Fever: A Treatise

History/ Pathogenesis

- Fever: A systematic defensive response caused by infection from bacteria and virus, indicated by abnormally elevated body temperature due to a resetting of the hypothalamic thermoregulatory center
- Hyperthermia: Elevation of body temperature due to inadequate compensation by normal heat-loss mechanisms and/ or increase in core temperature
- Hyperpyrexia: Elevation of temperature to unusually high levels, 105.8°F (41°C) or higher
- Fever Of Unknown Origin (FUO): Prolonged fever lasting over 7-10 days without identified cause on routine investigations

Thermoregulation And Pathogenesis Of Fever

- Human beings generally maintain consistent body temperatures in health, which is a range and NOT a fixed value. There are individual variations.
- There exists a balance between heat gained and lost
  - Heat gain - metabolic processes, exercise, shivering
  - Heat loss - convection, conduction, radiation

Human core temperature is tightly regulated through the preoptic nucleus of the anterior hypothalamus to a mean "set point" of 37°C with circadian variations rarely exceeding 0.6°C. An array of thermoregulatory mechanisms ensure that the hypothalamic set point temperature is maintained to within a natural "load error" of 0.2-0.5°C. Any deviations exceeding this provoke a natural counteractive response to restore core temperature back to the set point.

Dr CH Asrani DNB
Sainath Clinic
Kalina,
Mumbai 400 098
Tel.: 26652348
email: chasrani@vsnl.com

Fever is one of the best example of responses to injury and infection which depends on neuro-immune interactions. It is a natural self-defense mechanism intended to make the host less hospitable to microscopic invaders. Fever may be produced by several stimuli including bacteria, viruses, protozoa, immune reactions and drugs (the *exogenous pyrogens).* Substantial evidence supports the role of cytokines (aka *endogenous pyrogens)* in fever production. Cytokines are produced by cells interacting with *exogenous pyrogens* and function as mediators of fever, acting locally within damaged tissues, circulating factors and the brain. Mononuclear phagocytes are the main source of these endogenous pyrogens. The most important of the pyrogenic cytokines are interleukin-1 (IL-1), tumor necrosis factor (TNF), interleukin-6 (IL-6), interferon á, â and ã, interleukin-8 (IL-8), macrophage inflammatory protein (MIP-1alpha, MIP-1beta), and possibly platelet-derived growth factor (PDGF). The primary endogenous pyrogens IL-1, IL-6 and TNF-alpha act centrally on thermo sensitive neurons in the preoptic hypothalamus to:

- trigger increased heat production and
- to decrease heat loss.

The core body temperature rises until a higher stable point is reached. The temperature of the blood bathing the hypothalamus is equivalent to the new "set point" and the patient is usually flushed and warm. Defervescence occurs through activation of heat loss mechanism, in particular sweating, until the core body temperature reaches its baseline and a new equilibrium is established. Hyperthermia from other causes is not accompanied by a resetting of the central thermostat. In fever, the hypothalamic thermal set point is shifted higher by the action of circulating cytokines, causing intact peripheral mechanisms to conserve and generate heat until the body temperature increases to the elevated set point. The mechanisms of thermoregulation act to

raise body temperature up to the new set point, then maintain the elevated systemic temperature. Thus fever is not equivalent to an elevated core temperature. Rather, it represents an elevated set point.

IL-1 comes mainly from monocytes and macrophages, though it can also be produced by neutrophils, B and T cells, endothelial cells, and virtually all other nucleated cells.

TNF is another pyrogenic cytokine that acts directly on the hypothalamus to elevate the thermal set point. It also causes fever by inducing IL-1 production. LPS-activated macrophages are the main source of TNF, along with monocytes, antigen-stimulated T-cells and activated mast cells.

A positive feedback mechanism for IL-1 production by macrophages and endothelial cells has been demonstrated that is triggered by both IL-1 and TNF. Activation of macrophages by IFN- ã can augment IL-1 and TNF involves the synthesis of new specific mRNA as well as the IL-1 and TNF molecules themselves, which are then secreted by the stimulated cells.

Acute Phase Response

- Fever is one manifestation of cytokine mediated response, other physiologic responses being- Somnolence and anorexia.
- Increase in total circulating Polymorphs.
- Increase in hepatic acute phase proteins ie c-reactive protein, fibrinogen, haptoglobin, ceruloplasmin, ferritin, amyloid A protein, complement, antiproteases.
- On the other hand so called "household" proteins eg albumin, lipoprotein lipase, cytochrome P450 are suppressed.

Diminished Febrile Response Or Inability To Mount A Febrile Response

- Neonates
- Chronically ill
- Severe acute illness with hypothermia
- Malnourished
- Elderly

Beneficial Effects Of Fever

Whether fever represents a beneficial or harmful response to infection has been debated for hundreds of years. Perhaps the most powerful arguments to support a beneficial effect of fever on infection come from teleology and genetics. Fever is established as a phylogenetically ancient host response that is conserved highly in all mammals. That fever, despite high metabolic and nutritional costs, is conserved so highly argues forcefully for its evolutionary value, as does the endogenous nature of its mechanism, which requires a complex series of steps and interactions.

Recent work on the biology of cytokines has enabled the effects of individual components of this response all of which are beneficial to the host, to be examined. It is reasonable to argue on the basis on the many similarities in the febrile response and its mechanism among different vertebral classes, that fever is an adaptive benefit to the host, despite the fact that it is an energy-expensive phenomenon.

Adverse Effects

- Seizures
- Increased work load of left ventricle
- Discomfort
- Adverse effects also from cytokines
- Mediate some of the systemic and local manifestations of sepsis

Antipyresis

History Of Lowering Temperature

- Alexander the Great - mysterious febrile illness - Babylonian physicians -physical methods - cool baths
- Prior to 1899, antipyretic therapy primarily physical methods of cooling
- In 1899, aspirin, subsequently other drugs
- Physical methods, external cooling - no lowering of set point.

Objectives

- When reducing body temperature, normothermia need not be the quantitative objective; the aim should be optimal anti-pyresis.
- The increased body temperature is reduced to the extent that subjective symptoms alleviate but the beneficial effects remain.
- In practice this usually means that the body temperature decreases by 1-1.5°C, 1-2 hours after drug administration.

Indications

- Fever is associated with symptoms causing considerable discomfort, such as muscle pains, headache, nausea, bodyache and noticeable tiredness.
- The fever is markedly high (over 39 - 39.5°C).
- Child has a tendency for febrile convulsions. (The rise of fever is prevented by giving antipyretic drugs in time. In recurrent febrile convulsions, diazepam medication has also been used; however, the benefits of prophylactic therapy have been questioned).
- The child has a serious primary disease like severe heart, lung or kidney disease. In these cases fever may be harmful.
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Treatment

General Treatment: Sufficient fluid intake. Light, tasty food. Avoidance of physical strain. Absolute bed rest is not needed. Reducing the room temperature artificially or removing clothing to the point of discomfort is unnecessary and even harmful.

Medical treatment: The antipyretic should be given only when necessary. Regular use of it should be avoided in all other children except those prone to febrile convulsions.

Fever In Children

The most common 'emergency' presentation in paediatrics. In most, the cause is the viral infection, otitis media or pharyngitis/tonsillitis - and the prognosis is good. The challenge is to identify those feverish children with serious bacterial infections who need prompt treatment.

Bacteraemia occurs in ~4% febrile children sometimes without an obvious focus of infection; this is made more likely if the child is between 3 and 24 months of age with fevers of ≥40 degree C, and WCC > 15 x 109/l (but using ONLY these criteria, 50% of those with bacteraemia will be missed). A raised C- reactive protein may also indicate bacterial infection. Examples of organisms: Strep pneumoniae, H influenzae, N meningitides.

Finding a focus of infection entails a good history and examination, Chest X-ray + LP (if the child is ill). If ill and no focus of infection is found it may be wise to withhold antibiotics and to review the child after. Watching and waiting is not the easiest role and depends critically on the presence of a skilled nurse whose opinions you trust. However, dividends maybe great: eg if a rash or diarrhea develops you know you are observing the illness as it unfolds and not an antibiotic side-effect.

Purpura In Children

If the child is ill with purpura, he or she should be presumed to have leukaemia, meningococaemia or disseminated intravascular coagulation (investigate initially with the visual blood film and WCC). If the child is well, and there is no history of trauma, the cause is likely to be Henoch-Schonlein purpura or idiopathic thrombocytopenic purpura, readily total apart by the normal platelet count in the former.

Difficult Fevers In Children: Pt Evaluation

Aims Of Treatment

- To identify potentially serious or life-threatening illness that may present without symptoms or physical findings confirming a clear-cut focal source for the fever
- To diagnose the primary disease causing the fever.
- To evaluate the need and possibilities of treating

the underlying cause eg measles, chicken pox etc.
- To evaluate need to treatment symptomatic fever.

Causes Of Fever

- Infectious disease is the most common cause of fever for children in out patient care.
- Other possible causes of fever are inflammatory, intestinal, joint and connective tissue diseases, allergic reactions, malignant tumours and haematological diseases.

Situations Requiring Special Attention

- Fever without any clear focal symptoms / finding.
  - o Keep in mind the possibility of septicemia of pneumococcal or other aetiology.
- Fever in a child below 3-6 months of age.
  - o Remember the possibility of serious fulminant disease.
  - o Observe child's general condition, neurological symptoms and alertness. Hospital level investigations are usually necessary. If the patient is cared for in primary care, arrange follow-up and ensure that parents can contact a doctor easily.
- Fever and rash: Meningococcal septicaemia, Kawasaki disease.
- Fever, stomach pain and vomiting: Keep in mind appendicitis and urinary tract infection.
- Fever, vomiting and neck pain: Remember the possibility of a CNS infection.
- Fever and joint pain: Consider purulent joint infection.
- Prolonged fever: Arrange for further investigations.

Child With Fever But No Localizing Symptoms

Principles

- Identify diseases requiring immediate treatment (septicaemia, meningitis) and diseases requiring urgent treatment in less than 1 day (urinary tract infection, pneumonia). If the general condition is affected or the child is irritable on touching hospital admission for this is indicated.
- Children below the age of 3 preferably to be seen by a pediatrician only.
- Use serum CRP determination to rule out bacterial infection. CRP may also be increased in viral diseases.
- Careful follow-up, eg frequent telephone contacts with the same doctor is necessary if symptoms continue.

Assessing The General Status: When assessing the general status, pay particular attention is to be paid to the general condition, the skin, the respiratory tract and the lymph nodes.

- Signs of a serious bacterial infection include
  - o Impaired general condition.
  - o Unwillingness to drink/eat.
  - o Irritability on touching (even a gentle touch makes the child cry).
  - o Lethargy.
  - o Continuous complaining/ groaning
  - o Consciousness.
  - o Petechiae on the skin.

Minimum Investigations

- Examine the ears with an otoscope to detect acute otitis media.
- A urine analysis (mid stream sample) should be asked in all children with high fever but no clear focus of infection.
- Serum CRP estimation, urine test and blood count if there is the slightest suspicion of a serious disease. If the general condition is good, urine test is sufficient as the first examination. CRP and blood count are to be done if the fever continues.
- Maxillary sinuses by X-ray in children above 4 yrs.
- A chest X-ray is necessary in children whose
  - o Respiratory rate is more than 40/mins.
  - o General condition is impaired.
  - o Who have respiratory difficulty other than just expiratory wheeze.

Tip: Quantitative serum CRP measurement is better

than leukocyte indices for diagnosis of neonatal sepsis.

Fever And Rash In A Child

- Exanthema–Measles, Chicken pox, Rubella, Infectious Mononucleosis
- Differentiate petechiae from other spots (meningococcal sepsis!)
- Identify septic bacterial infections and leukemia,that require immediate hospitalization.
- The suspicion of any of the following should also be referred to hospital-idiopathic thrombocytopenic purpura (ITP), Henoch-Schönlein purpura, Stevens-Johnson syndrome, and systemic juvenile rheumatoid arthritis (Still's disease).
- Identify allergic reactions (itching or urticarial rash and serum sickness) to avoid future drug exposure. Unnecessary diagnoses of drug allergy should not be made!

Septicaemia

- Suspect septicaemia in all patients with impaired general condition and severe symptoms, particularly with fever.
- Serum CRP without delay in patients with slightest suspicion of septicaemia, if not hospitalized.
- Consider the possibility of streptococcal sepsis in children with a local infection eg pyoderma, follicular tonsilitis.
- Assess the presence of meningism and the level of consciousness to detect meningitis in all children with suspected severe infection.

Symptoms Suggesting Septicaemia

- General malaise
- Generalized or local pain
- Fatigue, weakness
- Nausea, vomiting
- ↑ Respiratory rate
- Low blood pressure
- Fever
- Chills
- Often petechiae
- Rapid pulse rate
- Unexplained aggravation of the symptoms of a pre-existing disease.

Investigations

- Serum CRP is the best test for diagnosing a septic infection if the symptoms have lasted at least 12 hours. If the symptoms have been present for less than 12 hours a low CRP concentration is not reliable in excluding a septic infection.
- The leukocyte count may be increased earlier than the CRP concentration (and should be determined especially if the symptoms have been present for less than 12 hours). A low leukocyte count never excludes a septic infection.
- A low platelet count supports the diagnosis of septicaemia or other severe disease.

Treatment

- IV fluids (N saline) should be started as soon as possible (even before shifting to the hospital). Several liters of fluid may be required. If the blood pressure does not rise sufficiently, try plasma expanders or dopamine, with increasing infusion rate.
- If the clinical picture suggests meningococcal sepsis or if the child's general condition is poor, shifting to the intensive care unit must be done within an hour:
- Try to take blood bacterial cultures before starting antibiotics (if a container for blood culture is not available, use syringe full of blood with rubber stopper).
- In patients with granulocytopenia (receiving cytostatic drugs) a third generation cephalosporin should always be started after two blood bacterial cultures have been taken. Without treatment, a neutropenic patient may die of septicaemia in a few hours.
- A doctor should accompany the patient if being sent to another establishment.

Malaria

Basic Rules

- A child with fever who has traveled in the endemic

areas should be regarded as suffering from malaria until proven otherwise.
- In addition to fever, the child may have diarrhoea, icterus or may suffer from confusion; blood count may show reduced amounts of leukocytes and platelets.
- Incubation time is usually 7 - 30 days, but may also be months or even yrs from infection.
- The clinical diagnosis must be made urgently as delay could be catastrophic.

Blood Sampling In Suspected Case Of Malaria
- Capillary sample (3-4 normal smears).
- One negative sample does not exclude malaria. Sampling should be repeated after 3 - 4 hours and during a fever peak.

Prophylaxis In Children
- Prophylaxis is especially important in children as the infection can aggravate more quickly than in adults.
- Mosquito repellents may irritate the skin and are therefore not recommended for children under the age of 3 years.
- Chloroquine can be used for prophylaxis from the age of 1 month onwards.

Treatment Of Resistant Malaria
- Nowadays, artemisin derivatives are used for resistant malaria.

Management
- Two age groups addressed separately:
  Birth to 3 months (neonate)
  3 to 36 months

Neonate To First 90 Days
- Due to the immaturity of the immune system, any suspected bacterial infection is sepsis until proved otherwise.
- Any fever >100.4°F (38°C) needs to be investigated.
- History of fever without clinic confirmation is valid – if the parent has measured and can cite the figure
- 10% will have serious occult bacterial illness. Causes include Gram-negative organisms, group B Strep, enterococci, in addition to common organisms in older children (*Hemophilus influenzae*, *Streptococcus pneumoniae*, group A Strep)
  - o 3.6% meningitis / bacteraemia
  - o 2.3% urinary tract infection
  - o 2.6% enteric pathogen
  - o 2.0% soft-tissue infection

Evaluation
- CBC
- Blood culture
- Catheterized urine for UA and culture.
- Lumbar puncture (Some authors divide this age group into those under 6 weeks and those over 6 weeks, and with clinical discretion in the decision to perform an LP in the over 6 week range)
- Stool culture or CXR if clinically indicated.
- Since CBC and UA may be unrevealing, presumptive antibiotic therapy is indicated pending initial culture results.
- Any fever >102°F (38.9°C) without a focus to explain the fever should at least have a urine for UA and culture.
- Depending on clinical presentation, consider CBC and blood culture.
- Any fever >104°F (40°C) should receive CBC and blood culture in addition to a urine.
- LP, CXR, stool cultures need to be considered if clinically indicated.

Management – 3-36 month

Empiric Antibiotics Indicated For
- WBC >15,000 and/or ANC >10,000
- Pyuria > 10 per HPF

Management: Hyperpyrexia
- Temperature of 105.8°F (41°C) or greater.

- Associated with a higher incidence of CNS disruption, such as meningitis or encephalitis. Can also occur in CNS tumors, intracranial hematomas and chronic brain defects.

Otitis Media In Children

Aims

- The diagnosis of acute otitis media (AOM) is based on findings on inspection of the tympanic membrane.
- Over-diagnosing AOM must be avoided; using diagnostic aids is helpful.

Definition

- Acute Otitis Media (Aom)
  - Effusion in the middle ear.
  - Tympanic membrane does not appear normal.
  - The child has symptoms of acute infection.
- Secretory Otitis Media
  - There is effusion in the middle ear, but the child lacks symptoms of acute infection.
- In myringitis the child has symptoms and the tympanic membrane is incised or bullous but its mobility is preserved and there is no fluid in the middle ear.

Epidemiology

- AOM is the most common bacterial infection in children and the reason for most courses of antimicrobial drugs.
- The incidence is highest between the ages of 6 months and 2 years.
- By the age of one year 40%, and by the age of two years 70% of children have had at least one episode of AOM.
- Every fifth child has at least three episodes of AOM.
- The incidence is highest in winter, lowest in summer.

Risk Factors

- AOM is generally preceded by viral upper respiratory tract infection (rhinovirus, respiratory syncytial virus, adenovirus or influenza virus) which can be considered the main risk factor of AOM.
- The peak of occurrence is on third or fourth day from appearance of symptoms of infection.
- Other known risk factors include Young age, Day care/ creche outside the home, Occurrence of otitis in other family members, Using a pacifier.
- Breast-feeding for a short period or not at all may have some effect in increasing occurrence of AOM

Examination of the ears

- While examining the ear, an adult should hold the child firmly on the lap and support the child's head towards his/her own chest.
- Both ears are examined even if the child complains only in one ear. Always begin by examining the healthy ear.
- Earwax in the outer auditory canal should be removed to allow an unhindered view of the tympanic membrane.

Optional Symptoms

- The unspecific symptoms commonly associated with AOM are much the same as those of a normal respiratory track infection without otitis; therefore, the diagnosis of otitis cannot be made reliably on the basis of symptoms.
- Earache is a quite specific symptom suggesting AOM; however, it is present in only more than half of children with otitis.
- Sudden loss of hearing during a respiratory tract infection suggests otitis, but this is often difficult to notice in small children who cannot yet express themselves clearly
- Stroking ears is common in small children and does not suggest AOM if respiratory infection is not present.

Findings On The Tympanic Membrane

- Both ears are examined with an otoscope
- A pneumatic otoscope and a head mirror or an otomicroscope are good instruments for the examination of the ear.
- The mobility of the tympanic membrane cannot be evaluated reliably unless the otoscope fits the ear

canal completely air proofly.
- The diagnosis of otitis media is based on tympanic membrane findings
- There may be one or more findings suggesting otitis
- Differences in the tympanic membranes support the diagnosis of otitis.
- Mild redness of the tympanic membrane is usual in a crying or feverish child and is not as such a sufficient sign form making the diagnosis of otitis.

Tonsillitis And Pharyngitis In Children

Aetiology

- Adenoviruses are the most common aetiological agents.
- Streptococcal pharyngitis is common but is rare in children below 3 years of age.

Symptoms And Signs

- Clinical diagnosis is unreliable.
- Adenoviruses and other viruses can cause exudative tonsillitis.
- In 2/3rd of school-aged children with streptococcal tonsillitis there is no exudates
- Sore throat with rash is often caused by adenoviruses or other viruses.
- Ear pain may radiate to the tonsillar region (and vice versa).
- Streptococcal pharyngitis may also cause abdominal pain.

Diagnostics

- Diagnosis should be based on the detection of streptococci in pharyngeal secretions by culture or rapid antigen test. Bacteria other than streptococci need not be sought.
- A rapid culture method will give a result the next morning. If a rapid antigen test is used a negative result should be verified by culture. In children below 3 years of age streptococcal tonsillitis is so rare that a negative antigen test need not be controlled by culture.

Treatment

- Fever and pain are best treated with antipyresis and appropriate treatment of the cause. Because of infectiousness the child, should be isolated from crèche or school for one day after the onset of specific treatment. The length of absence from day care or school is determined by the general condition and not by the aetiological agent.

Treatment Of Pneumonia In Children

Diagnosis By Auscultation

- It is not always easy to differentiate obstructive rales from pneumonic rales. The latter are dry and fine.
- Unilaterally diminished breathing sounds are a significant finding.

Follow-Up Of Treatment

- If pneumonia is treated in primary care it is essential to follow-up the response to treatment, eg by asking the parents to report the next day. If the patient is definitely ill and does not show signs of improvement in 2 - 4 days the situation should be reassessed and consider referral to a hospital.
- Follow-up chest radiography should be carried out if there has been lobar infiltration or atelectasis, or if recovery is slow.
- Remember that the radiographic picture normalizes slowly. If the general condition of the child is good, control radiography should not be carried out before 4 - 6 weeks have elapsed.
- At one month about 20% of the patients continue to have abnormalities on the radiograph that gradually disappear.

Indications For Hospitalization

- The child should be referred to hospital if he or she has
  - impaired general condition
  - dyspnoea
  - bilateral/ widespread pneumonic infiltration
  - pleural effusion
- Children below the age of 6 months should always be hospitalized.

Fever of Unknown Origin

- Prolonged febrile illnesses reported for a while
- Petersdorf and Beeson - 1961
  - Classic monograph with criteria - 100 cases
  - Illness of more than 3 weeks duration
  - Fever higher than 101°F on several occasions
  - Diagnosis uncertain after one week of study in hospital
- Infections
- Neoplastic disease
- Collagen vascular diseases
- Miscellaneous

Approach

- Detailed history, repeated physical examinations Particular attention to history of travel exposures, hobbies, bites, medications, including complementary therapies, pets
- Laboratory data
- Radiological investigations
- Progress from non-invasive to invasive as necessary
- Approximately 10% of cases, no cause found during initial investigations

Suggested Modifications and New Categories

- Classic - one week study in hospital modified to 3 outpatient visits, or at least 3 days in hospital
- Nosocomial
- Neutropenic
- HIV associated

Nosocomial: Causes

- Underlying diseases and complications of hospitalizations
- Many - infections
  - Some more difficult to diagnose
- Candidiasis
- Sinusitis
- Drug fever - may be superimposed on other problems

Neutropenic

- **Key Factors**
  - Nature and stage of underlying diseases
  - Severity and duration of neutropenia
  - Chemotherapy - type, duration, number of cycles
  - Duration of hospitalization
  - Age
- Causes -Mostly Infections
  - Blood stream
  - Pneumonia
  - Oral cavity
  - Skin/soft tissue
  - Perirectal
- Early - Bacterial
- Late - Fungal, Viral, Other
- Drugs

HIV Associated

- Opportunistic infection
- HIV infection itself
- Malignancy
- Drugs
- Coexistence of more than one cause

Fever Due To Recurrent Infections of childhood is a common clinical problem. Normal pre school children may have 6-12 relatively mild and self limiting infections a year. In some cases problem may be more severe and persisting where identification of the underlying factor(s) becomes important. Many of the responsible factors may co-exist and have an additive effect.

1. Increased Exposure To Infectious Agent

a. Overcrowding
b. Poor environmental hygiene
c. Exposure to a case in immediate vicinity

2. Malnutrition

3. Anatomical Abnormality: Obstruction of drainage of secretions leads to stagnation → increased microbial growth → persistence of infection.

Example

a. Blocked eustachian tube → recurrent otitis media

b. Enlarged adenoids → URTI
c. FB in bronchus → LRTI
d. Blocked lacrimal duct → eye infection
e. Urethral stricture → UTI
Infection here ALWAYS /occurs at the same site.

4. ALLERGY presenting as recurrent infection /as mucosal edema → anatomical obstruction. Patients with allergies also have subtle immune system disturbances.

5. DELAYED MATURATION of immune system – it is only by school age (7-12) that the immune system approaches that of an adult.

Immune deficiency

a. PRIMARY – familial

b. SECONDARY – HIV - AIDS, long term steroids, debilitating illness etc

GENERAL APPEARANCE

Observing the child in the parent's arms from far yields a very useful assessment of the child's overall toxicity. Signs to evaluate include the child's alertness, color, respiratory status, responsiveness to other people or objects, feeding pattern and age-appropriate gross motor activities.

SKIN: Skin examination is helpful in early detection of some of the more severe life-threatening infections. Look for evidence of poor perfusion, mottling or petechial rashes, which are all signs of serious systemic illness.

- Petechial rashes can occur in bacterial sepsis, such as meningococcemia.
- Osler nodes may be found in children with endocarditis.
- Cellulitis is another common cause of fever in toddlers. Look for localized signs of redness, warmth and tenderness on the skin.
- Viral exanthemas, such as those occurring in rubella, varicella, cox sackie virus, and herpes simplex virus

HEAD, EYES, EARS, NOSE, MOUTH AND THROAT

The head, eyes, ears, nose, mouth and throat are sites for some of the more common infections in children.

- The eyes may show conjunctivitis, periorbital cellulitis with signs such as decreased mobility, proptosis, ↓ visual acuity, and papilledema.
- Tympanic membranes may show signs of acute otitis media with the cardinal signs of erythema, decreased motility and loss of landmarks and light reflex.
- The nose, mouth, and throat may show inflammation or ulceration suggestive of upper respiratory infections, streptococcal pharyngitis or herpetic gingivostomatitis.
- A prolonged course of URTI may lead to sinusitis, suggested by 8 or more consecutive days of nasal discharge, daytime and night time cough, and occasionally, sinus tenderness and postnasal drip.

NECK

- Cervical adenitis is another common complication of an extended URTI. It usually appears as a well-circumscribed tender area of swelling upon examination of the neck.
- Retropharyngeal abscess is most commonly observed in children younger than 3 years. Patients may present with stridor and/or meningismus.

CVS: Any new or worsening cardiac murmur, distant or muffled heart sounds, tachycardia out of proportion to fever, grunting respiration with relatively clear lungs, and hepatomegaly should make the clinician wary of possible endocarditis, pericarditis or myocarditis. Although these may be caused by bacterial organisms, such as *Staphylococcus aureus* and *Haemophilus influenzae*, they may also result from viral infections, such as coxsackie virus B.

RESPIRATORY SYSTEM

- Tachypnoea, nasal flaring, retractions, and auscultatory abnormalities (such as decreased breath sounds, wheezing, rales and rhonchi) can suggest pneumonia, bronchiolitis, and tracheobronchitis.
- Inspiratory stridor or a barking cough that is worse at night in a fully immunized child younger than 2 years may suggest laryngo-tracheo-bronchitis.

Abdomen

- In a simple case of viral gastroenteritis, abdominal examination findings are usually benign.
- Children with an acute abdomen (appendicitis, which is not so uncommon as commonly believed) can present with anorexia, low-grade fever, right lower quadrant tenderness over the McBurney point.
- Other gastrointestinal diseases to consider with fever include hepatitis, cholangitis, appendicitis, peritonitis and pancreatitis.

Genitourinary System

One of the more common causes of fever is urinary tract infection (UTI). This diagnosis can be extremely subtle in the child who does not talk. A high index of suspicion should be maintained for UTI for highly febrile children, particularly girls younger than 1 year. Suprapubic or flank tenderness, while helpful, is often absent in young children, who may instead present with vomiting or diarrhea.

Phimosis in boys and Vulvovaginits in girls may also be causing fever without any focal signs, hence examining all orifices becomes important in practice.

Musculoskeletal System

- In septic arthritis, a swollen joint with tenderness, erythema, increased warmth, and decreased range of motion may be appreciated.
- Patients with osteomyelitis present with the constellation of fever, irritability, malaise, restriction of movement of the involved extremity, and signs of localized inflammation.
- Children with myositis, most commonly associated with outbreaks of influenza A, may present with severe muscle pain, especially in the calf muscles. GB syndrome should be thought of and ruled out

Fever Phobia

Survey done in 1980 by Dr Barton Schmitt

- 58% of parents consider a fever of 102°F (38.9°C) or less to be a "high fever"
- 62% of parents believe fever can cause permanent harm (most commonly "brain damage")
- 56% of parents give antipyretic medication for temperatures of 99.8°F(37.8°C) or less (ie for normal temperatures)
- 51% of parents credit doctors as their main source of information about fever

Why Should Doctors Deal With Fever Phobia?

- Emphasis on "fever control" by doctors may cause parents to focus on the figure on the thermometer and neglect other more significant symptoms (decreased alertness, respiratory difficulty, refusal to drink, etc.)
- Recall that 51% of parents credit doctors as their main source of information about fever
- In the same survey, parents who credited their source of knowledge about fever to reading gave more appropriate answers than those who credited health-care providers

How Should Doctors Deal With Fever Phobia?

- Assume and encourage a calm approach to fever
- Avoid overly aggressive fever therapy
- Antipyretic medication generally only warranted for fever of 100°F or higher and if associated discomfort
- Cold water *pattis* cover too small a surface area and sponge baths are generally not warranted unless there is history of febrile convulsions
- Any round-the-clock antipyretic is unwarranted.

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