Tuberculosis Meningitis Project

Self Project

Rupali Kathal

1. OBJECTIVE

• Monitored **24 cc** conglomerated ring of lesions in left cerebellum through a series of **8** contrast MRIs for 18 months
• Using **Tableau** software visualized the volume of Tuberculoma and its diminishing rate
• Studied the demographic distribution of Tuberculosis Meningitis patients in **6** major cities in Madhya Pradesh

2. MOTIVATION

High cases of this disease in the world, especially in a third-world country like India. In 2022, there were **500** cases of adult tuberculosis meningitis in Telangana alone. Brain tuberculomas diagnosis is difficult. The virus is slow to act and the symptoms might not begin until months or even years after you were initially infected. TBM needs to be diagnosed and treated early as it is associated with high mortality and severe neurological sequelae, especially in endemic countries like India. Nonspecific symptoms of TBM pose a challenge for accurate timely diagnosis

So studies are needed to better understand the disease.

3. INTRODUCTION

3.1 TUBERCULOSIS

Tuberculosis (TB) is a potentially severe infectious disease that mainly affects the **lungs**. It is caused by **Mycobacterium tuberculosis.** This bacteria causes tuberculosis to spread from person to person through tiny droplets released into the air via coughs and sneezes. An unusual incidence of tuberculosis in different parts of the body is called tuberculomas. The rate of brain tuberculosis is rare.

3.2 TUBERCULOSIS MENINGITIS

Tuberculosis Meningitis or TBM is a form of meningitis characterized by inflammation of the membranes (meninges) around the brain or spinal cord and caused by a specific bacterium known as Mycobacterium tuberculosis. In TBM, the disorder develops gradually.

Tuberculous meningitis (TBM), which accounts for approximately only **6%** of all cases of extrapulmonary tuberculosis (TB), is one of the most serious clinical forms of TB, with a **high mortality rate** and **disabling neurological sequelae**.

The bacteria spread to the brain and spine from another place in the body through the bloodstream, usually the lung.

Unlike Tuberculosis of the lungs, Bacteria from patients suffering from brain TB do not transmit via air, physical contact, or sharing food or water. So Tuberculosis is not contagious and does not require quarantine.

4. STATISTICS

The estimated mortality due to TBM in India is **3.9 per 100000 population**.

The largest numbers of these cases were reported in India, China, and Russia, and approximately 1% of patients with TB disease and associated with major morbidity and mortality.

5. SYMPTOMS & DIAGNOSIS

The symptoms often start slowly, and may include:

- Fever and chills

- Mental status changes
- Nausea and vomiting
- Sensitivity to light (photophobia)
- Severe headache
- Stiff neck (meningismus)

Other symptoms that can occur with this disease may include:

- Agitation
- Bulging fontanelles (soft spots) in babies
- Decreased consciousness
- Poor feeding or irritability in children
- Unusual posture, with the head and neck arched backward (opisthotonos). This is usually found in infants (less than 3 months old)

The health care provider will examine you and conduct some tests like a lumbar puncture or a spinal tap. A CT and MRI will also be needed. The CT findings in most cases showed multiple ring-enhancing lesions but finding based on CT alone is presumptive. Biopsy of the brain is the most accurate method of diagnosis in the case of multiple brain tuberculomas.

6. TREATMENT

Treatment of Brain Tuberculosis includes **anti-TB medicines, steroids, and decongestant medication**. Anti-TB medicines include four first-line drugs, isoniazid, rifampin, pyrazinamide, and ethambutol. Recovery requires a strict treatment plan.

In case the anti-TB drug course does not work, surgical procedures may be required.

7. CASE STUDY

In 2019, a 19-year-old female with altered consciousness, drowsiness, and high fever were referred to the emergency room and through a series of CT and MRI scans was diagnosed with a conglomerated ring of lesions in the left cerebellum. Some of the symptoms included prolonged headache(6-months), weakness, stiff neck, and anorexia.

Patient 1


None
RUPALI KATHAL 19Y/F
20OC11391
29-01-2021
Series: 601 Image: 11
[HR]
29-01-2021
[AR]
50
[PL]
mm
29-01-2021
12:01:05
SerDate 29-01-2021
SerTime 12:01:05
Achieva
SP 33.0mm
ST 3.0mm
512x512
W: 1722 C: 991
[FL]
SANYA DIAGNOSTICS, BHOPAL/PHILIPS-E3
0 fps
Slow
Fast
1x1

In this case, an anti-TB drug was prescribed and its regular administration led to the shrinking of the tuberculoma and full recovery in the time span of 2 years

Compare case study symptoms with other cases from all over the world

Patient name	Patient 1	Patient 2	Patients 3	Patient 4	Patient 5	Patient 6	Patient 7	Patient 8
Age	19	15	19	25	17	40	28	16
Gender	F	F	F	F	F	M	F	M
Country	India	Iran	Asian	Albanian	Nigeria	Nigeria	India	Asian
Neck pain/Stiffness	yes	yes	yes	yes	yes	No	Yes	yes
fever	yes	No	No	yes	yes	yes	Yes	yes

Prolonged weakness	for 6 months	for six months	for 4 months	For a month	3-week	No	For 3months	4-5 months
Nausea	yes	yes	yes	yes	yes	yes	Yes	No
anemia	yes	yes	yes	yes	yes	yes	No	No
weight loss	yes	yes	yes	no	no	no	Yes	No
chest pain	no	no	no	no	no	no	yes	No
Seizure	yes	yes	yes	no	no	yes	No	No
Pregnant	no	no	no	yes	no	no	No	No
Brain stem reflexes	normal	normal	normal	normal	not normal	not normal	normal	Normal
chest examination	normal	normal	normal	normal	normal	not normal	Not normal	Normal
Family history of hypertension	no	no	no	no	no	no	Yes	yes
Family history of diabetes mellitus	yes	no	no	yes	yes	no	Yes	yes
Family history of sickle cell disease	no	no	no	no	no	no	No	No

Family history of Tuberculosis	no	no	yes	no	no	no	No	Yes
response to Anti-TB treatment	yes	yes	yes	yes	yes	no	No	Yes
Time of recovery	2 years	1 year	18 months	18 months	18 months	died after 6 days of admission	46 months	12 months

MRI data

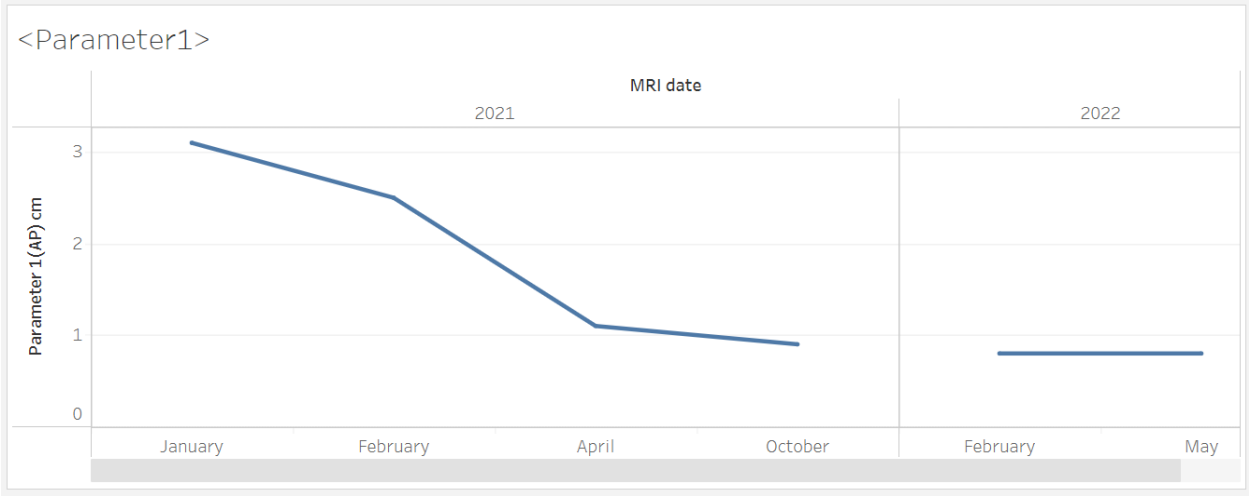
Patient 1

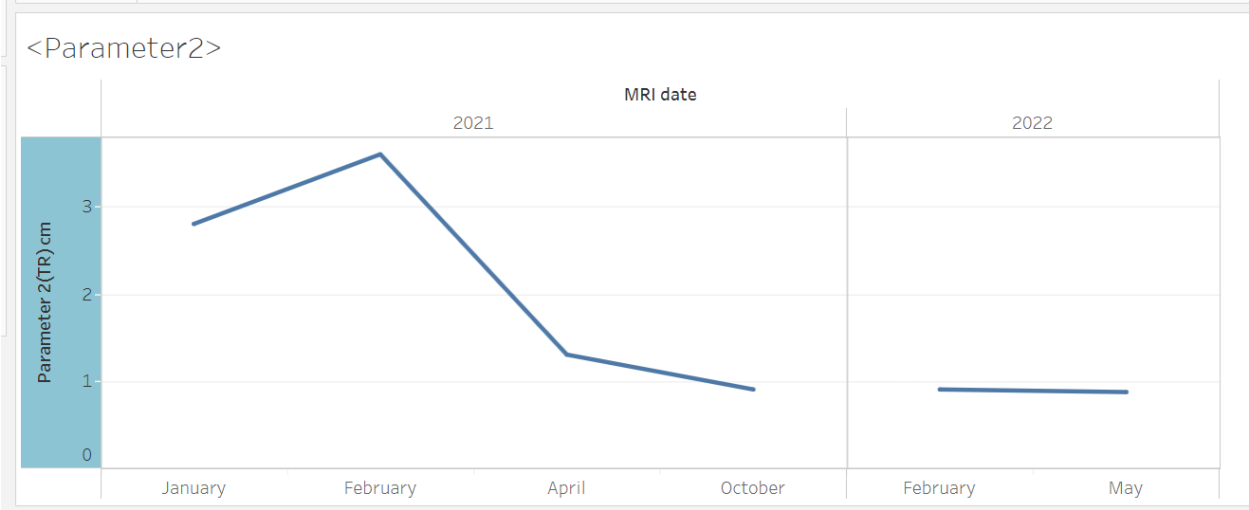
MRI date	Time(days)	Time(months)	Del T (days)	Del (months)	Parameter 1(AP) cm	Parameter 2(TR) cm	parameter 3(CC) cm	Volume (cc)	Volume reduction	Reduction percentage	Reduction %/time
29/1/21	0	0			3.1	2.8	2.7	23.436			
8/2/21	11	0.3666666667	11	0.3666666667	2.5	3.6	3.2	28.8	-5.364	-22.88786482	-62.42144952
30/4/21	92	3.066666667	81	2.7	1.1	1.3	1.4	2.002	26.798	93.04861111	34.46244856
29/10/21	274	9.133333333	182	6.066666667	0.9	0.9	0.85	0.6885	1.3135	65.60939061	10.81473472
9/2/22	377	12.56666667	103	3.433333333	0.8	0.9	0.9	0.648	0.0405	5.882352941	1.713306682
22/5/22	479	15.96666667	102	3.4	0.8	0.87	0.82	0.57072	0.07728	11.92592593	3.507625272

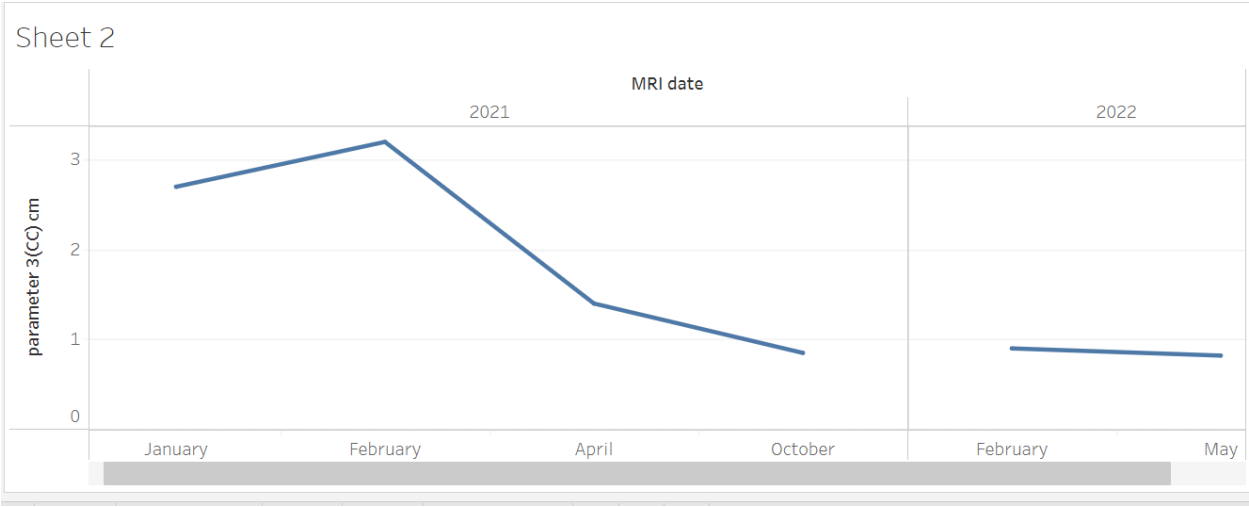
OBSERVATION

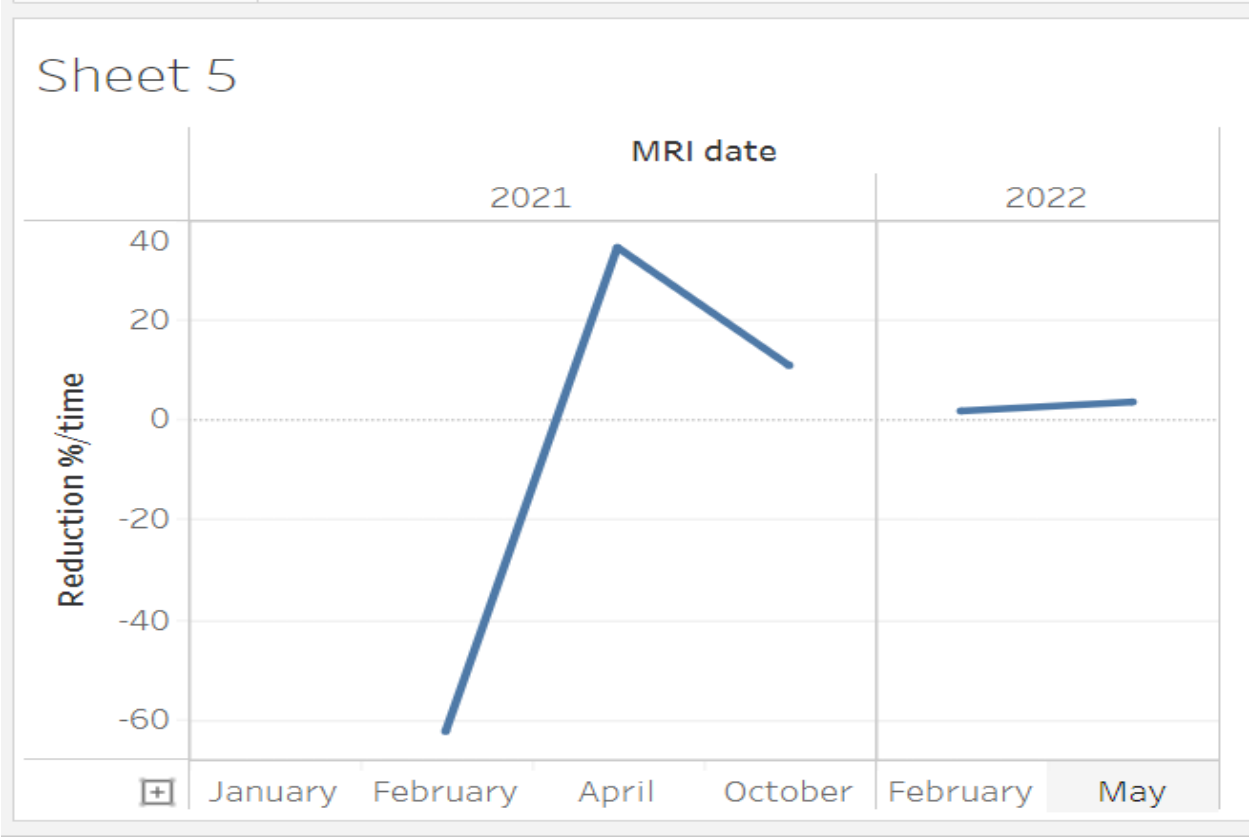
(i) 93% of tuberculoma shrunk in three months.

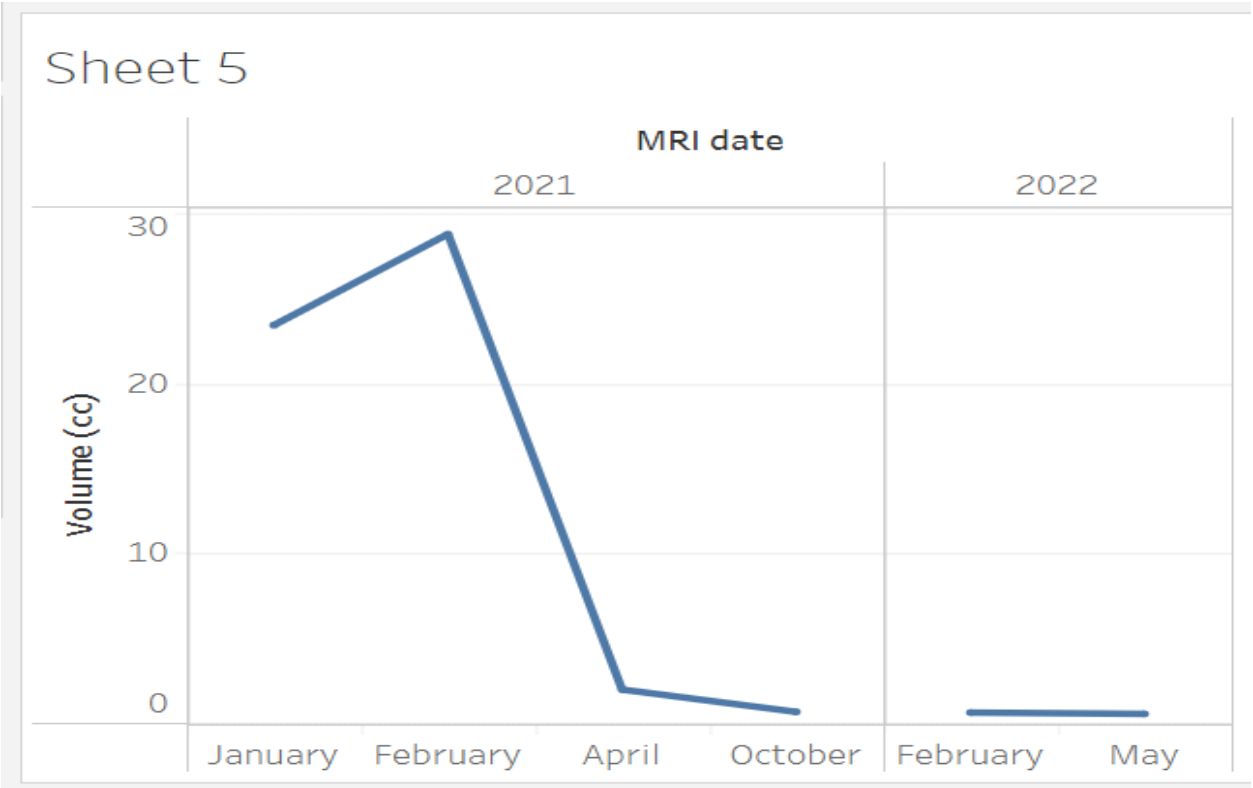
(ii) The remaining 7% took nearly 11 months

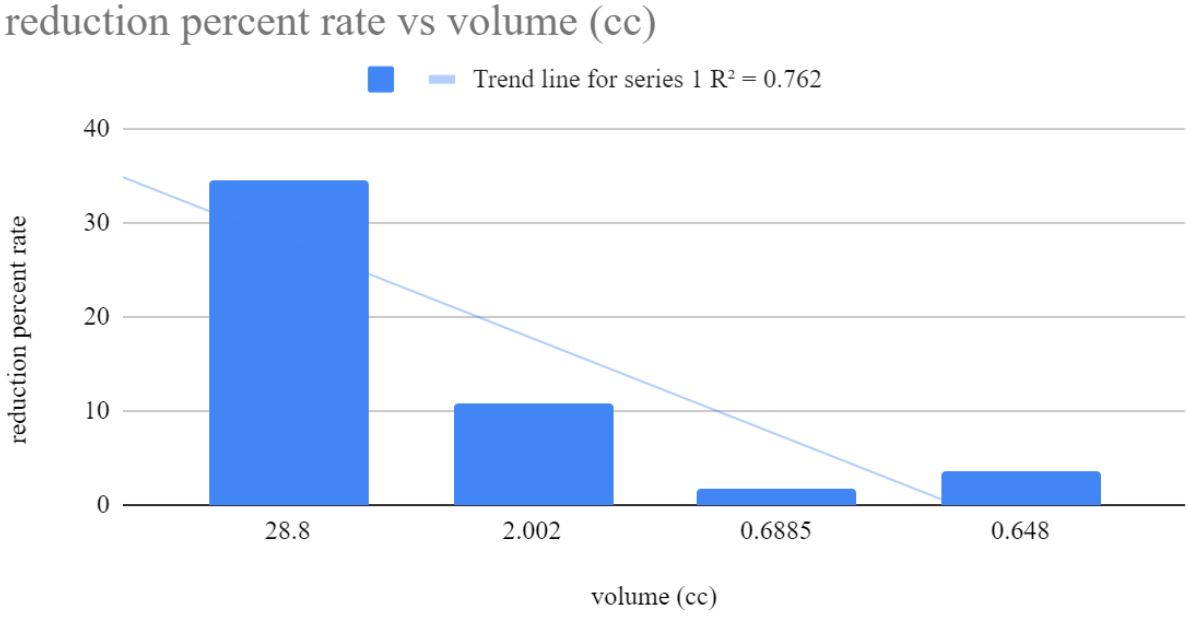





Sheet 2
MRI date
2021
2022
parameter 3(CC) cm
3
2
1
0
January
February
April
October
February
May

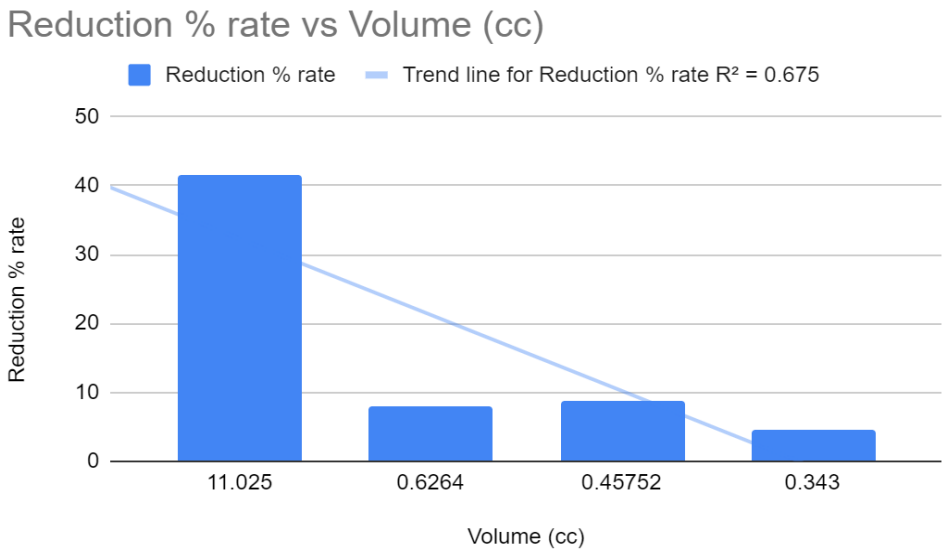

Sheet 5
MRI date
2021
2022
Reduction %/time
40
20
0
-20
-40
-60
January
February
April
October
February
May

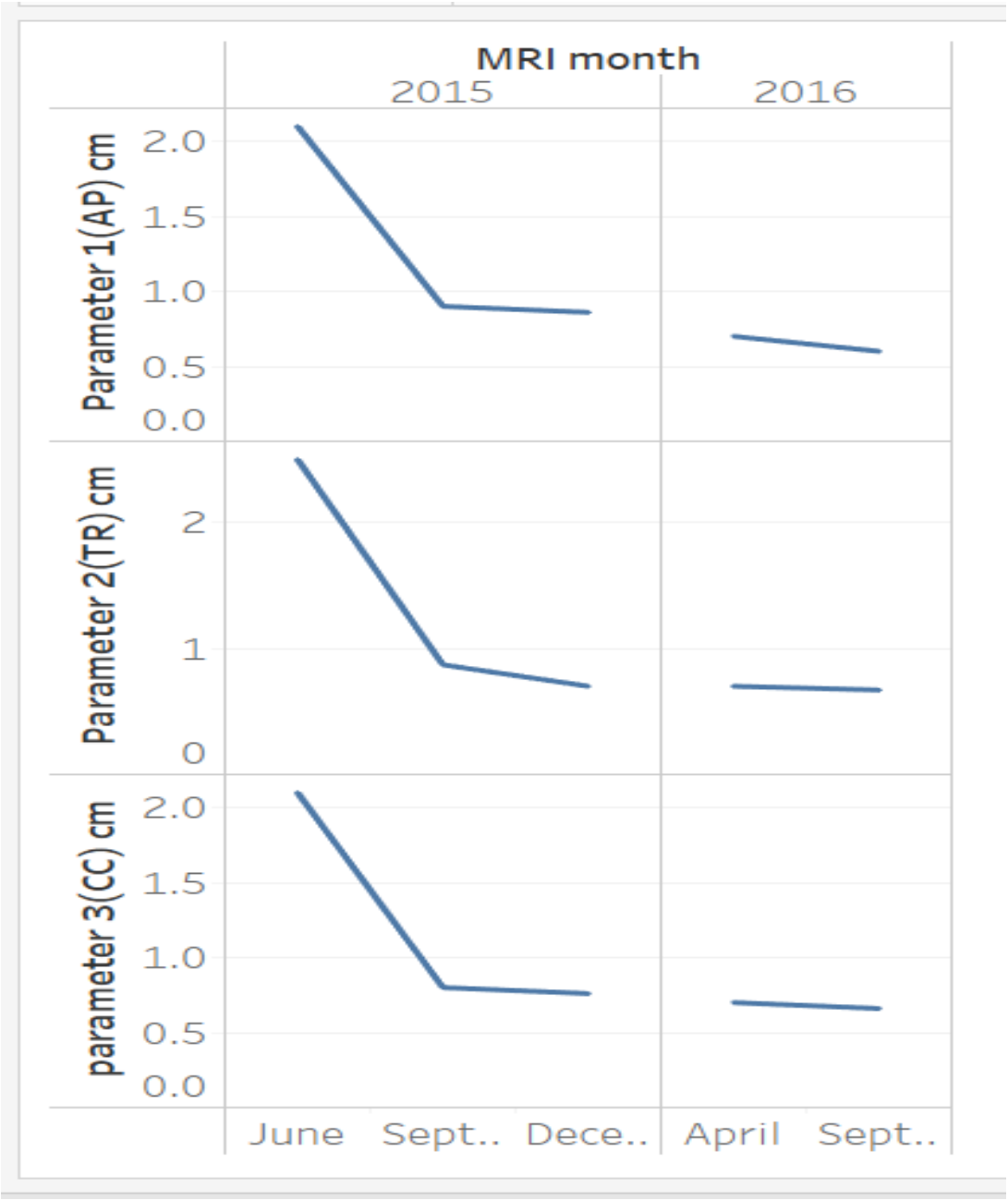

Sheet 5
MRI date
2021
2022
30
20
10
0
Volume (cc)
January
February
April
October
February
May

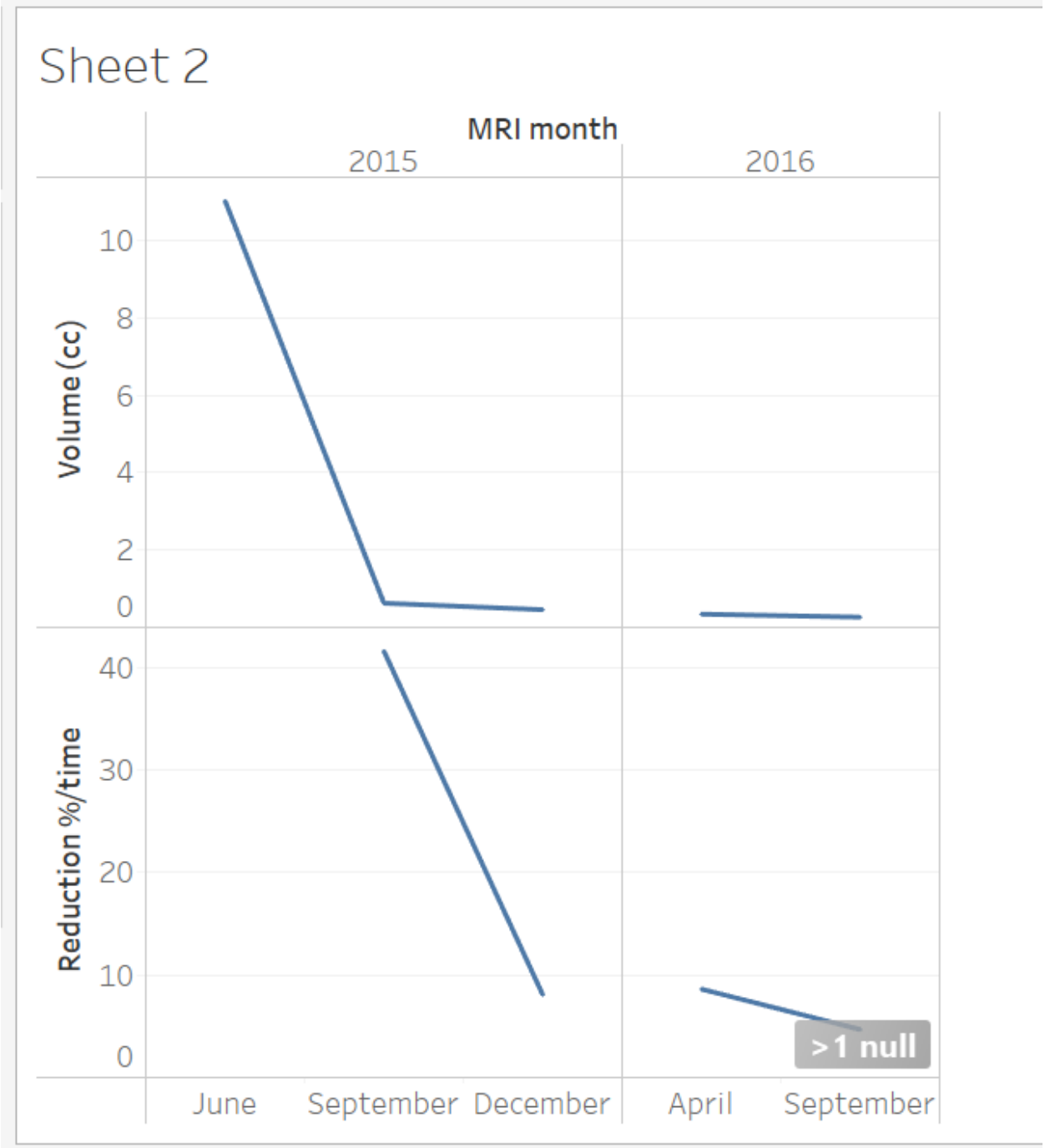

reduction percent rate vs volume (cc)
Trend line for series 1 R² = 0.762
40
30
20
10
0
reduction percent rate
28.8
2.002
0.6885
0.648
volume (cc)

Patient 2

MRI month	Del T (days)	Del (months)	Parameter 1(AP) cm	Parameter 2(TR) cm	parameter 3(CC) cm	Volume (cc)	Volume reduction	Reduction percentage	Reduction % rate
June,2015			2.1	2.5	2.1	11.025			
September,2015	68	2.266666667	0.9	0.87	0.8	0.6264	10.3986	94.31836735	41.61104442
December,2015	100	3.333333333	0.86	0.7	0.76	0.45752	0.16888	26.96040868	8.088122605
April,2016	87	2.9	0.7	0.7	0.7	0.343	0.11452	25.03059976	8.631241295
September,2016	145	4.833333333	0.6	0.67	0.66	0.26532	0.07768	22.64723032	4.685633859




MRI month
2015
2016
Parameter 1(AP) cm
2.0
1.5
1.0
0.5
0.0
Parameter 2(TR) cm
2
1
0
parameter 3(CC) cm
2.0
1.5
1.0
0.5
0.0
June
Sept..
Dece..
April
Sept..


Sheet 2
MRI month
2015
2016
Volume (cc)
10
8
6
4
2
0
Reduction %/time
40
30
20
10
0
>1 null
June
September
December
April
September

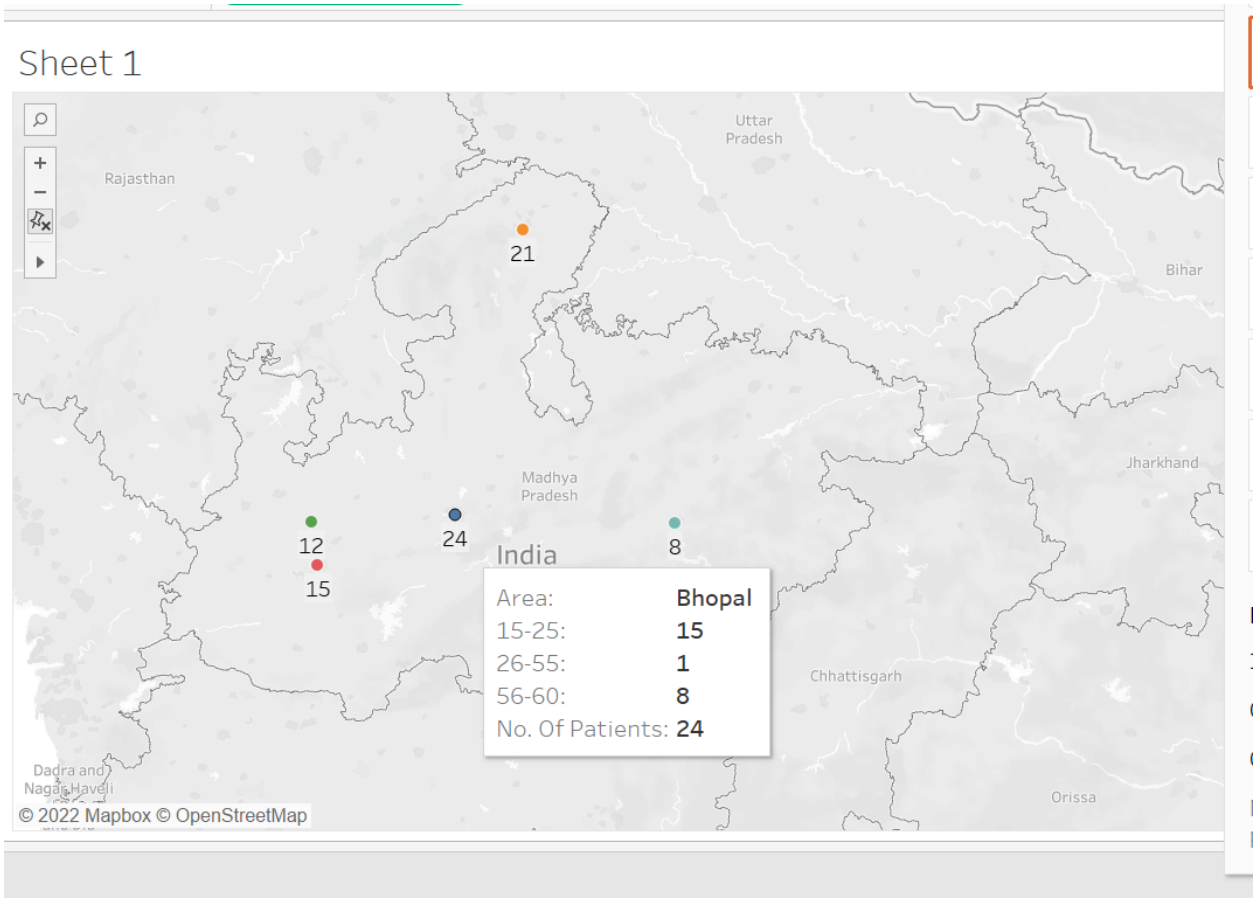
8. ANALYSIS

1. The complete disappearance of meningitis usually takes 12-18 months.
2. The rate of diminishing of tuberculoma is very high in the beginning but it deteriorates with time as the size of tuberculoma decreases.
3. In both cases of patient 1 and patient 2 the first 90% volume reduction is at a very fast rate.
4. Shrinking of the last 7-8 % may take as long as 8-10 months. So, it's important to continue the treatment strictly even if the symptoms reside as there is always a chance of relapse. Relapses are risky as seen in the case of patient 7.
5. Patient 7 stopped treatment midway and suffered a relapse. His condition worsen as the tuberculoma grew drug resistance and the patient had to undergo a series of brain and spinal surgery. Luckily the patient recovered after a long-suffering of 46 months. Which is 3 times more than the average recovery rate.

The government provides Tuberculosis patients with DOT ATT drugs free of cost. Operation ASHA brings tuberculosis treatment at economically feasible rates to disadvantaged communities. The organization's primary work is detecting and curing TB and preventing and treating Multi-drug-resistant Tuberculosis in India. Their trained health care workers work alongside doctors to help patients and their families of patients suffering from Tuberculosis.

According to one such health worker, "We receive 500 cases of Tuberculosis per month. 3-4 out of which are of Tuberculosis Meningitis. He works in Bansal Hospital, Bhopal but also receives cases from many small cities around like Hoshangabad, Vidhisha, etc."

Demographic Distribution of Patients (2019-20)



*Data from NGO ASHA

Area	no. of patients	15-25	26-55	56-60
Bhopal	24	15	1	8
Indore	15	10	0	5
Jabalpur	8	4	3	1
Gwalior	21	10	2	9
ujjain	12	7	5	0

Age group of 15-25 are more susceptible to this disease amounting to 54% of total patients are in this age group.

CONCLUSION

TBM must be diagnosed and treated early as it is associated with high mortality and severe neurological sequelae, especially in endemic countries like India. Nonspecific symptoms of TBM pose a challenge for accurate timely diagnosis [8]. The study was carried out to find out the demographics of the disease and factors associated with the outcome of the disease in adult TBM patients in the northern region of India.

1. Noticed that the symptoms of TBM differ in patients
2. The rate of diminishing of tuberculoma is very high in the beginning but it deteriorates with time as the size of tuberculoma decreases.

3. Age group of 15-25 are more susceptible to this disease amounting to 54% of total patients are in this age group.

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