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Investigations in Fever and an Overview of its Outbreak

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Abstract

Fever is a common physiological response characterized by an elevation in body temperature, often indicating an underlying medical condition. This abstract provides an overview of fever, including its causes, symptoms, and management strategies. Fever occurs when the body's internal thermostat, located in the hypothalamus, raises the body temperature in response to various stimuli. These stimuli can be infections caused by bacteria, viruses, or other pathogens. Non-infectious causes such as inflammatory conditions, medication side effects, malignancies, or even physical exertion can also trigger fever. Symptoms of fever vary depending on its underlying cause and severity. Common symptoms include an elevated body temperature above the normal range of 36-37°C (96.8-98.6°F), chills, sweating, headache, muscle aches, fatigue, and loss of appetite. In some cases, additional symptoms specific to the underlying condition may also manifest. The management of fever primarily focuses on treating the underlying cause while alleviating symptoms and providing comfort. Non-pharmacological interventions such as rest, maintaining adequate hydration, and utilizing cooling measures like tepid sponging or cooling blankets can help reduce temperature. Over-the-counter medications like acetaminophen and non-steroidal anti-inflammatory drugs (NSAIDs) are commonly used to control fever and alleviate associated discomfort. However, it is essential to follow appropriate dosing guidelines and consult a healthcare professional, especially for children or individuals with pre-existing medical conditions.

Keywords: - Fever, Body Temperature, Diagnosis

Introduction

Acute onset fever is a sudden elevation in the body temperature a symptom of an underlying medical condition. The major challenge confronted by the physician is to differentiate bacterial infection and to identify other pathogens requiring specific treatment (eg. Malaria). Another challenge is the diagnostic and management dilemma associated with fever in person without an identifiable focus. According to World Health Organization, a disease outbreak is the occurrence of cases of diseases over what would normally be expected in a defined community, geographical area, or season.

The extent of an outbreak may vary from a limited area to several vast countries. The present review discusses how the investigation needs to be carried out for a fever outbreak, which helps in preventing a similar outbreak from happening in the future.

Myths
Fever is harmful to the body.
Brain injury is caused by fevers up to 104°F
Treatment is required for all fevers.
Only injections can bring the temperature down.
Testing the temperature by touching the skin is a trustworthy method.
No, fever shouldn't be treated as soon as it manifests.

Facts
Fever is a sign of a strong immune system and aids in the body's ability to fight illness.
Temperatures exceeding 108°F are dangerous for the brain, and temperatures below this rarely cause injury.
Treatment is only necessary if the temperature makes the patient uncomfortable (often >102°–103°F).
Most of the time, oral analgesics and oral medications for fever reduction are sufficient.
Not really

Fever, however, boosts the body's ability to fight against infections and slows the growth of microorganisms.

Material & Methods

Salient factors are to be considered in a case of fever. The following factors need to be considered in a patient presenting with acute fever.

- Presence of any risk factor (eg: receiving chemotherapy or having immunosuppression)
- Any danger signs.
- Presence of diagnostic focus.
- Age group to which child belongs (0 to 28 days, 1 to 3 months, and 3-36 months or above) The general rule followed in clinical practice is that if the fever > 105°F, the most probable cause is a bacterial infection. However, there are exceptions like influenza and adenoviral infection which can cause fever > 105°F.

Danger Signs

It is paramount to identify life-threatening signs such as reduced level of consciousness and difficulty in breathing the ABCD red flag signs to be noted are:

- A - arousal, alertness, activity
- B - breathing, difficulty
- C - color and circulation
- D - decreased intake and urine output

Focus of Infection

If the focus is present, all investigations are directed towards the confirmation of the focus of infection some of the examples are listed below:

- X-ray for chest findings a suspected case of pneumonia or respiratory distress.
- Urine routine and culture analysis for urinary symptoms.
- Splenomegaly, especially in an endemic area - peripheral blood smear / rapid test for malaria.

Fever without focus is the most confusing and difficult situation. Bacteremia, urinary tract infection (UTI), and pneumonia are the most common severe bacterial infection in infants that may not be clinically apparent. The choice of the worker depends on the pace and severity of the illness. The Investigation must be done in all these sick children without focus by 72 hours if the fever doesn't subside.

Investigations

• Complete Hemogram

The white blood cell (WBC) count with differential count is the most commonly preferred test in the hemogram. Value < 5000 and > 15,000/cumm suggest an abnormal finding. In nearly 50% of children with bacteremia esp. with Haemophilus influenza type b (HIB), the WBC range is between 5000 to 15,000/cumm. The researchers have noted higher WBC values in UTI infection. •

Inflammatory markers: C reactive protein (CRP) and procalcitonin

CRPF and procalcitonin are the commonly used acute-phase reactants. The increased CRP level is noticeable only after 12 hours after the onset of fever and the elevated levels are noted both in viral and bacterial infection. CRP > 80mg/L and procalcitonin > 2ng/L help in identifying severe bacterial infection with 40 to 50% sensitivity and 90% specificity.

• Chest X-ray

Pneumonia is useful in detecting complications such as effusions and empyema.

• Blood culture

Blood culture is another gold standard test in acute fever management, and it should be done before initiation of antibiotic treatment. Preliminary results are available within 24 to 48 hours of culture. Negative blood result from prior antibiotic use missing the bacteremic episode. Therefore, sending a blood culture before the initiation of antibiotics should be implemented in routine practice. Blood culture is usually negative in subjects who are already on antibiotics.

CSF exam for sick infants without localization

CSF exam is indicated in children less than 28 days without any signs and symptoms of neurologic complications. It is also recommended in children with sepsis and localized on CNS.

Serology

For dengue, the commonly performed diagnostic test are NS1, antigen IgM and IgG. Widal agglutination test in clinical practice is plagued by controversy. The possibility of false positive findings is higher due to repeated exposure to salmonella typhi in the endemic zone and the cross-reactiveness of the non-salmonella antigen. Even if a widal test has to be performed it should be done after one week of exposure. It is no longer acceptable as the clinical method of diagnosis and the test has to be repeated after 4 weeks to demonstrate a rise in titers. For malaria as per the Government of India policy, only the IgM test has to be performed. The finding should be corporate by conducting a peripheral blood smear which is still considered to be the golden standard. The golden standard test for rickettsia disease is the indirect immunoperoxidase test immunofluorescence test and PCR. The microagglutination test (MAT) is considered the golden standard for leptospirosis.

USG/Echo

Ultrasonography (USG) of the abdomen assists in identifying hidden findings even in the early stages of the disease, especially in a patient with localizing signs and symptoms. In patients with a typical or incomplete Kawasaki disease, it is wise to perform early echocardiography to detect coronary artery abnormalities.

Urine analysis and culture

It is necessary to inform the patients to catch clean, midstream urine. The urine analysis is considered one of the gold standard tests for acute fever evaluation.

Stool analysis

It is recommended only if diarrhea is present and is considered a focus of infection. The presence of blood in the stool is indicative of a bacterial infection in the presence of a fever.

Results/observations

Investigating a fever outbreak is necessary to identify the source of illness and to formulate guidelines on public health intervention. An outbreak can be recognized through surveillance activities like integrated disease surveillance programs (IDSP) and by analyzing the reports of clinicians laboratories press and the media.

The key objective of outbreak investigation are :

- To control ongoing outbreaks and prevent future outbreaks.
- To provide statutorily mandated services.
- To strengthen surveillance at a local level.
- To advance knowledge about a disease.
- To provide training opportunities.

Investigations into outbreaks take the following steps:

1. Confirm the epidemic and the diagnosis.
2. Establish a case and carry out case research.
3. Compile and organize time, place, and person data.
4. Implement prompt preventative measures.
5. Construct and examine a hypothesis.
6. Arrange and carry out additional research.
7. Put controls in place and assess them.
8. Share your results.

Conclusion

A battery of tests are available for the evaluation of acute fever however the judicious selection of the appropriate test is mandatory. In most cases, clinical and investigative reevaluation at the end of 24 hours gives a better understanding of the associated problem. Investigations help in identifying risk factors associated with the outbreak and providing newer research insights on the emerging pathogen only by participating in investigations repeatedly public health professionals can learn the 8-step process of outbreak investigations. This paper provides a summary of investigations into fever. A battery of tests are available for the evaluation of acute fever however the judicious selection of the appropriate test is mandatory.

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