

[42] F Mirakhori, Evaluation of Amyloid Plaques in the Nervous System of Alzheimer's Patients with Reference to Non-Pharmacological Treatments in Patients, International Neurourology Journal, 2024, 28 (1), 804-820

[43] A Jalali, S Hassani, S Albuzyad, A Moaddab, M Rajabzadeh, Investigation of Cardiopulmonary Complications in Patients with Infection and Prevalence of Intubation in ICU with Radiological Poin, Pakistan Heart Journal, 2023, 56 (2), 906-919

[44] FA Mirghaed, TN Ahmadi, SS Albuzyad, AA Khorram, F Mahshad, A Systematic Review of Molecular Expression and Genetic Mutations in Patients with Cystic Fibrosis and Alzheimer's Disease, International Neurourology Journal, 2024, 28 (1), 773-786

[45] KH Mirzaei, M Shojaei, M Saboury, Application of Robotic Instruments in Hip Arthroplasty Surgery Based on Practical Tips a Systematic Review, Eurasian Journal of Chemical, Medicinal and Petroleum Research, 2024, 3 (2), 593-609