Role of Radiology in Tropical Diseases

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Abstract: *Tropical diseases are infectious diseases that are prevalent in or unique to tropical and subtropical regions. India is a tropical country & these diseases permanently curtail human potential, anchoring at least one billion poor people in poverty. They cause enormous economic burden for endemic countries. All such diseases cause great human misery. So this research work is done to evaluate useful role of radiology in early diagnosis of such tropical diseases & to assess value of various radiological modalities like X-rays, Ultrasonography, CT Scan, MR imaging etc. in diagnosis of such tropical diseases with a cost effective approach.*
Keywords: *Tropical Radiology, Tropical Diseases, Radiology in Tropical diseases.*

I. INTRODUCTION

Tropical diseases are infectious diseases that are prevalent in or unique to tropical and subtropical regions.[1] India is a tropical country and these diseases cause great human misery with enormous economic burden for endemic countries. Human exploration of rainforests and increased international air travel and other tourism to tropical regions has led to an increased incidence of such diseases.[2] The greenhouse effect and increasing global temperature of the atmosphere seem to be influencing the spread of tropical diseases and vectors to other latitudes that were previously spared them, such as Southern United States, the Mediterranean areas etc.[1] An estimated 1 billion people – one sixth of the world populations – are infected with one or more of these diseases,[2] so it is important to early diagnose these diseases. Various radio-diagnostic modalities like X-rays, Ultrasonography, CT scan, MR imaging etc. can early diagnose most of these diseases, so it is important to know that which modality/modalities is/are useful for us for a definite diagnosis with a cost effective approach.

II. AIMS AND OBJECTIVES

* To evaluate the role of radiology in diagnosis of Tropical diseases.
* To assess the value of correlative radiological imaging with a cost effective approach.

III. MATERIALS AND METHODS

In this study, we have collected cases & data of 50 cases of tropical diseases during the period of June 2006 to October 2008, during the period of our postgraduate residency. Most of the patients were referred from medical & surgical departments of civil hospital - Ahmadabad. The patients were selected on the basis of either clinical provisional diagnosis of tropical disease or laboratory-pathology investigations were indicative in favor of the tropical disease. All the patients were examined by one or more radio-diagnostic imaging modality as required; required X-rays & USG of almost all patients were done. Additional radiological investigations like contrast X-ray procedure, CT scan, MRI etc. whichever needed was done to approach the definite diagnosis. Follow up of all patients were also done during and after treatment.

IV. CLASSIFICATIONS OF TROPICAL DISEASES

There are many ways to classify the Tropical diseases like: Disease wise classification, System wise (Body system affected) classification and the WHO classification. Among all these, "Disease wise classification" is more commonly used, so here mentioned.[3]

1) Parasitic diseases: (1a) Major multisystem diseases – Amebiasis, Hydatid disease, Schistosomiasis, Taeniasis, Chagas disease & Paragonimasis. (1b) Gastrointestinal and abdominal diseases – Predominantly small bowel involving – Ascariasis, Strongyloidiasis, Ancylostomiasis, Anisakiasis, Capillariasis & Giardiasis. Predominantly colon involving – Trichriasis & Helminthoma. Liver involving – Clonorchiasis, liver flukes & Fascioliasis. (1c) Soft tissue diseases – Drancuncliasis & Filarial diseases. (1d) Miscellaneous diseases – Malaria, Dengue, Tropical splenomegaly & Kala azar.

2) Non-Parasitic diseases: (2a) Major multisystem diseases – AIDS, Tuberculosis & Mycoses. (2b) Gastrointestinal and abdominal diseases – Predominantly small bowel involving – Typhoid & Paratyphoid fevers. Predominantly colon involving – Bacillary Desentery & Lymphogranuloma Venereum. (2c) Soft tissue & Bone diseases – Soft tissue involving – Tropical Pyomyositis. Bone involving – Cancrum Oris,

Brucellosis, Tropical ulcer, Leprosy, Tetanus, Small Pox, Scleroma. Chest/Lung involving – Plague & Melioidosis.

3) Neoplastic (Malignant) diseases: Burkitt's lymphoma & Kaposi Sarcoma.
4) Miscellaneous diseases: Gastrointestinal – Tropical Sprue, CVS involving – Anaemias, Chagas disease, Endomyocardial fibrosis, CHD, Atheroma, IHD & Pulmonary hypertension etc. Soft tissue involving – Tumoral calcinosis. Bone involving – Ainhum, Haemoglobinopathies etc.

- The WHO classification [1,4] includes following common entries: African Trypanosomiasis, Dengue fever, Leishmaniasis, Malaria, Schistosomiasis, Tuberculosis, Chagas disease, Leprosy, Lymphatic Filariasis & Onchocerciasis. Additional neglected tropical diseases includes [1,2]: Ascariasis, Trichuriasis, Hookworm, Trachoma, Dracunculiasis, Buruli ulcer, Treponematoses, Leptospirosis, Strongyloidiasis, Neurocysticercosis, Scabies. Some very rare diseases may occur in sudden epidemics are: Ebola hemorrhagic fever, Lassa fever & the Marburg viral disease.

V. OBSERVATIONS AND ANALYSIS

Table – 1: Age Incidence

Age (Yrs)	No. of Patient	Percentage
</= 10	6	12
11 – 20	5	10
21 - 30	12	24
31 - 40	10	20
41 - 50	8	16
51 - 60	7	14
61 - 70	2	4
	50	100%

Table – 1: Shows Age incidence of the patients which were affected by Tropical diseases. It shows that affected maximum patients (24%) were between 21 – 30 yrs.

Table – 2: Sex Incidence

Sex	No. of Patient	Percentage
Male	30	60
Female	20	40
	50	100%

Table – 2: Shows those predominantly male patients were affected more than female patients by tropical diseases. Male: Female ratio is 3:2.

Table – 3: Parasitic VS Non Parasitic Diseases

	No. of Patient	Percentage
Non Parasitic Diseases	28	56
Parasitic Diseases	22	44
	50	100%

Table – 3: Shows that incidence of Non- Parasitic diseases (56%) were more than Parasitic diseases (44%) in the cases.

Table – 4: Disease Incidence

Disease	No. of Patient	Percentage
Tuberculosis	13	26
HIV Infection	9	18
Hydatid Disease	7	14
Worm Infections	5	10
Cysticercosis	3	6
Amoebiasis	3	6
Haemoglobinopathies	3	6
Tropical Spleenomegaly	2	4
Leprosy	2	4
Typhoid	1	2
Schistosomiasis	1	2
Toxoplasmosis	1	2
	50	100%

Table – 4: Shows that Tuberculosis (26%) and HIV infection (18%) were affected major proportion of overall cases.

Table – 5: Incidence of Multi system Diseases

Disease	No. of Patient	Percentage
Tuberculosis	13	26
HIV Infection	9	18
Hydatid Disease	7	14
Taeniasis, Cysticercosis	4	8
Amoebiasis	3	6
Schistosomiasis	1	2
Total	37	74%

Table – 5: According to classification, in the category of Major multi-system diseases, Tuberculosis (26%) and HIV infection (18%) were affected major proportion of overall cases. Total overall incidence of Multi-system diseases was 74%.

Table – 6: Incidence of Organ/System Involvement

(Multiple Organ/System involvement by a single disease is also taken into consideration.)

Organ/System	No. of Cases	Percentage
Lungs	13	26
Liver	11	22
Bowel (GIT)	11	22
Skeletal System	11	22
Brain (CNS)	8	16
Spleen	6	12
Heart (CVS)	4	8
Kidneys, Bladder (GUT)	3	6
Peritoneum	3	6
Lymphnodes	3	6
Orbit	1	2

Table – 6: Incidence of Organ/System involvement shows that Lungs (Respi.) were most commonly (26%) affected and Liver, Bowel (GIT) and Skeletal system were second (22%) commonly affected by Tropical diseases.

Table – 7: Incidence of Positive findings in Various Radiological modalities

Radiological modality	No. of Cases	Percentage
X- Rays	30	60
Ultrasonography	26	52
CT Scan	21	42
MRI	8	16
Conventional Contrast Procedures	7	14
Other Radiological Modalities	-	-

Table – 7: Plain X- Rays were positive in 60% of cases and USG was positive in 52% of cases. Both the investigations have very high positive predictive values.

Table – 8: Incidence of the Last Radiological modality Which reaches up to the Final Diagnosis

Radiological modality	No. of Cases	Percentage
CT Scan	19	38
X- Rays	10	20
MRI	8	16
Ultrasonography	7	14
Conventional Contrast Procedures	6	12
Other Radiological Modalities	-	-
	50	100%

Table – 8: Shows that CT Scan was used mainly (38%) as the last radiological modality to reach the final diagnosis.

Table – 9: Diagnosed Cases mainly by: Plain X- Rays

Sr. No.	Case No.	Disease	Organ/System involved
1	8	Tuberculosis	Skeletal Sys, Lymphnodes
2	11	Guinea worms	Skeletal Sys.
3	12	Guinea worms	Skeletal Sys.
4	33	Leprosy	Skeletal Sys.
5	40	PCP (HIV)	Respi. Sys.
6	42	Sickle cell disease	Skeletal Sys, CVS
7	43	Thalassemia	Skeletal Sys, CVS, Liver, Spleen, Kidney
8	44	Thalassemia	Skeletal Sys, CVS, Liver, Spleen
9	45	Schistosomiasis	Kidneys, Bladder (GUT)
10	50	Leprosy	Skeletal Sys.

Table – 9: Incidence of Plain X- Ray diagnosed cases includes mainly Haemoglobinopathies, Leprosy and Guinea Worm infection. 20% of cases in the study were mainly Diagnosed by Plain X- Rays.

Table – 10: Diagnosed Cases mainly by: Conventional Contrast Procedures

Sr. No.	Case No.	Disease	Organ/System involved
1	9	Tuberculosis	GIT
2	10	Tuberculosis	GIT, Respi.
3	15	Round Worm	GIT
4	16	Tape Worm	GIT
5	17	Tuberculosis	GIT
6	37	Amebic Colitis	GIT, Liver

Table – 10: Incidence of cases diagnosed by Conventional Contrast Procedures includes mainly Abdominal Tuberculosis and Worm infestations. 12% of cases in the study were mainly diagnosed by Conventional Contrast Procedures.

Table – 11: Diagnosed Cases mainly by: Ultrasonography

Sr. No.	Case No.	Disease	Organ/System involved
1	13	Amebiasis	GIT, Liver
2	28	HIV Infection	Spleen
3	29	Malaria	Spleen
4	30	Amebiasis	Liver
5	32	Typhoid	GIT
6	38	Malaria	Spleen
7	39	Round Worm	GIT

Table – 11: Incidence of cases diagnosed by Ultrasonography includes mainly Amebic Liver abscess and Tropical spleenomegaly in Malaria. 14% of cases in the study were mainly diagnosed by Ultrasonography.

Table – 12: Diagnosed Cases mainly by: MRI

Sr. No.	Case No.	Disease	Organ/System involved
1	2	Tuberculosis	CNS, Respi.
2	14	Cysticercosis	Skeletal Sys.
3	18	Tuberculosis	CNS, Respi.
4	21	Toxoplasmosis	CNS, Respi.
5	31	Tuberculosis	Skeletal Sys.
6	34	Cysticercosis	CNS
7	35	HIV Encephalitis	CNS, Respi.
8	46	HIV Encephalopathy	CNS

Table – 12: Incidence of cases mainly diagnosed by MRI includes Tuberculosis, HIV Encephalitis, Cysticercosis and Toxoplasmosis. 16% of cases in the study were mainly diagnosed by MRI.

Table – 13: Diagnosed Cases mainly by: CT Scan

Sr. No.	Case No.	Disease	Organ/System involved
1	1	Tuberculosis	CNS, Respi.
2	3	Hydatid Disease	Orbit
3	4	Hydatid Disease	Liver
4	5	Hydatid Disease	Liver, Spleen, Pelvis
5	6	Cysticercosis	CNS
6	7	Hydatid Disease	Liver
7	19	Hydatid Disease	Liver, Peritoneum
8	20	Hydatid Disease	Liver, Peritoneum
9	22	NHL (HIV)	GIT
10	23	Hydatid Disease	Respi.
11	24	Tuberculosis	Respi., CVS
12	25	Tuberculosis	Skeletal sys, Kidney, GIT
13	26	Tuberculosis	Respi.
14	27	Tuberculosis	Respi.
15	36	Tuberculosis	Respi.
16	41	HIV Adenopathy	Lymphnodes
17	47	NHL (HIV)	Liver
18	48	HIV Adenopathy	Lymphnodes
19	49	M. Avium Infection (HIV)	Respi.

Table – 13: Incidence of cases diagnosed by CT Scan includes mainly Hydatid disease and Tuberculosis. Highest numbers of cases (38%) in the study were mainly diagnosed by CT scan.

VI. SUMMARY AND CONCLUSION

- Maximum patients (24%) were affected by Tropical diseases between ages 21 – 30 yrs. Tropical disease which affected mainly above mentioned age group were: Tuberculosis, HIV infection & Hydatid disease.
- Predominantly male patients (60%) were affected more than female patients (40%) by Tropical diseases. Male: Female ratio was 3:2.
- Non-Parasitic diseases (56%) had more incidence than Parasitic diseases (44%) in the cases because of high incidences (44%) of Tuberculosis & HIV infections.
- Tuberculosis (26%) & HIV infection (18%) were affected major proportion (44%) of overall cases.
- Worm infections including Cysticercosis (16%) & Hydatid disease (14%) were more common in the category of Parasitic diseases in the cases.
- Lungs (Respiratory system) were most commonly (26%) affected by Tropical diseases.
- Plain X-rays were positive in 60% of cases and USG was positive in 52% of cases. Both the investigations are currently used as most common primary radiological imaging modalities and have high positive

predictive values. So these modalities either suggest approximate diagnosis or gives clues for further investigations.

- USG guided diagnostic/therapeutic aspiration procedures have major advantage in the treatment as real time, radiation less & cost effective imaging approach.
- Highest numbers of cases (38%) in the study were mainly diagnosed by CT scan as the last radiological modality to reach the final diagnosis.
- As MRI study is the preferred modality for detail evaluation and differential diagnosis, major limiting factors are their cost and limited availability in poorly developed tropical areas. In this study, combined diagnostic accuracy of X-rays, USG & CT scan were 84%. So, this suggests that combined use of other available cost effective radiological modalities like X-rays, USG & CT scan reduces the need of costly MRI study.

Thus, as per the objectives, the present study has evaluated the role of radiology in investigations and diagnosis of Tropical diseases and justified the values of correlative imaging with a cost effective approach.

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