

REVIEW ARTICLE ON TOMATO FEVER

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ABSTRACT

Tomato flu is an infectious disease caused by an unexplained virus. The main symptoms of the infection are tomato-shaped blisters All over the body which enlarges to resemble the shape of a tomato, therefore being named as 'Tomato flu'. Most commonly affects Children below the age of 5 years. Tomato flu is considered a "Hand, Foot and Mouth disease". The clinical manifestation of most Cases is mild. It is a self-limiting infection; which gets resolved on its own in 7-10 days. The diagnosis is based on the clinical history And physical examination, especially in regions where there are outbreaks. This infectious disease etiological agent, its treatment Regimen, and vaccination stills remain unknown and is a crucial area of research at present. COVID-19 has taught us lessons for Outbreak preparedness and management of cases in emergency conditions by repurposing drugs and vaccines which is also synonymously being tried to curb the condition at present situation.

KEYWORDS: Tomato flu, Hand Foot Mouth disease, COVID-19, Outbreak preparedness.

INTRODUCTION

Tomato flu is an infectious disease that is caused by an unexplained viral organism detected first in Kerala, India in May 2022. The infection was named 'Tomato flu' due to its main symptom, the tomato-shaped Blisters all over the body.^[1,2] The presentation initially starts as a red-coloured small blister which then enlarges to resemble the shape of a tomato, hence the name 'Tomato Flu', also synonymously known as tomato fever.^[3] It predominantly affects children below the age of 5 years. Strong immunity against the tomato flu virus might be the Reason for its low incidence in adults.^[3] However, adults Might act as carriers transmitting the virus while handling the children. Tomato flu is considered to be a "Hand, Foot, And Mouth disease" (HFMD), the common viral infection According to Dr. Amar S Fettle, Epidemiologist and State Nodal Officer of Kerala.^[4] HFMD is caused by viruses that Belong to the enterovirus genus such as polioviruses, Coxsackie viruses, echo viruses, and other enteroviruses. Coxsackie virus A16 is the most frequent cause of HFMD. Coxsackie virus A16 infection produces only a mild form of the disease in HFMD.^[5,6] Without medical care, almost all Patients recover in about 7 to 10 days.^[6] It is frequently confused with foot-and-mouth disease, also known as Hoof-and-mouth disease, which affects cattle, sheep, and Swine. The two illnesses, however, are unrelated as they are brought on by different viruses. Infection is transmitted from one person to another by direct contact with the infectious virus, which is present

in the saliva, Blister fluid, nose and throat secretions, and stool of those who are infected. The virus is most frequently transferred by people's hands, fomites, and by contact with surfaces that have been exposed to the virus. Even though infected People typically show no symptoms in the first week of the Sickness, they are most contagious during that time. HFMD is not acquired or spread by animals and most vulnerable Age group is young children under five.^[7] Most patients have only minimal clinical characteristics. Since enteroviruses are widespread, adults and older children are likely to be immune. Respiratory droplets, contact with Blister fluids, and contact with contaminated faeces are the three main routes that enterovirus is spread.^[8] By avoiding contact with sick individuals and maintaining Personal hygiene, the possibility of transmission can be reduced. Adults, including pregnant women, are more Susceptible to infection if they have never been exposed to these viruses' protective antibodies. Most enterovirus Infections during pregnancy result in mothers having a Minor or no illness. There is currently no definite evidence that maternal enterovirus infection can cause Untoward pregnancy outcomes such as abortion, stillbirth, or congenital abnormalities. However, mothers who Contract the virus just before giving birth may pass it to the newborn.^[9] The likelihood of infection is higher in a new-Born whose mother is experiencing enterovirus disease Symptoms at the time of birth. The majority of new-borns who contract an enterovirus have a minor illness, but in rare circumstances, they may develop a

serious infection in several vital organs, including the liver and heart, and could die as a result of the infection.^[10,11] However, researchers are still looking into the precise etiological factor that is causing this infection.

Epidemiology

The disease outbreak started in the Kollam district of Kerala where around 82 cases of Tomato flu have been reported till May 13, 2022, and the numbers are expected to go up further. A four-year-old child from Aryankavu, a Village near the Kerala-Tamil Nadu border is the first

Symptoms of tomato flu



Large, spherical, reddish blisters on multiple part of the body

- High-grade fever
- Dehydration
- Skin rash and skin irritation
- Myalgia
- Swollen and painful joints
- Other uncommon symptoms are:
 - Nausea and vomiting,
 - Running nose,
 - Sneezing,
 - Frequent coughs,
 - Patches and discoloration on various body parts including Hands, buttocks and knees,
 - Abdominal pain and cramps,
 - Feeling of tiredness,
 - Fatigue.

Tomato flu does not cause any serious illness. Complications are rare with the disease.

Management of tomato flu

Tomato flu is a self-limiting viral fever. Hence, it usually gets resolved on its own in approximately 7-10 days.^[6] The disease is diagnosed clinically by history and physical examination, especially in regions where there are outbreaks.

Treatment

Tomato flu being a rare infectious disease and with its recent emergence, no specific drugs are available now to Treat this virus. Owing to the unavailability of disease-specific treatment, only the symptoms are managed like any other flu with antipyretics and analgesics accordingly. Ibuprofen or Acetaminophen can be used to

case Of Tomato flu which was reported on May 6, 2022.¹² Since Then, and 26 cases were found to be positive for Hand, Foot and Mouth disease in Orissa which is presumed to be Tomato flu.^[13]

Clinical features

Tomato flu is considered the aftermath of chikungunya or Dengue infection due to the similarity of their symptoms, though their correlation has not yet been proved.^[14] The Common presenting symptoms that have been identified So far are as follows:

treat the Fever. Antibiotics are of no use unless the skin blisters become purulent. A lot of fluid intake in the form of water, Juice, or milk is encouraged as dehydration is commonly seen. Bed rest is recommended along with proper hygiene and sanitation should be maintained. Affected children should be isolated for five to seven days.^[15]

Outbreak preparedness

If a child displays any HFMD symptoms, parents are encouraged to consult a doctor as soon as possible. They should also be vigilant to any deviation from their child's usual behaviour, such as a refusal to eat or drink or Persistent vomiting or drowsiness.

- All children and adults should wash their hands regularly and thoroughly, especially after changing diapers or using the toilet.
- Using a diluted solution of chlorine-containing bleach, contaminated objects and surfaces should be thoroughly cleaned and disinfected.
- By enhancing disease surveillance, a case definition will be developed to aid in the early identification of severe Cases as well as the reporting, monitoring, and treatment of such patients.
- Development of an HFMD reporting protocol and daily HFMD reporting at every level of health care facilities are Essential.
- Foundation or expansion of facilities for paediatric Intensive care units (ICUs).
- ICU staff training programs should be organized.
- Establishing a specialized medical team and providing Round-the-clock on-duty service.
- Surveillance and evaluation of severe cases based on Clinical signs should be improved.

- Clinical surveillance for early detection of severe cases and prompt intervention should be provided to reduce Mortality.
- To prevent cross-transmission among other sick children, Consultation rooms for febrile rash cases should be set up in fever outpatient clinics or paediatric wards. For each Patient, medical equipment needs to be sterilized.

Preventive measures

Prevention plays a vital role during the sudden outbreak of An unknown infection. If preventive measures are followed strictly by each individual, the impact of an outbreak can be controlled easily. However, since tomato flu commonly affects children less than 5 years of age, compliance with Preventive measures is uncertain. It is the responsibility of their caretakers to be vigilant during disease outbreaks. The following are some of the preventive measures that Should be followed to prevent tomato flu.^[16]

1. Since it can spread rapidly from one person to another, infected persons must be isolated for at least 5 to 7 days.
2. Tomato flu being a highly contagious infection, patients should be advised not to scratch the skin blisters. Since it commonly affects children, preventing them from scratching the infectious blisters is critical.
3. Close contact with infected individuals should be avoided. Children should be advised not to touch or hug those children who have fever or rash.
4. Practicing good hygiene and proper sanitation are good Defences against the disease. Children should be thought about these practices.
5. Clothes, utensils and other materials used by the Patients should be sterilized properly and regularly.
6. Keep the children well hydrated.
7. A well-balanced diet should be followed regularly which Helps to maintain good immunity.
8. If any of the family members become symptomatic, they should be isolated immediately and should consult a doctor.



Drugs and vaccines under trial

Tomato flu is a newly emerging infectious disease, hence Drugs for the treatment and vaccines are yet to be Developed or yet to undergo clinical trials.

Steps taken by the government

In response to cases of tomato flu being discovered in Kerala, Tamil Nadu, the neighbouring state, has increased its border surveillance. Initiatives were started by the Kerala government in all Anganwadi and medical centres to treat the affected individuals.^[17] Anganwadi centres in Coimbatore are conducting disease Screenings, and 24 mobile teams with health professionals have reportedly been deployed.^[18] Three teams made up of Revenue inspectors, health inspectors, and police have been deployed in shifts to keep a watch for anyone with

fever and rashes.^[18] Since majority of the cases are From Kerala the neighbouring regions are kept on a close Watch.^[19] Outpatient departments of all the hospitals in the Neighbour states are instructed to report those presenting with the symptoms of tomato flu.^[19]

Methodology

The study was an observational prospective study. The research was carried out between August 20th and August 30th, 2022. A self-created questionnaire was created and distributed over social media. Our Investigation was both cost economical and time efficient. The individuals were interested enough to complete our questionnaire. Participants in our study used smart phones or PCs with an internet connection. The research was carried out during a 10-day period.^[20-26]



Result: -

Among 110 participants, Most of them were working professionals.

More than 60 % of our participants were following the safety measures and precautions suggested by CDC.



FIG 1: Total Points Distribution

TABLE No.1 Occupation

Occupation	Number of Participants	Percentage
Health care Professionals	37	33.6%
Medical/Paramedical Student	17	15.5%
Professor/Teacher	10	9.1%
Other	46	41.8%

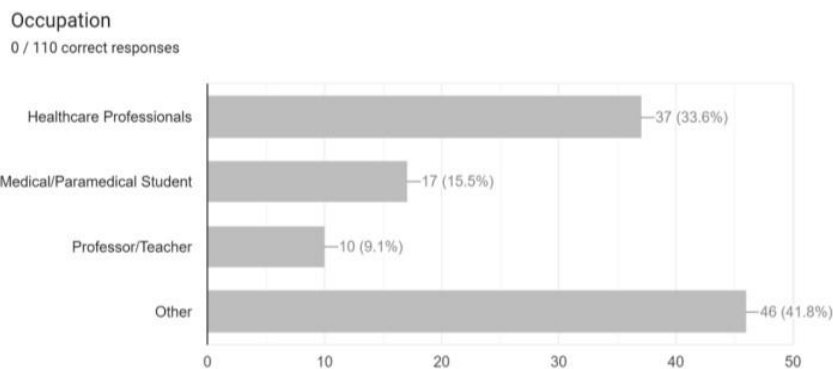
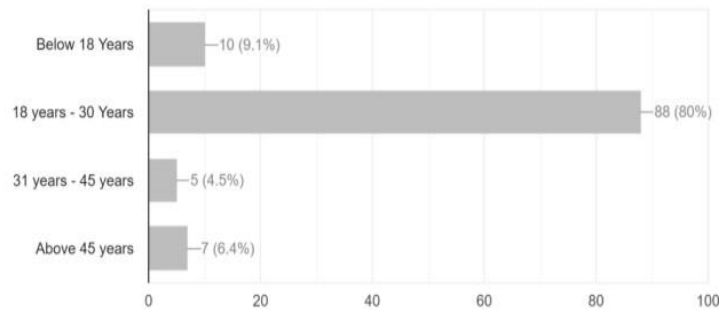


FIG 2 : Occupation distribution of participants

In our Prospective Study of 110 participants it has been found that 33.6% of our participants belong to healthcare related professions, 15.5% participants were Medical/Paramedical Student, 9.1% participants were Professor/Teacher and 41.8% participants were from other professional backgrounds.

Table 2: Age of participants

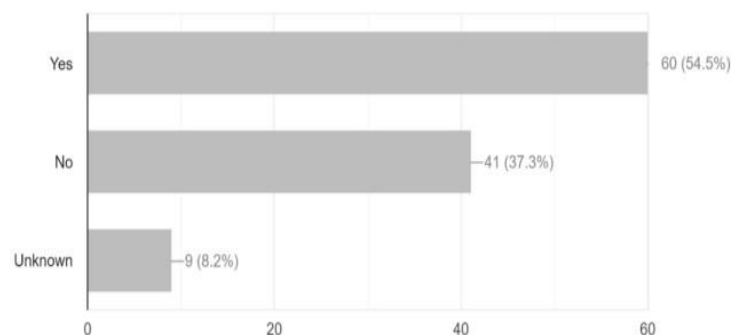
Age of Participants	Number of Participants	Percentage %
<18 years	10	9.1
18 years – 30 years	88	80
31 years – 45 years	5	4.5
>45 years	7	6.4

Age of Participants
0 / 110 correct responses**FIG 3: Age Distribution of Participants**

In addition we have got that 9.1% of our participants belong to age below 18 years, 80% of our participants belong to age group of 18-30 years, 4.5% of our participants belong to 31-45 years and 6.4% of our participants belong to age group of above 45 years.

Table 3: Mass Knowledge about Tomato Fever

Options	Number of Participants	Percentage %
Yes	60	54.5
No	41	37.3
Unknown	9	8.2

Do you know about the "Tomato Fever"?
0 / 110 correct responses**FIG 4: Do you aware about the "Tomato Fever"?**

In our study, 54.5% of our participants have heard about Tomato fever, 37.3% of our participants have no idea about tomato fever, and 8.2% have no idea about tomato fever.

Table 4: Symptoms of Tomato Fever

Symptoms	Number of Participants	Percentage %
Fatigue, Dehydration	12	10.9
Skin Irritation, Fever	24	21.8
Vomiting, Swelling of joints	4	3.6
Above All	70	63.6

What are the symptoms of tomato fever?

70 / 110 correct responses

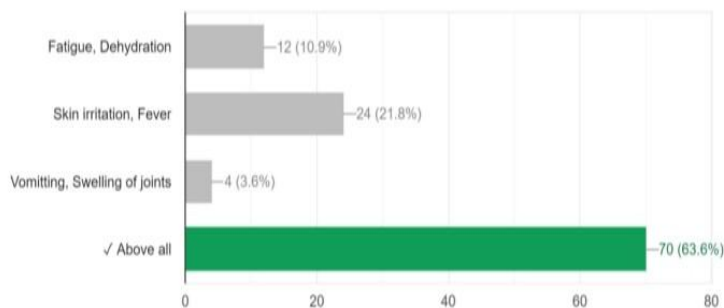


FIG 5: Symptoms awareness among Participants about “Tomato Fever”

In this study we have found that symptoms of tomato fever were recognized as Fatigue and Dehydration by 10.9%, Skin irritation and Fever by 21.8%, Vomiting and Swelling of Joints by 3.6% and all the above symptoms by 63.6% of participants.

Table 5: Vulnerable group for this disease

Options	Number of Participants	Percentage %
Adult Person (>18 years to 45 years)	31	28.2
Older person (>45 years)	13	11.8
Children (<15 years)	66	60

Who are more vulnerable to this disease?

66 / 110 correct responses

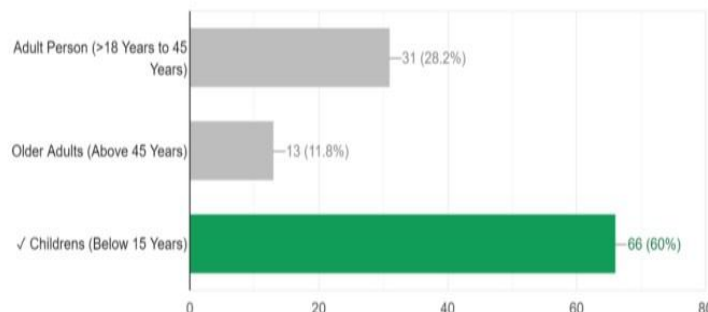


FIG 6: Who are more vulnerable to “Tomato Fever?”

This study has shown 28.2% of our participants has selected adult person as vulnerable to this disease, 11.8% selected as older adults and 60% has selected as children below 15 years.

Table 6: Cause of Tomato Fever

Options	Number of Participants	Percentage %
Yes	38	34.5
No	52	47.3
Unknown	20	18.2

Do you know cause of this fever?

0 / 110 correct responses

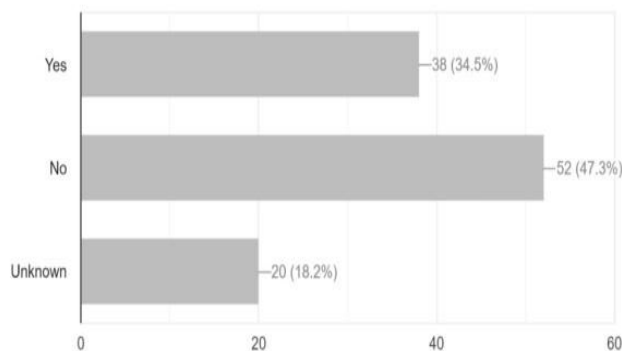


FIG 7: Awareness about the cause of “Tomato fever”

This study has shown that participants were not so aware of this fever as 34.5% of our participants says Yes, 47.3% has selected as option No and Unknown by 18.2%.

Table 7: Treatment available for this fever

Options	Number of Participants	Percentage %
Antibacterial Treatment	22	20
Antiviral Treatment	72	65.5
Antifungal Treatment	16	14.5

What is the treatment available for this fever?

72 / 110 correct responses

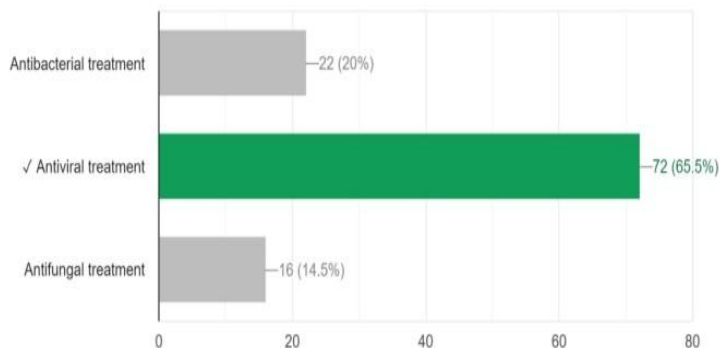


FIG 8: Treatment option available for “Tomato Fever”

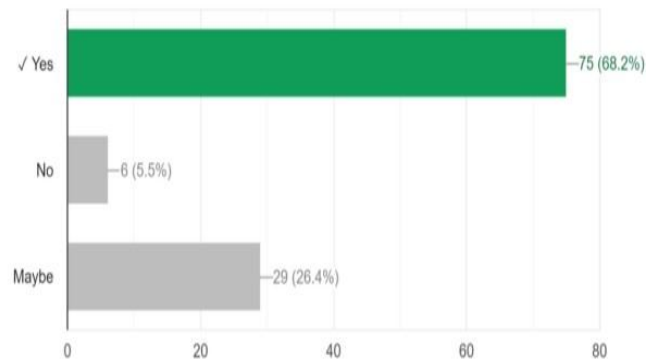
On asking about treatment for this fever, 20% of our participants has selected as antibacterial treatment, 65.6% has selected antiviral treatment and 14.5% has selected as antifungal treatment.

Table 8: Is hand hygiene essential for this fever ?

Options	Number of Participants	Percentage %
Yes	75	68.2
No	6	5.5
Maybe	29	26.4

Is hand hygiene essential for this fever?

75 / 110 correct responses

**FIG 9: Is Hand Hygiene essential?**

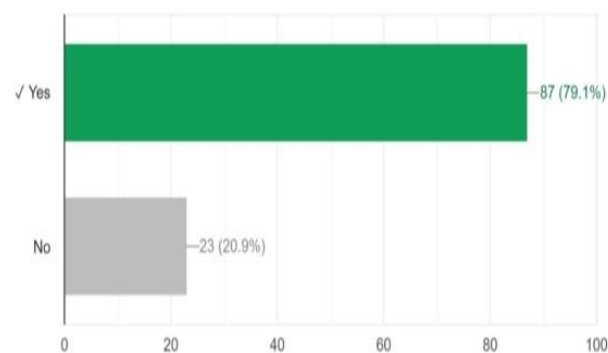
This following study has gathered information regarding hygiene for this fever where 68.2% of participants has selected Yes, 5.5% has selected No and Maybe by 26.4%.

Table 9: Is it has been detected in India ?

Options	Number of Participants	Percentage %
Yes	87	79.1
No	23	20.9

Is it has been detected in india?

87 / 110 correct responses

**FIG 10: Is it has been detected in India?**

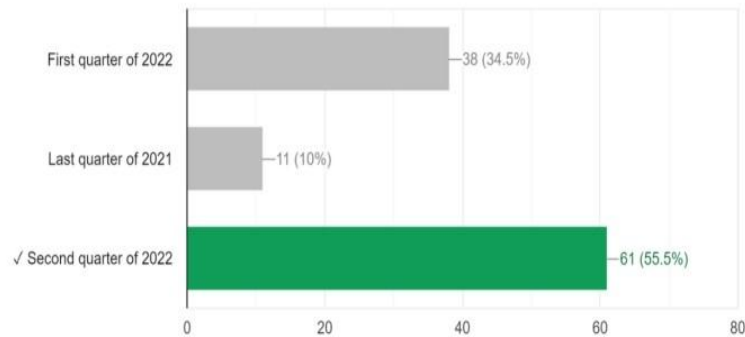
This survey has found that 79.1% of our participants knows that it has been detected in India and 20.9% of our participants were no aware of its detection in India.

Table 10: First case detected in India

Options	Number of Participants	Percentage %
First quarter of 2022	38	34.5
Last quarter of 2021	11	10
Second quarter of 2022	61	55.5

when was the first case detected in India?

61 / 110 correct responses

**FIG 11: When was the first case detected in India?**

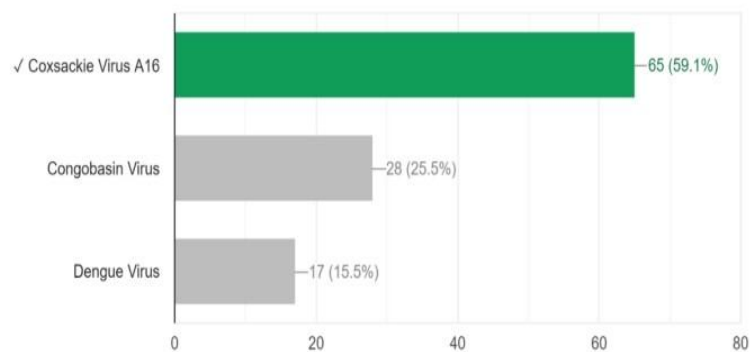
This survey question has first case detected in India has been known by 34.5% as first quarter of 2022, 10% as last quarter of 2021 and 55.5% as second quarter of 2022.

Table 11: Organism responsible for this fever

Options	Number of Participants	Percentage %
Coxsackie Virus A16	65	59.1
Congobasin Virus	28	25.5
Dengue Virus	17	15.5

Which organism is responsible for this fever?

65 / 110 correct responses

**FIG 12: Which organism is responsible for this fever?**

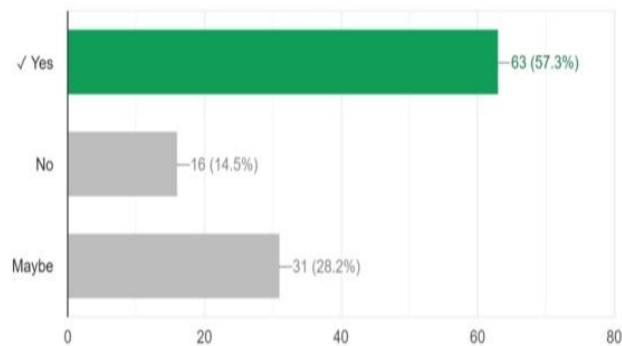
This prospective study has asked regarding organism responsible for this fever as participants has selected Coxsackie Virus A16 by 59.1%, 25.5% of congobasin Virus and Dengue Virus 15.5%.

Table 12 : Options and percentage of people knowing this is a contagious fever

Options	Number of Participants	Percentage %
Yes	63	57.3
No	16	14.5
Maybe	31	28.2

Is it contagious?

63 / 110 correct responses

**FIG 13: Is tomato fever contagious?**

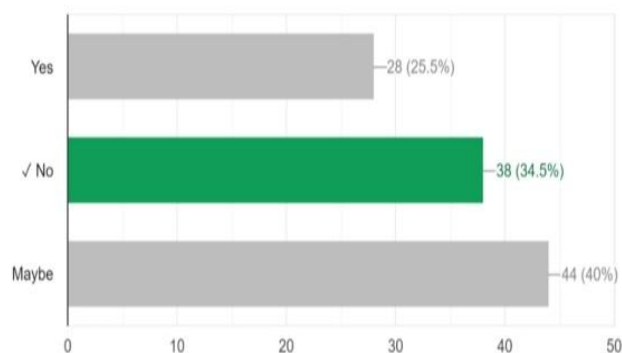
The contagious report has been found as 57.3% of participants have selected Yes, 14.5% has selected No and 28.2% has selected as Maybe.

Table 13: Is it capable of causing threat to someone's life

Options	Number of Participants	Percentage %
Yes	28	25.5
No	38	34.5
Maybe	44	40

Is it life threatening ?

38 / 110 correct responses

**FIG 14: Is "Tomato fever" life threatening?**

This study has found that life threatening has been found by 25.5% and 34.5% has not found them life threatening and 40% were not sure about this fever.

Table 14 : This table asks people should be concerned about this fever

Options	Number of Participants	Percentage %
Yes	68	61.8
No	22	20
Maybe	20	18.2

Should you be concerned about this fever ?

68 / 110 correct responses

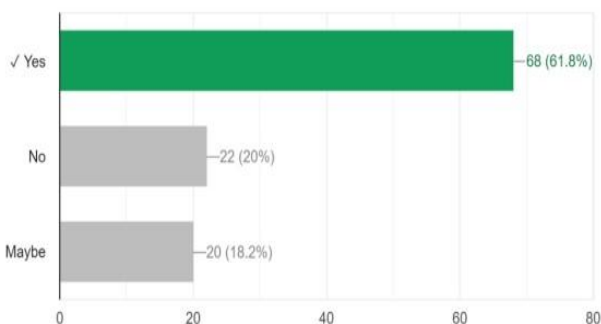


FIG 15: Should you be concerned about “Tomato Fever”

This study has asked people about concern regarding this fever and it has been found that 61.8% has concern, 20% has no concern and 18.2% were not so sure about this.

Table 15: Complications of this fever

Options	Number of Participants	Percentage %
Type 1 Diabetes Mellitus	12	10.9
Neuropathic Complication	17	15.5
Sore Formation	23	20.9
Skin Discoloration	58	52.7

What are the complications ?

58 / 110 correct responses

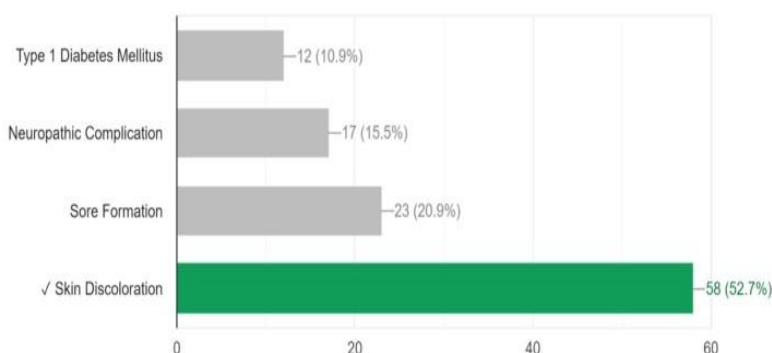


FIG 16: Complication of “Tomato Fever”?

Regarding complications 10.9% has selected type 1 Diabetes Mellitus, 15.5% as Neuropathic Complication, 20.9% as sore formation and 52.7% as Skin Discoloration.

Table 16 :Is isolation a crucial factor in tomato fever

Options	Number of Participants	Percentage %
Yes	65	59.1
No	11	10
Maybe	34	30.9

Does patient need to be isolate ?

65 / 110 correct responses

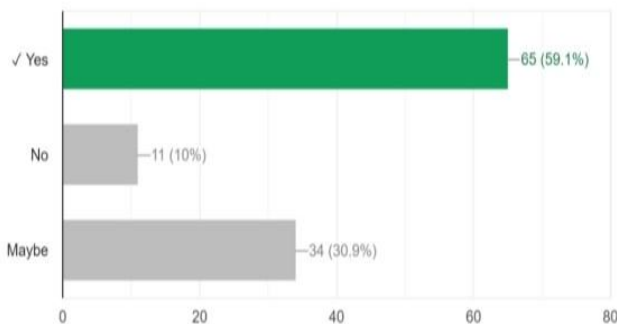


FIG 17: Does patient need to be isolate?

This study has found 59.1% of participants think that patient need to be isolated, 10% thinks no need of isolation and 30.9% has no idea.

Table 17 : Is it similar to dengue or Chikungunya

Options	Number of Participants	Percentage %
Yes	36	32.7
No	27	24.5
No data available	47	42.7

Is it similar to Dengue or Chikungunya ?

47 / 110 correct responses

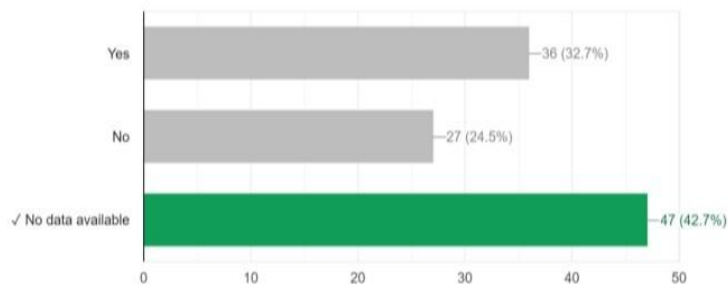


FIG 18: Is it similar to Dengue or Chikungunya?

When asked regarding similarity to dengue or chikungunya participants has selected yes by 32.7%, No by 24.5% and 42.7% were not so sure as no data available.

Table 18: Fighting against the virus

Options	Number of Participants	Percentage %
By isolating Yourself	18	16.4
By not sharing personal belongings	20	18.2
Above all	72	65.5

How this fever can be fought ?

72 / 110 correct responses

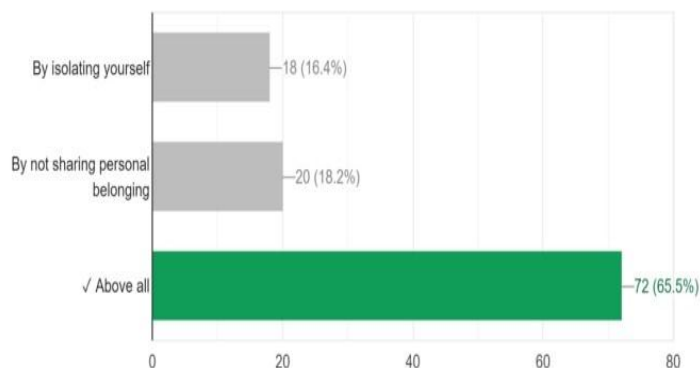


FIG 19: How to fight against “ Tomato Fever”

Study found that participants has selected isolation by 16.4%, by not sharing personal belonging by 18.2% and 65.6% has selected both the option.

Table 19: Any vaccine available for this disease

Options	Number of Participants	Percentage %
Yes	17	15.5
No	70	63.6
Maybe	23	20.9

Is there any vaccine available for this ?

70 / 110 correct responses

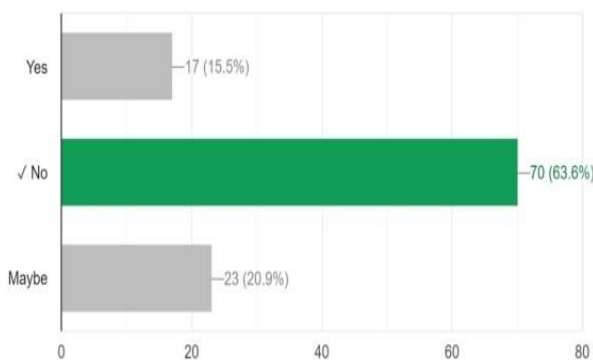


FIG 20 : Availability of vaccine for “ Tomato Fever”

When asked regarding any vaccine available for this fever, 15.5% has selected as Yes, 63.6% has selected no and 20.9% were not sure about its vaccine availability.

Table 20 : Available OTC medicine for tomato fever

Options	Number of Participants	Percentage %
Paracetamol	70	63.6
Doxycycline	30	27.3
Pantoprazole	10	9.1

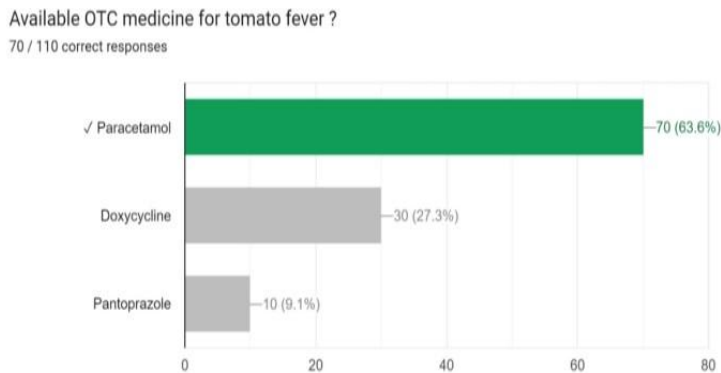


FIG 21 : OTC medication available for “Tomato Fever”

This study has question regarding available OTC medicine for Tomato fever which has been selected as Paracetamol by 63.6% of participants, Doxycycline by 27.3% of the participants and 9.1% selected as pantoprazole.

Table 21 : Advice from parents to their children

Options	Number of Participants	Percentage %
Maintain social distance & isolate yourself	82	74.5
Take protein rich diet	21	19.1
Regular exercise	7	6.4

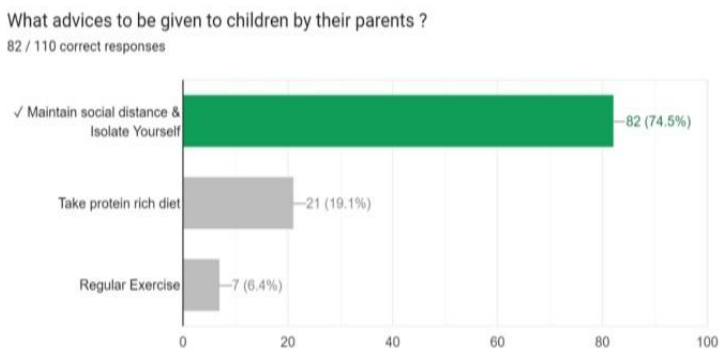


FIG 22: Advises to be given to children by parents for “Tomato Fever”

This study has asked participants regarding advice to children by their parents, where 74.5% has selected Maintain social distance and isolate you, 19.1% has selected to take protein rich diet and regular exercise by 6.4% of the participants.

CONCLUSION

As tomato fever is a new among all the types of flu, still its spread, cause, treatments are all similar to dengue and chikungunya. So, as this study concludes that most aren't aware of this fever, still they know that isolation is first step. As during recent pandemic everyone has learned about hygiene which is a crucial factor for this fever. Preventing infected child from sharing toys, clothes, food is one of the leading prevention. Drug repurposing is one of the most efficacious approaches to ensure public safety. As no antiviral drugs or vaccine are available for prevention of tomato flu. Monitoring and follow up is

needed for better Understanding the potential treatment. Union home ministry and some state govt have already issued advisory regarding tomato fever.

Declarations & Limitations

Being an emerging disease, and lack of concrete evidence regarding the etiological agent and pathogenesis of the disease condition, the article has been synthesized based on the evidence and reports available online at present situation. Further close follow up of the cases and research can help to generate more evidence regarding this atypical disease.

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