



# INDIAN JOURNAL OF PRACTICAL PEDIATRICS



- **IJPP is a quarterly subscription journal of the Indian Academy of Pediatrics committed to presenting practical pediatric issues and management updates in a simple and clear manner**
- **Indexed in Excerpta Medica, CABI Publishing, Scopus**

**Vol.23 No.3**

**JUL.- SEP. 2021**

**Dr.S.Thangavelu**  
Editor-in-Chief

**Dr.T.L.Ratnakumari**  
Executive Editor

## **CONTENTS**

### **TOPIC OF INTEREST - "FEVER"**

- Fever - Pathophysiology and types** **225**  
- Ashwath D
- Fever in neonates** **229**  
- Srinivas Murki, Deepak Sharma
- Approach to fever without localizing signs in children aged 1 to 36 months** **234**  
- **Indian context**  
- Rajesh Chokhani
- Approach to a child with fever less than one week duration** **238**  
- Sahana Devadas, Gayathri Devi Chinnappa, Varun Govindarajan
- Approach to a child with fever of 1-2 weeks duration** **247**  
- Monjori Mitra, Satyaki Das
- Approach to a child with fever beyond 2 weeks** **254**  
- Arun George, Winsley Rose
- Periodic fever** **264**  
- Karamath S. Pyarejan
- Fever in the immunocompromised child** **268**  
- Indira Jayakumar, Chidhambharam L, Vasanth Kumar S
- Symptomatic management of fever** **278**  
- Yagnesh Popat, Swati Popat
- Antimicrobial choice in tropical infections** **282**  
- Abhay K. Shah, Aashay A. Shah

### **GENERAL ARTICLE**

- Dengue vaccines update** **291**  
- Shyamala J

**Journal Office and address for communications:** Dr. S.Thangavelu, Editor-in-Chief, Indian Journal of Practical Pediatrics, 1A, Block II, Krsna Apartments, 50, Thamizh Salai (Halls Road), Egmore, Chennai - 600 008. Tamil Nadu, India. Tel.No. : 044-28190032 E.mail : [ijpp\\_iap@rediffmail.com](mailto:ijpp_iap@rediffmail.com)

**DRUG PROFILE**

<b>Medications to manage acute exacerbation of asthma in children</b>	<b>298</b>
- Jeeson C. Unni, Ranjit Baby Joseph	

**ADOLESCENCE**

<b>Body image during adolescence</b>	<b>305</b>
- Amitha Rao Aroor, Preeti M. Galagali	

**RADIOLOGY**

<b>Imaging findings of tuberculosis in children (Part-2)</b>	<b>311</b>
- Raveendran J	

**CASE REPORT**

<b>Left ventricular non-compaction cardiomyopathy associated with congenital cytomegalovirus infection</b>	<b>314</b>
- Ram Babu Sharma, Shashank Sharma, Neelam Singh	

<b>Pan ophthalmitis a rare, yet preventable complication of dengue infection</b>	<b>316</b>
- Mayuri Yeole, Himaal Dev, Raghu Nagaraju	

**CASE VIGNETTE**

<b>Cantu syndrome</b>	<b>318</b>
- Senthil Kumar P, Ahila Ayyavoo	

<b>PICTURE QUIZ</b>	<b>320</b>
---------------------	------------

<b>ADVERTISEMENTS</b>	<b>324</b>
-----------------------	------------

<b>NEWS AND NOTES</b>	<b>246,263,320</b>
-----------------------	--------------------

<b>CLIPPINGS</b>	<b>228,237,253,277,281,290,304,310,313,317,319</b>
------------------	--

**FOR YOUR KIND ATTENTION**

- \* The views expressed by the authors do not necessarily reflect those of the sponsor or publisher. Although every care has been taken to ensure technical accuracy, no responsibility is accepted for errors or omissions.
- \* The claims of the manufacturers and efficacy of the products advertised in the journal are the responsibility of the advertiser. The journal does not own any responsibility for the guarantee of the products advertised.
- \* Part or whole of the material published in this issue may be reproduced with the note "Acknowledgement" to "Indian Journal of Practical Pediatrics" without prior permission.
- \* The write up should be in accordance with the recommendations of Central IAP particularly with issues involving National Programmes like Immunization, Public Health Programs and Nutrition.
- \* NOTE: Many trade names of the vaccines are included in the text for the sake of clarity.

**EDITORIAL BOARD**

Published by Dr. S.Thangavelu, Editor-in-Chief, IJPP, on behalf of Indian Academy of Pediatrics, from 1A, Block II, Krsna Apartments, 50, Thamizh Salai (Halls Road), Egmore, Chennai - 600 008. Tamil Nadu, India and Printed by Mr. D.Ramanathan, at Alamu Printing Works, 9, Iyyah Street, Royapettah, Chennai - 600 014.

**FEVER****FEVER - PATHOPHYSIOLOGY AND TYPES****\*Ashwath D**

**Abstract:** *The basic mechanisms of thermoregulation with specific reference to elevated body temperature is discussed. A distinction is made between fever and elevation of body temperature due to other causes like environment. The different types of fever based on etiology and clinical characteristics are briefly reviewed.*

**Keywords:** *Fever, Thermoregulation, Pyrexia, Pyrogens.*

**Points to Remember**

- *Fever is elevation of core body temperature above the normal for the age and species.*
- *The body temperature is regulated by the hypothalamic thermoregulatory center.*
- *The ill effects of fever are multisystemic.*
- *The clinical patterns of fever may help in suspecting the etiology.*
- *Hyperpyrexia (temperature > 41°C) is typically seen with non infectious causes.*

**References**

1. Barrett KE, Barman SM, Boitano S, Brooks HL. Hypothalamic Regulation of Hormonal Functions. In: Ganong's Review of Medical Physiology [Internet]. 25<sup>th</sup> ed. New York, NY: McGraw-Hill Education; 2018. Available from: [accessmedicine.mhmedical.com/content.aspx?aid=111582978](https://accessmedicine.mhmedical.com/content.aspx?aid=111582978). Accessed on 6<sup>th</sup> June, 2021.
2. Walter EJ, Hanna-Jumma S, Carraretto M, Forni L. The pathophysiological basis and consequences of fever. *Crit Care* 2016; 20(1):200. doi: 10.1186/s13054-016-1375-5. Accessed on 6<sup>th</sup> June, 2021.
3. Richardson M, Pursell E. Who's afraid of fever? *Arch Dis Child* 2015; 100(9):818-820.
4. Nield LS, Kamat. D. Fever | Clinical Gate [Internet]. Available from: <https://clinicalgate.com/fever/> Accessed on 6<sup>th</sup> June, 2021.

---

\* Consultant in Pediatrics and Neonatology,  
Kovai Medical Centre and Hospital,  
Coimbatore,  
Tamil Nadu.  
email: drashwathd@gmail.com

**FEVER****FEVER IN NEONATES**

**\*Srinivas Murki**  
**\*\*Deepak Sharma**

**Abstract:** *Fever in a neonate is one of the symptoms causing concern and requiring admission to NICU. Fever in neonates is defined as rectal temperature  $\geq 38^{\circ}\text{C}$ . It is important to differentiate between environmental exposure hyperthermia and fever in neonates. Neonates with environmental hyperthermia are usually active, alert and have stable vital parameters. Once the environmental factors causing hyperthermia are corrected, their body temperature normalizes rapidly without any other treatment being required. After ruling out hyperthermia due to environmental causes, all neonates with fever should have complete sepsis work up including cerebrospinal fluid analysis to rule out serious bacterial infection. When there is no apparent focus of fever, empiric antibiotics should be started in these neonates based on local antibiogram without waiting for other laboratory reports.*

**Keywords:** *Hyperthermia, Neonate, Serious Bacterial Infection, Fever without focus.*

**Points to Remember**

- *Fever in neonates may be a manifestation of underlying serious bacterial infection.*
- *Detailed history and examination should be done for all neonates with fever.*
- *Environmental hyperthermia is one of the important reasons for increased body temperature in neonates and should be ruled out in stable, well looking neonates.*
- *Dehydration is an important cause of fever and is often associated with hypernatremia.*
- *All neonates with fever and rash must be evaluated.*
- *Neonates having fever without focus should undergo full sepsis workup.*
- *All neonates with fever should be admitted and started on intravenous antibiotics after sending investigations.*

**References**

1. Alverson B, Wolf H. Neonatal Fever. *J Hosp Med.* 2010; 1; 5:23-4. doi:10.1002/jhm.731.
2. NICE Guideline Updates Team (UK). Fever in under 5s: assessment and initial management. London: National Institute for Health and Care Excellence (UK); 2019 Nov. PMID: 31891472. Accessed on 13/06/2021.
3. Antoon JW, Potisek NM, Lohr JA. Pediatric Fever of Unknown Origin. *Pediatr Rev* 2015; 36(9):380-390.
4. Aronson PL, Thurm C, Alpern ER, Alessandrini EA, Williams DJ, Shah SS, et al. Variation in care of the febrile young infant, 90 days in US pediatric emergency departments. *Pediatrics* 2014; 134(4):667-677.
5. Uslu S, Ozdemir H, Bulbul A, Comert S, Bolat F, Can E, et al. A comparison of different methods of temperature measurements in sick newborns. *J Trop Pediatr* 2011; 57(6):418-423.
6. World Health Organization. Managing newborn problems: A guide for doctors, nurses, and midwives, 2003. Section 1, page F73-74. Available from <https://apps.who.int/iris/handle/10665/42753>. Accessed on 15/06/2021.

---

\* Chief Neonatologist,  
Paramitha Children's Hospital,  
Hyderabad.

\*\* Resident - Neonatology,  
Fernandez Hospital,  
Hyderabad.

email: [srinivasmurki2001@gmail.com](mailto:srinivasmurki2001@gmail.com)

7. Gérardin P, Barau G, Michault A, Bintner M, Randrianaivo H, Choker G, et al. Multidisciplinary Prospective Study of Mother-to-Child Chikungunya Virus Infections on the Island of La Réunion. *PLoS Med* 2008 Mar; 5(3):e60. doi: 10.1371/journal.pmed.0050060.
8. Sirinavin S, Nuntnarumit P, Supapannachart S, Boonkasidecha S, Techasaensiri C, Yoksarn S. Vertical dengue infection: case reports and review. *Pediatr Infect Dis J* 2004; 23(11):1042-1047.
9. Basurko C, Carles G, Youssef M, Guindi WE. Maternal and fetal consequences of dengue fever during pregnancy. *Eur J Obstet Gynecol Reprod Biol* 2009; 147(1):29-32.
10. Esposito S, Rinaldi VE, Argentiero A, Farinelli E, Cofini M, D'Alonzo R, et al . Approach to Neonates and Young Infants with Fever without a Source Who Are at Risk for Severe Bacterial Infection. *Mediators Inflamm*. 2018 Nov 26; 2018:4869329. doi: 10.1155/2018/4869329.

**FEVER****APPROACH TO FEVER WITHOUT LOCALIZING SIGNS IN CHILDREN AGED 1 TO 36 MONTHS - INDIAN CONTEXT****\*Rajesh Chokhani**

**Abstract:** *Fever without localizing signs is a common symptom in children. It can be due to mild self limiting illnesses or serious causes. A pediatrician should be able to discriminate the mild from the serious causes by using a systematic approach that involves detailed history, careful examination and select laboratory tests. While the disease process evolves, symptomatic treatment and careful follow up are essential to recognize any clinical deterioration. At the same time, one should avoid unnecessary investigations and inappropriate antibiotics.*

**Keywords:** *Fever without focus, Well looking febrile infant, Serious bacterial infection.*

**Points to Remember**

- *Confirm the presence of fever.*
- *A detailed history and careful clinical examination are vital to pick up localizing symptoms and signs.*
- *Even when a febrile infant 1 to 3 months of age is assessed to be otherwise 'well', screening investigations to rule out a serious bacterial infection are ideal with urinalysis being a must.*
- *In older infants and young children, a sound clinical approach can safely guide decision making on further management.*
- *The need for a constant follow up is essential until fever subsides or a clear diagnosis is made.*

**References**

1. Nield LS, Kamat D, Fever without focus In: Nelson Textbook of Pediatrics. eds Kliegman RM, Stanton BF, St Geone JW, Schor NF. 21<sup>st</sup> ed. Philadelphia, PA: Elsevier; 2020; pp1280-1287.
2. Kuppermann N, Dayan PS, Levine DA. A Clinical Prediction Rule to Identify Febrile Infants 60 Days and Younger at Low Risk for Serious Bacterial Infections. *JAMA Pediatr* 2019; 173(4):342-351.
3. England JT, Del Vecchio MT, Aronoff SC. Use of serum procalcitonin in evaluation of febrile infants: a meta-analysis of 2317 patients. *J Emerg Med* 2014;47(6): 682-688.
4. Kuppermann N, Mahajan P. Role of serum procalcitonin in identifying young febrile infants with invasive bacterial infections: one step closer to the Holy Grail? *JAMA Pediatr* 2016;170(1):17-18.
5. Phasuk N, Nurak A. Etiology, Treatment, and Outcome of Children Aged 3 to 36 Months With Fever Without a Source at a Community Hospital in Southern Thailand. *J Prim Care Community Health* [Internet]. 2020 Jan Dec; 11.2150132720915404 Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7232878>". <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7232878>. Accessed on 24<sup>th</sup> Aug 2021.
6. Baker MD, Avner JR. Management of fever in young infants: evidence versus common practice. *Pediatrics* 2016; 138(6).
7. Reddy M, Bansal A. Febrile Child. *Indian J Pediatr* 2017; 84(10):782-786.

---

\* Consultant Pediatrician,  
P D Hinduja Hospital,  
Mumbai.  
email: rajeshchokhani@gmail.com

<b>FEVER</b>
--------------

## APPROACH TO A CHILD WITH FEVER LESS THAN ONE WEEK DURATION

\***Sahana Devadas**

\*\***Gayathri Devi Chinnappa**

\*\*\***Varun Govindarajan**

**Abstract:** *Fever, a thermo regulated elevation of body temperature above normal daily variation, is the most common reason for parents to seek medical care. The disease spectrum in Indian children is more diverse than western countries, with tropical diseases and serious bacterial infections being more common. Since most short duration fevers are self-limited, the primary goal of treatment is to keep the child comfortable, while looking for the localizing signs. Fever without localizing signs pose a unique challenge, especially in young infants who are prone to a wide spectrum of viral and serious bacterial infections. While a well appearing infant needs only parental reassurance and adequate follow-up, an ill appearing infant needs further investigations based on local epidemiology. A thorough clinical assessment and prudent selection of laboratory tests identify at-risk children, aiding in prompt management.*

**Keywords:** *Febrile illness, Short duration, Antipyretics, Serious bacterial infections, Tropical infections.*

## Points to Remember

- *Short duration fevers are usually self-limiting and caused by common viruses.*
- *Disease profile of Indian children is different from the western population and clinical examination with relevant investigation is important.*
- *Fever maybe the only early sign of serious bacterial infections in young infants requiring hospitalization, where empirical broad-spectrum antibiotics and complete evaluation into the cause are required.*
- *Undifferentiated, benign viral fevers presenting with rash need to be differentiated early from sinister entities like meningococemia, scrub typhus, dengue fever and Kawasaki disease based on the pattern of rash appearance and distribution.*
- *Older children usually have localizing signs for infection which need to be actively searched for and treatment instituted appropriately.*
- *Undifferentiated fever in children with immunodeficiency or immunocompromised states need aggressive evaluation for source of infection and warrant early initiation of empirical antibiotics.*
- *Antibiotics in short duration fevers is justified only when a bacterial source of infection is conclusively identified.*
- *Pediatricians play an active role in counseling the parents regarding danger signs of infection, when to seek medical care, allay fears and address common misconceptions regarding fever even during wellness visits of the child to the clinic.*

## References

1. Bryan CS. Fever, Famine, and War: William Osler. Clin Infect Dis 1996; 23(5):1139-49. doi: 10.1093/clinids/23.5.1139.
2. Gupta P. Fever. In: Gupta P, Menon PSN, Ramji S, Lodha R. PG Textbook of Pediatrics. 2<sup>nd</sup>edn. New Delhi: Jaypee Brothers Medical Publishers (P) Ltd, New Delhi, 2019; pp1246-1253.
3. Ward MA, Hannemann NL. Fever: Pathogenesis and treatment. In: Feigin and Cherry's Textbook of Pediatric

---

\* Professor

\*\* Associate Professor

\*\*\* Junior Resident,  
Department of Pediatrics,  
Vanivilas Women and Children Hospital,  
Bangalore Medical College and Research Institute,  
Bengaluru.  
email: sahanad28@gmail.com

- Infectious Diseases, 8<sup>th</sup> edn, Cherry JD, Harrison G, Kaplan SL, Steinbach WJ, Hotez P (Eds), Elsevier, Philadelphia 2018; pp83-88.
4. Barbi E, Marzuillo P, Neri E, Naviglio S, Krauss BS. Fever in children: pearls and pitfalls. *Children (Basel)* 2017; 4(9):81. <https://doi.org/10.3390/children4090081>.
  5. Kumar VS. Approach to fever. In: Fever from evidence to action. FeFCon-2108. Fever Foundation. Micro Labs Ltd. Bengaluru 2018; pp32-37.
  6. Matlani M, Kumar P, Meena SS, Vashistha M, Dogra V. Etiological Trends and Epidemiological Profile of Tropical Fever in Children Presenting with Acute Undifferentiated Fever at a Tertiary Care Centre in North India. *J Nepal Pediatr Soc* 2021; 41(1):54-60.
  7. Brower L, Shah S. Fever without a focus in the neonate and young infant. In: Kliegman RM, Geme JWS, Blum NJ, Shah SS, Tasker RC, Wilson KM. *Nelson Textbook of Pediatrics*. 21<sup>st</sup>edn. Philadelphia: Elsevier; 2020; pp1389-1392.
  8. Chitkara AJ. Fever with Rash. Fever in India - Opportunities & Challenges. Second Annual National Conference of Fever Foundation: FeFCon 2019. Bengaluru. November 2019.
  9. Niehues T. The febrile child: diagnosis and treatment. *DtschArztebl Int* 2013; 110(45):764-774. doi: 10.3238/arztebl.2013.0764
  10. Aronson PL, Neuman MI. Fever in the Older Child. In: Kliegman RM, Geme JWS, Blum NJ, Shah SS, Tasker RC, Wilson KM. *Nelson Textbook of Pediatrics*. 21<sup>st</sup> edn. Philadelphia: Elsevier; 2020; 1393-1396.
  11. Michaels MG, Chong HY, Green M. Infections in Immunocompromised Persons. In: Kliegman RM, Geme JWS, Blum NJ, Shah SS, Tasker RC, Wilson KM. *Nelson Textbook of Pediatrics*. 21<sup>st</sup>edn. Philadelphia: Elsevier; 2020; 1403-1410.
  12. Wolf J, Flynn PM. Infection Associated with Medical devices. In: Kliegman RM, Geme JWS, Blum NJ, Shah SS, Tasker RC, Wilson KM. *Nelson Textbook of Pediatrics*. 21<sup>st</sup>edn. Philadelphia: Elsevier; 2020; 1410-1413.
  13. Multisystem inflammatory syndrome in children and adolescents with COVID-19. Scientific Brief. COVID-19: Clinical care. 15 May 2020. WHO/2019nCoV/Sci\_Brief/Multisystem\_Syndrome\_Children/2020.
  14. Balasubramaniam S. An Overview of fever: A lifespan approach. Fever in India - Opportunities and Challenges. Second Annual National Conference of Fever Foundation: FeFCon 2019. Bengaluru. November 2019.
  15. Poojary A. New Rapid Diagnostic tests for Fever. Fever in India - Opportunities & Challenges. Second Annual National Conference of Fever Foundation: FeFCon 2019. Bengaluru. November 2019.
  16. Shenoy B. Prescribing antibiotics in pediatric office practice. Fever in India - Opportunities and Challenges. Second Annual National Conference of Fever Foundation: FeFCon 2019. Bengaluru. November 2019.
  17. Avner JR. Acute fever. *Pediatrics in Review* 2009; 30; 5-13.



**FEVER**

## APPROACH TO A CHILD WITH FEVER OF 1-2 WEEKS DURATION

\***Monjori Mitra**  
\*\***Satyaki Das**

**Abstract:** *Fever is one of the common clinical symptoms seen in pediatric population diagnosed with an identified bacterial or viral infection. In several others, the fever may be prolonged for a longer duration commonly called fever of unknown origin (FUO). Common causes are infectious in nature such as viral, bacterial, fungal and parasitic. Non-infectious causes are immune-mediated and granulomatous diseases, periodic fever syndromes and autoinflammatory disorders and neoplasms. Important factors to be considered for diagnosis are periodicity of fever and associated signs and symptoms. When investigating prolonged fever, it is important to consider the age at onset, family history, duration of febrile episodes, length of the interval between episodes, associated symptoms and response to treatment. Along with case history data, a careful physical examination during and between febrile episodes may provide useful clues and guide laboratory investigations. A careful watch is mandatory in cases of prolonged fever because new signs and symptoms may appear over time which may help to approach the diagnosis.*

**Keywords:** *Fever of unknown origin, Fever etiology, Fever periodicity, Relapsing fever.*

### Points to Remember

- *When investigating fever of 1-2 weeks, it is important to consider the age at onset, family history, travel history, exposure to animals, periodicity, associated symptoms and response to treatment.*
- *A careful physical examination during and between febrile episodes may provide useful clues and guide laboratory investigations.*
- *It is important to rule out the possibility of an infectious disease, the common ones being enteric fever, scrub typhus, malaria and leptospirosis.*
- *After excluding an infectious etiology, neoplastic, immune-mediated and autoinflammatory causes should be taken into consideration.*
- *Repeated clinical examinations are mandatory, as new signs and symptoms may appear over time which may give a clue to the likely diagnosis and help to choose the appropriate laboratory investigations.*

### References

1. Wunderlich CA, Seguin E. Medical Thermometry and Human Temperature; William Wood & Company: New York, NY, USA, 1871.
2. Finkelstein JA, Christiansen CL, Platt R. Fever in pediatric primary care: occurrence, management and outcomes. *Pediatrics* 2000; 105(1 Pt 3):260-266.
3. Greenes DS, Harper MB. Low risk of bacteremia in febrile children with recognizable viral syndromes. *Pediatr Infect Dis J* 1999; 18(3):258-261.
4. Pasic S, Minic A, Djuric P, Micic D, Kuzmanovic M, Sarjanovic L, et al. Fever of unknown origin in 185 pediatric patients: a single-centre experience. *Acta Paediatr* 2006; 95(4):463-466.
5. Kool M, Elshout G, Moll HA, Koes BW, van der Wouden JC, Berger MY. Duration of fever and course of symptoms in young febrile children presenting with uncomplicated illness. *J Am Board Fam Med* 2013; 26:445-452.
6. Maguire S, Ranmal R, Komulainen S, Pearse S, Maconochie I, Lakhanpaul M, et al. RCPCH Fever Project Board. Which urgent care services do febrile children use and why? *Arch Dis Child* 2011; 96:810-816.

---

\* Professor of Pediatrics

\*\* Resident Medical Officer,  
Institute of Child Health, Kolkata.  
email: monjorimr@gmail.com

7. Elshout G, Monteny M, van der Wouden JC, Koes BW, Berger MY. Duration of fever and serious bacterial infections in children: A systematic review. *BMC Fam Pract* 2011; 12:33.
8. Cutler SJ. Relapsing fever *Borrelia*. *Clin Lab Med* 2015; 35:847-865.
9. Shaalan MA, Memish ZA, Mahmoud SA, Alomari A, Khan MY, Almuneef M, et al. Brucellosis in children: clinical observations in 115 cases. *Int J Infect Dis* 2002; 6(3):182-186.
10. Buckle GC, Walker CL, Black RE. Typhoid fever and paratyphoid fever: Systematic review to estimate global morbidity and mortality for 2010. *J Glob Health* 2012; 2:010401. doi: 10.7189/jogh.02.010401.
11. Van CT, Thuy NT, San NH, Hien TT, Baranton G, Perolat P. Human leptospirosis in the Mekong delta, Vietnam. *Trans R Soc Trop Med Hyg* 1998; 92: 625-628.
12. Baltimore RS, Gewitz M, Baddour LM, Beerman LB, Jackson MA, Lockhart PB, et al. Infective Endocarditis in Childhood: 2015 Update: A Scientific Statement From the American Heart Association. *Circulation* 2015; 132: 1487-1515.
13. Pizzo PA, Lovejoy FH Jr, Smith DH. Prolonged fever in children: review of 100 cases. *Pediatrics* 1975; 55: 468-473.
14. Kaplan SL, Feigin RD. Experience and reason-briefly recorded. *Pediatrics* 1976; 58:614.
15. Sharma LC, Falodia J, Kalla K, Kalla M, Gupta JB, Gupta SS, et al. Esophageal histoplasmosis in a renal allograft recipient. *Saudi J Kidney Dis Transpl* 2013; 24:764-767.
16. Sondermeyer GL, Lee LA, Gilliss D, McCarty JM, Vugia DJ. Epidemiology of Pediatric Coccidioidomycosis in California, 2000-2012. *Pediatr Infect Dis J* 2016; 35(2):166-171. doi: 10.1097/INF.0000000000000952. PMID: 26461228.
17. Schumacher RF, Spinelli E. Malaria in children. *Mediterr J Hematol Infect Dis* 2012; 4.
18. Rosen MJ, Dhawan A, Saeed SA. Inflammatory bowel disease in children and adolescents. *JAMA Pediatr* 2015; 169:1053-1060.
19. Piram M, Koné-Paut I. Maladie de Behçet de l'enfant. *Rev Méd Interne* 2014; 35:121-125.
20. Janka GE. Familial and acquired hemophagocytic lymphohistiocytosis. *Eur J Pediatr* 2007; 166(2):95-109. doi: 10.1007/s00431-006-0258-1. Epub 2006 Dec 7.
21. Lee KY, Yeon YH, Lee BC. Kikuchi-Fujimoto disease with prolonged fever in children. *Pediatrics* 2004; 114:e752.
22. Cogulu O, Koturoglu G, Kurugol Z, Ozkinay F, Vardar F, Ozkinay C. Evaluation of 80 children with prolonged fever. *Pediatr Int* 2003; 45(5):564-569. doi: 10.1046/j.1442-200x.2003.01793.x. PMID: 14521533.

<b>FEVER</b>
--------------

## APPROACH TO A CHILD WITH FEVER BEYOND 2 WEEKS

\*Arun George  
\*\*Winsley Rose

**Abstract:** *Prolonged fever of two weeks duration or more poses diagnostic challenges due to a wide variety of differential diagnoses including infections, malignancies, rheumatological conditions and other rare causes. It is important to have a structured approach to make a definitive diagnosis. A good history, meticulous physical examination supported by a step wise escalation of investigations to arrive at a definite diagnosis is the key to successful management of prolonged fever. Empirical steroids, anti-tuberculous and broad spectrum antibiotic therapy should be avoided till a definite diagnosis is established.*

**Keywords:** *Fever, Pyrexia of unknown origin, Approach, Algorithm.*

## Points to Remember

- *A detailed history and thorough examination are the cornerstone for diagnosis in a child with prolonged fever.*
- *Epidemiological data, contact history, previous medical history, fever pattern, focused physical examination and screening tests often provide adequate information to establish a diagnosis.*
- *Non-invasive tests are performed first before taking up the child for invasive and expensive investigations in a step wise manner based on the clinical details.*
- *Management includes supportive treatment as well as targeted therapy after the diagnosis is obtained. empirical broad spectrum antimicrobials, anti-malarials, anti tuberculous therapy and steroids should be avoided.*

## References

1. Harper MB, Fleischer G. Infectious disease emergencies. In: Fleishcher G, Ludwig S, editors. Textbook of Pediatric Emergency Medicine. 6th ed. Philadelphia: Lippincott Williams & Wilkins, 2010; pp887-946.
2. Antoon JW, Potisek NM, Lohr JA. Pediatric Fever of Unknown Origin. *Pediatr Rev* 2015; 36(9):380-391.
3. Tansey EA, Johnson CD. Recent advances in thermoregulation. *Adv Physiol Educ* 2015;39(3):139-148.
4. Mackowiak PA, Wasserman SS, Levine MM. A critical appraisal of 98.6 degrees F, the upper limit of the normal body temperature, and other legacies of Carl Reinhold August Wunderlich. *JAMA* 1992; 268(12):1578-1580.
5. Hui C, Neto G, Tsertsvadze A, Yazdi F, Tricco AC, Tsouros S, et al. Diagnosis and management of febrile infants (0-3 months). *Evid Rep Technol Assess (Full Rep)* 2012; (205):1-297.
6. American College of Emergency Physicians Clinical Policies Committee; American College of Emergency Physicians Clinical Policies Subcommittee on Pediatric Fever. Clinical policy for children younger than three years presenting to the emergency department with fever. *Ann Emerg Med* 2003; 42(4):530-545.
7. Mahajan P, Batra P, Thakur N, Patel R, Rai N, Trivedi N, et al. For Academic College of Emergency Experts in India (ACEE-INDIA) - INDO US Emergency and Trauma

---

\* Assistant Professor

\*\* Professor,  
Department of Pediatrics,  
Christian Medical College, Vellore.  
email:winsleyrose@cmcvellore.ac.in

- Collaborative. Consensus Guidelines on Evaluation and Management of the Febrile Child Presenting to the Emergency Department in India. *Indian Pediatr* 2017; 54(8):652-660.
8. Petersdorf RG, Beeson PB. Fever of unexplained origin: report on 100 cases. *Medicine (Baltimore)* 1961; 40:1-30.
  9. Durack DT, Street AC. Fever of unknown origin-reexamined and redefined. *Curr Clin Top Infect Dis* 1991; 11:35-51.
  10. Chow A, Robinson JL. Fever of unknown origin in children: a systematic review. *World J Pediatr* 2011; 7(1): 5-10.
  11. Sumathisri R, Pandi K, Srinivasan S. Fever in the tropics: aetiology and clinical profile of fever of unknown origin in children-a prospective observational study in a tertiary care hospital in South India. *Int J Contemp Pediatr* 2019; 6(5):1834-1838.
  12. Landge AA, Singhal T. Etiology of Fever of Unknown Origin in Children from Mumbai, India. *Indian Pediatr* 2018; 55(1):71-72. PMID: 29396941.
  13. Dayal R, Agarwal D. Fever in Children and Fever of Unknown Origin. *Indian J Pediatr* 2016; 83(1):38-43.
  14. Dall L, Stanford JF. Fever, Chills, and Night Sweats. In: Walker HK, Hall WD, Hurst JW, editors. *Clinical Methods: The History, Physical, and Laboratory Examinations*. 3<sup>rd</sup>ed. Boston: Butterworths; 1990; Chapter 211. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK324/> Accessed on 8<sup>th</sup> May, 2021.
  15. Ogoina D. Fever, fever patterns and diseases called 'fever'- a review. *J Infect Public Health* 2011; 4(3):108-124.
  16. Mackowiak PA, Bartlett JG, Borden EC, Goldblum SE, Hasday JD, Munford RS, et al. Concepts of fever: recent advances and lingering dogma. *Clin Infect Dis* 1997; 25(1):119-138.
  17. Attard L, Tadolini M, De Rose DU, Cattalini M. Overview of fever of unknown origin in adult and paediatric patients. *Clin Exp Rheumatol* 2018; 36 Suppl 110(1):10-24.
  18. Thomas KT, Feder HM Jr, Lawton AR, Edwards KM. Periodic fever syndrome in children *J Pediatr* 1999; 135(1):15-21.
  19. Tse SM, Laxer RM. Approach to acute limb pain in childhood. *Pediatr Rev* 2006; 27(5):170-180.
  20. Dutta S, Jain N, Bhattacharya A, Mukhopadhyay K. Infantile cortical hyperostosis. *Indian Pediatr* 2005; 42(1):64-66.
  21. Pala NA, Ashraf M, Bhoughal B. Profile of thyrotoxic patients presenting as pyrexia of unknown origin: An observational case study from a tertiary care hospital. *Int J Med Res Rev* 2019; 7(1):30-35.
  22. Segurado Rodríguez MA, Ortiz De Frutos FJ, Cornejo Navarro P, Rodríguez Peralto JL, Sánchez Del Pozo J, Guerra Tapia A, et al. Displasia ectodérmica hipohidrotica: una causa de fiebre de origen desconocido [Hypohidrotic ectodermal dysplasia: A cause of fever of unknown origin]. *An Esp Pediatr* 2002; 56(3):253-257.
  23. Franco-Paredes C, Mehrabi D, Calle JC, Jurado RL. Night sweats revisited. *Infect Dis Clin Pract* 2002; 11:291-293.
  24. Shapiro DS. Infections Acquired from Animals Other Than Pets. *Infect Dis* 2017; 663-669.e2.
  25. Glickman LT, Chaudry IU, Costantino J, Clack FB, Cypess RH, Winslow L. Pica patterns, toxocariasis and elevated blood lead in children. *Am J Trop Med Hyg* 1981; 30(1):77-80.
  26. Singh V, Parakh A. What Is New in the Management of Childhood Tuberculosis in 2020? *Indian Pediatr* 2020; 57(12):1172-1176.
  27. Mehta NY, Copelin II EL. Abdominal Abscess. 2021 Jun 20. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan. Accessed on 8<sup>th</sup> July, 2021.
  28. Seashore CJ, Lohr JA. Fever of unknown origin in children. *Pediatr Ann* 2011; 40(1):26-30.
  29. Lye PS, Densmore EM. Fever. In: Kliegman RM, Lye PS, editors. *Nelson Pediatric Symptom-Based Diagnosis*. 1st ed. Philadelphia: Elsevier, 2018 ;pp701-725.
  30. Amin K, Kauffman CA. Fever of unknown origin. *Postgrad Med* 2003; 114(3):69-75.
  31. Fernandez C, Beeching NJ. Pyrexia of unknown origin. *Clin Med* 2018; 18(2):170-174.
  32. Servy A, Valeyrie-Allanore L, Alla F, Lechiche C, Nazeyrollas P, Chidiac C, et al. Prognostic value of skin manifestations of infective endocarditis. *JAMA Dermatol* 2014; 150(5):494-500.
  33. Rose W, Rajan RJ, Punnen A, Ghosh U. Distribution of Eschar in Pediatric Scrub Typhus. *J Trop Pediatr* 2016; 62(5):415-420.
  34. Jezierska M, Stefanowicz J, Romanowicz G, Kosiak W, Lange M. Langerhans cell histiocytosis in children - a disease with many faces. Recent advances in pathogenesis, diagnostic examinations and treatment. *Adv Dermatol Allergol Dermatol Alergol* 2018; 35(1):6-17.
  35. Goldmuntz EA, White PH. Juvenile Idiopathic Arthritis: A Review for the Pediatrician. *Pediatr Rev* 2006; 27(4):e24-32.
  36. Sahai S. Lymphadenopathy. *Pediatr Rev* 2013; 34(5): 216-227.
  37. Haq SA, Alam MN, Hossain SM, Ahmed T, Tahir M. Value of clinical features in the diagnosis of enteric fever. *Bangladesh Med Res Counc Bull* 1997; 23(2):42-46.
  38. Hasan S, Khan NI, Reddy LB. Leukemic gingival enlargement: Report of a rare case with review of literature. *Int J Appl Basic Med Res* 2015; 5(1):65-67.
  39. Darwazeh AMG, Darwazeh TA. What makes oral candidiasis recurrent infection? A Clinical View. *J Mycol* 2014; 2014:e758394.

40. Scott Moses M. Fever of unknown origin examination [Internet]. Fpnotebook.com. 2021. Available from: <https://fpnotebook.com/id/Fever/Fvprofunknwnorgnexamntn.htm>. Accessed on 20<sup>th</sup> July, 2021.
41. Todd JK. Childhood Infections: Diagnostic value of peripheral white blood cell and differential cell counts. *Am J Dis Child* 1974; 127(6):810-816.
42. Abdul-Hamid G. Classification of Acute Leukemia [Internet]. Acute Leukemia - The Scientist's Perspective and Challenge. IntechOpen; 2011 Available from: <https://www.intechopen.com/books/acute-leukemia-the-scientist-s-perspective-and-challenge/classification-of-acute-leukemia>. Accessed on 8<sup>th</sup> May, 2021.
43. Fincher RM, Page MI. Clinical significance of extreme elevation of the erythrocyte sedimentation rate. *Arch Intern Med* 1986; 146(8):1581-1583.
44. Limper M, de Kruif MD, Duits AJ, Brandjes DPM, van Gorp ECM. The diagnostic role of procalcitonin and other biomarkers in discriminating infectious from non-infectious fever. *J Infect* 2010; 60(6):409-416.
45. Frush DP, Goske MJ. Image Gently: toward optimizing the practice of pediatric CT through resources and dialogue. *Pediatr Radiol* 2015; 45(4):471-475.
46. Buchmann RF, Jaramillo D. Imaging of articular disorders in children. *Radiol Clin North Am* 2004; 42(1):151-168.
47. Balink H, Verberne HJ, Bennink RJ, van Eck-Smit BL. A Rationale for the use of F18-FDG PET/CT in fever and inflammation of unknown origin. *Int J Mol Imaging* 2012; 2012:165080.
48. Kumar V, Bhatia A, Madaan GB, Marwah S, Nigam AS. Role of bone marrow examination in the evaluation of infections: Clinico-hematological analysis in a tertiary care centre. *Turk Patoloji Derg (English)* 2020; 36(1):17-22.

**FEVER****PERIODIC FEVER****\*Karamath S. Pyarejan**

**Abstract:** *Periodic fevers are often poorly understood due to the lack of understanding and many a times are missed. Even though these are rare, the children who have these conditions are subjected to multiple unnecessary investigations and treatments. Understanding the concept of auto-inflammation can be helpful in the approach to many chronic diseases and their treatment.*

**Keywords:** *Periodic fever, Autoinflammatory syndromes, Recurrent fever.*

**Points to Remember**

- *Fever need not always be due to infections.*
- *Autoimmunity and auto-inflammation are both self directed inflammation processes.*
- *Periodic fevers must be thought of in a well child with episodic / recurrent fever.*
- *Steroids/ immunosuppressants should always be started after a proper diagnosis.*

**References**

1. McDermott MF, Aksentijevich I, Galon J, et al. Germline mutations in the extracellular domains of the 55 kDa TNF receptor, TNFR1, define a family of dominantly inherited autoinflammatory syndromes. *Cell* 1999; 97:133.
2. Manthiram K, Zhou Q, Aksentijevich I, Kastner DL. The monogenic autoinflammatory diseases define new pathways in human innate immunity and inflammation. *Nat Immunol* 2017; 18:832.
3. Long SS. Distinguishing among prolonged, recurrent, and periodic fever syndromes: Approach of a pediatric infectious diseases subspecialist. *Pediatr Clin North Am* 2005; 52:811-835.
4. McGonagle D, McDermott MF. A proposed classification of the immunological diseases. *PLoS Med* 2006; 3(8):e297. DOI: 10.1371/journal.pmed.0030297
5. Barron KS, Kastner DL. Periodic fever syndromes and other inherited auto-inflammatory diseases. In: Petty RE, Laxer RM, Lindsely CB, Wedderburn LR, editors. *Textbook of pediatric rheumatology*. 7<sup>th</sup> edn. Philadelphia, PA: Elsevier; 2016; pp609-626.
6. Stoffels M, Simon A. The Concept of Autoinflammatory Diseases. In: N.Rose, I. Mackay (eds): *The Autoimmune Diseases*, 5<sup>th</sup> edn. 2014; pp39-50.
7. de Jesus AA, Ferguson PJ, Goldbach-Mansky R. Classic Autoinflammatory Diseases. In: K.E. Sullivan and E.R. Stiehm (eds): *Stiehm's Immune Deficiencies* 2014; pp517-550.
8. Ahmadinejad Z, Mansouri S, Ziaee V, Aghighi Y, Moradinejad MH, Fereshteh-Mehregan F. Periodic Fever: A Review on Clinical, Management and Guideline for Iranian Patients - Part II. *Iran J Pediatr* 2014; 24(3): 229-240.
9. Ziaee V, Ahmadinejad Z, Mansori S, Alijani N. Periodic Fever: A Review on Clinical, Management and Guideline for Iranian Patients - *Iran J Pediatr* 2013; 23(1):S75.

---

\* Associate Professor of Pediatrics,  
Government Kallakurichi Medical College,  
Kallakurichi.  
email: karamathdr@gmail.com

<b>FEVER</b>
--------------

## FEVER IN THE IMMUNOCOMPROMISED CHILD

\*Indira Jayakumar  
 \*\*Chidhambharam L  
 \*\*\*Vasanth Kumar S

**Abstract:** *Fever in the immunocompromised child is a medical emergency, which if left untreated can lead to serious morbidity and mortality. High degree of suspicion, prompt evaluation and management are essential for a successful outcome in children with febrile neutropenia. Although majority of them may not have localizing symptoms or signs, a detailed history and frequent physical examination specifically of the perianal region, central line sites, ear and oral cavity are mandatory to identify source of infection. Blood cultures (adequate volume) are essential in identifying the bug especially when there is no identifiable focus. Risk stratification based on underlying disease, severity of neutropenia and presence of other comorbidities is essential in categorizing the severity and guiding decision on admission or outpatient therapy. Initial stabilization, prompt initiation of appropriate antibiotics (with anti-pseudomonas cover) and adequate supportive care are the cornerstones of treatment. Delay in administering the first dose of antibiotic significantly worsens the outcome. Education of the family as well as the primary pediatrician is important in this regard. Diagnosis and management of such fevers in the ER and the pediatric ward are reviewed along with institutional practices which are of special relevance to the primary pediatrician.*

**Keywords:** *Neutropenia, Immunocompromised, Malignancy, Hematopoietic stem cell transplant, Culture, Anti-pseudomonas cover.*

## Points to Remember

- *High index of suspicion, prompt diagnosis and management are essential in cases of fever in the immunocompromised which is a medical emergency and can present with only fever and subtle or atypical or no clinical signs.*
- *Risk stratification based on underlying disease, degree of neutropenia, expected fall in ANC and underlying medical comorbidities helps in deciding on the need for admission and appropriate antibiotic.*
- *Meticulous physical examination - especially the perianal region, ENT, central line site, to look for focus of infection.*
- *Adequate volume of blood cultures (both via central and peripheral lines) is crucial in identifying the organism, especially in cases where the focus of infection is not identifiable.*
- *Appropriate antibiotic having anti pseudomonas cover, should be administered within the first hour, as delay in giving the first dose of antibiotic increases the morbidity and mortality.*
- *Addition of Gram-positive coverage / empiric antifungal coverage is needed wherever essential*
- *CMV, adenovirus, varicella are common viral infections in post haplo-hematopoietic stem cell transplant setting.*
- *Good supportive care and strict aseptic precautions are important components to ensure successful outcomes.*

## References

1. St. Jude Children's Research Hospital Fever and neutropenia. Available at: <https://www.stjude.org/treatment/patient-resources/caregiver-resources/patient-family-education-sheets/prevent-control-infection/fever-and-neutropenia.html>. Accessed on Aug 15, 2021.
2. Dvorak CC, Auletta JJ. Fever and Infection in the immunocompromised patient. In: Rudolph's Pediatrics. 23<sup>rd</sup> edn. McGraw-Hill Education, USA 2018; pp3366-3367.

---

\* Senior Consultant

\*\* Junior Consultant

\*\*\* Consultant,  
 Pediatric ICU,  
 Department of Pediatric Critical Care,  
 Apollo Children's Hospital,  
 Chennai.  
 email: indirajayakumar@yahoo.com

3. Lustberg MB. Management of neutropenia in cancer patients. *Clin Adv Hematol Oncol* 2012; 10(12):825-826.
4. Freifeld AG, Bow EJ, Sepkowitz KA, Boeckh MJ, Ito JI, Mullen CA, et al. Clinical practice guideline for the use of antimicrobial agents in neutropenic patients with cancer: 2010 update by the infectious diseases society of America. *Clin Infect Dis* 2011; 15:52:e56-e93. doi: 10.1093/cid/cir073.
5. Lehrnbecher T, Robinson P, Fisher B, Alexander S, Ammann RA, Beauchemin M, et al. Guideline for the Management of Fever and Neutropenia in Children With Cancer and Hematopoietic Stem-Cell Transplantation Recipients: 2017 Update. *J Clin Oncol* 2017; 35(18):2082-2094. doi: 10.1200/JCO.2016.71.7017.
6. Badieli Z, Khalesi M, Alami MH, Kianifar HR, Banihashem A, Farhangi H, et al. Risk factors associated with life-threatening infections in children with febrile neutropenia: a data mining approach. *J Pediatr Hematol Oncol* 2011; 33(1):e9-e12. doi: 10.1097/MPH.0b013e3181f6921a.
7. Härtel C, Deuster M, Lehrnbecher T, Schultz C. Current approaches for risk stratification of infectious complications in pediatric oncology. *Pediatr Blood Cancer* 2007; 49:767-773.
8. Davis K, Wilson S. Febrile neutropenia in paediatric oncology. *Paediatr Child Health (Oxford)* 2020; 30(3): 93-97.
9. Phillips RS, Wade R, Lehrnbecher T, Stewart LA, Sutton AJ. Systematic review and meta-analysis of the value of initial biomarkers in predicting adverse outcome in febrile neutropenic episodes in children and young people with cancer. *BMC Med* 2012; 10:6.
10. Taplitz RA, Kennedy EB, Bow EJ, Crews J, Gleason C, Hawley DK, Langston AA, Nastoupil LJ, Rajotte M, Rolston K, Strasfeld L, Flowers CR. Outpatient Management of Fever and Neutropenia in Adults Treated for Malignancy: American Society of Clinical Oncology and Infectious Diseases Society of America Clinical Practice Guideline Update. *J Clin Oncol* 2018; 36(14):1443-1453. PMID: 29461916.
11. Fletcher M, Hodgkiss H, Zhang S, Browning R, Hadden C, Hoffman T, et al. Prompt administration of antibiotics is associated with improved outcomes in febrile neutropenia in children with cancer. *Pediatr Blood Cancer* 2013; 60:1299.
12. Oberai S, Suthar R, Bansal D, Marwaha RK. Febrile neutropenia: outline of management. *Indian J Pediatr* 2013; 80(2):138-143. doi: 10.1007/s12098-012-0901-y. Epub 2012 Nov 22.
13. Paul M, Dickstein Y, Schlesinger A, Glasberg SG, Weiser KS, Leibovici L. Beta-lactam versus beta-lactam-aminoglycoside combination therapy in cancer patients with neutropenia. *Cochrane Database Syst Rev* 2013; 2013(6):CD003038. doi: 10.1002/14651858.CD003038.pub2.
14. Mermel LA, Allon M, Bouza E, Craven DE, Flynn P, O'Grady NP, et al. Clinical practice guidelines for the diagnosis and management of intravascular catheter-related infection: 2009 Update by the Infectious Diseases Society of America. *Clin Infect Dis* 2009; 49(1):1-45. doi: 10.1086/599376.
15. Diorio C, Robinson PD, Ammann RA, Castagnola E, Erickson K, Esbenshade A, Fisher BT, Haeusler GM, Kuczynski S, Lehrnbecher T, Phillips R, Cabral S, Dupuis LL, Sung L. Guideline for the Management of Clostridium Difficile Infection in Children and Adolescents With Cancer and Pediatric Hematopoietic Stem-Cell Transplantation Recipients. *J Clin Oncol* 2018; 36(31):3162-3171.
16. Ahmed NM, Flynn PM. (2019) Fever in children with chemotherapy-induced neutropenia. Morven S Edwards, David G Poplack, Mary M Torchia. (Eds). Uptodate available from <https://www.uptodate.com/contents/fever-in-children-with-chemotherapy-induced-neutropenia>. Last updated: Fri Aug 12 00:00:00 GMT 2011.
17. Dvorak CC, Auletta JJ. Fever and Infection in the immunocompromised patient. *Rudolph's Pediatrics*. 23<sup>rd</sup> ed. McGraw-Hill Education; 2018; p3369.
18. Calitri C, Ruberto E, Castagnola E. Antibiotic prophylaxis in neutropenic children with acute leukemia: Do the presently available data really support this practice? *Eur J Haematol* 2018; 101(6):721-727. Epub 2018 Sep 24.
19. Schaison G, Eden OB, Henze G, Kamps WA, Locatelli F, Ninane J, Ortega J, Riikonen P, Wagner HP. Recommendations on the use of colony-stimulating factors in children: conclusions of a European panel. *Eur J Pediatr* 1998; 157(12):955-966.
20. Ozkaynak MF, Krailo M, Chen Z, Feusner J. Randomized comparison of antibiotics with and without granulocyte colony-stimulating factor in children with chemotherapy-induced febrile neutropenia: a report from the Children's Oncology Group. *Pediatr Blood Cancer* 2005; 45(3): 274-280.



**FEVER****SYMPTOMATIC MANAGEMENT OF FEVER****\*Yagnesh Popat****\*\*Swati Popat**

**Abstract:** *Fever is a normal response in many conditions, the most common of which is infection. Treatment of fever may be helpful if the child is uncomfortable and includes both pharmacological and non-pharmacological therapy. Recommended antipyretic is paracetamol according to the child's age and weight. Simultaneously the cause of the fever should be evaluated and treated accordingly.*

**Keywords:** *Fever, Antipyretics, Treatment, Children, Paracetamol.*

**Points to Remember**

- *Fever is just symptom and not a disease.*
- *Antipyretics are used to reduce the discomfort associated with fever.*
- *Paracetamol and ibuprofen are the antipyretics of the choice.*
- *Counsel parents to on the proper dose of the antipyretics and to avoid fever phobia.*

**References**

1. Piyush Gupta, Vikram Bhaskar, Ravishankara M, Bishwajit Mishra. IAP guidelines for parents: Fever general management, 2021. Available from <https://iapindia.org/pdf/IAP-Guidelines-for-Fever.pdf>.
2. Mark A Ward. Patient education: Fever in children (Beyond the Basics). Uptodate, version number Mar 23, 2020. <https://www.uptodate.com>.
3. Chiappini E, Bortone B, Galli L, de Martino M. Guidelines for the symptomatic management of fever in children: systematic review of the literature and quality appraisal with AGREE II. *BMJ open* 2017; 7(7):e015404.
4. Avner JR, Baker MD. Management of fever in infant and children. *Emerg Med Clin North Am* 2002; 20(1): 49-67.

---

\* Chairperson-Infectious Disease Chapter of IAP- 2021

\*\* Director,  
Om Baby care Hospital,  
Rajkot.  
email:ombabycare@hotmail.com

<b>FEVER</b>
--------------

## ANTIMICROBIAL CHOICE IN TROPICAL INFECTIONS

\***Abhay K. Shah**  
\*\***Aashay A. Shah**

**Abstract:** Febrile infections that are prevalent and unique to tropical and subtropical regions are collectively known as tropical infections. Enteric fever, leptospirosis, scrub typhus and malaria are the most commonly encountered tropical infections in our country. Epidemiology, disease pattern, morbidity and mortality varies from region to region. It is important to treat them early as delay in institution of specific therapy may lead to increased morbidity and mortality. Early diagnosis and prompt management by choosing appropriate antimicrobial agents is very crucial for favorable outcome. Blood culture is the gold standard for the diagnosis of enteric fever. Third generation cephalosporins are considered as the first choice for treatment. Azithromycin is reserved for relapses and should ideally be used for extensively drug resistant typhoid. Diagnosis of leptospirosis and scrub typhus mainly depend upon relevant epidemiological factors with typical clinical features. Drug of choice for leptospirosis is penicillin while doxycycline is the drug of choice for scrub typhus. For uncomplicated *P.vivax* chloroquine is the drug of choice. Artemisinin combination therapy is recommended for falciparum malaria. All severe and complicated malaria should be treated as falciparum malaria. Primaquine is needed for prevention of relapses in malaria.

**Keywords:** Tropical infections, Antimicrobial, Enteric fever, Scrub typhus, Leptospirosis, Malaria, Children.

## Points to Remember

- *Third generation cephalosporins are the drug of choice for multidrug resistant typhoid currently and azithromycin is to be reserved for XDR enteric fever.*
- *In mild cases of leptospirosis, doxycycline is to be used and in severe cases IV penicillin or ceftriaxone if allergic to penicillin.*
- *Doxycycline is the drug of choice irrespective of the age of the child in Indian tick typhus and scrub typhus and treatment should begin promptly without waiting for confirmatory laboratory results.*
- *For uncomplicated vivax malaria chloroquine is the drug of choice.*
- *Artemisinin combination therapy is the treatment of choice in all cases of falciparum malaria.*
- *All cases of severe and complicated malaria should be treated as falciparum malaria irrespective of the species of malarial parasite on smear examination.*
- *For rapid killing of malaria parasites, IV artesunate is a must at least for the first 24 hours, even if the child is able to take orally.*
- *Primaquine is recommended in appropriate dose and duration for prevention of relapses in malaria.*

## References

1. GBD 2017 Typhoid and Paratyphoid Collaborators. The global burden of typhoid and paratyphoid fevers: A systematic analysis for the Global Burden of Disease Study 2017. *Lancet Infect Dis* 2019; 19:369-381.
2. Ochiai RL, Acosta CJ, Danovaro-Holliday M, Baiqing D, Bhattacharya SK, Agtini MD, et al. A study of typhoid fever in five Asian countries: Disease burden and implications for controls. *Bull World Health Organ* 2008; 86:260-268.
3. Feasey NA, Gaskell K, Wong V, Msefula C, Selemani G, Kumwenda S, et al. Rapid emergence of multidrug resistant, H58-lineage *Salmonella typhi* in Blantyre, Malawi. *PLoS Negl Trop Dis* 2015; 9:e0003748.
4. Bavdekar A, Chaudhari M, Bhave S, Pandit A. Ciprofloxacin in typhoid fever. *Indian J Pediatr* 1991; 58:335-339.

---

\* Director and Infectious Diseases Consultant

\*\* Pediatric Gastroenterologist,  
Dr Abhay K Shah Children Hospital and  
Infectious Diseases Center,  
Ahmedabad, Gujarat.  
email:drabhaykshah@yahoo.com

5. Bharmoria A, Shukla A, Sharma K. Typhoid fever as a challenge for developing countries and elusive diagnostic approaches available for the enteric fever. *Int J Vaccine Res* 2017; 2: 1-16.
6. Shastri D, Singhal T. Antimicrobial therapy in enteric fever, IAP speciality series on Rational antimicrobial practice in Pediatrics, third edition, Jaypee publications New Delhi 2018 pp252-259.
7. Balaji V, Sharma A, Ranjan P, Kapil A. Revised ciprofloxacin breakpoints for Salmonella Typhi: its implications in India. *Indian J Med Microbiol* 2014; 32(2):161-163.
8. Frenck RW, Nakhla I, Sultan Y, et al. Azithromycin versus ceftriaxone for the treatment of uncomplicated typhoid fever in children. *Clin Infect Dis* 2000; 31(5):1134-1138. [PubMed]
9. Adler B, de la Peña Moctezuma A. Leptospira and leptospirosis. *Vet Microbiol* 2010;140: 287-296.
10. Leptospirosis Fact Sheet- WHO, South-East Asia. Available at: <https://apps.who.int/iris/handle/10665/205437>. Accessed on 15<sup>th</sup> August, 2021.
11. Shivakumar S. Indian Guidelines for diagnosis and management of human Leptospirosis-ICMR-[www.apiindia.org](http://www.apiindia.org)>chap07 antimicrobials
12. H Dale Davis, Kari A Simonsen. Leptospira. In: Kliegman RM, Stanton BF, Schor NF, St Geme III JW, Behrman RE. eds, Nelson Textbook of Pediatrics, 21<sup>st</sup> edn, Reed Elsevier India Private Ltd., New Delhi 2020; pp6438-6444.
13. Bithu R, Kanodia V, Maheshwari RK. Possibility of scrub typhus in FUO cases: An experience from Rajasthan. *Indian J Med Microbiol* 2014; 32:387-390.
14. Rathi N. Rickettsial Diseases in India - A long way ahead. *Pediatr Infect Dis* 2015; 7:61-63.
15. Rathi N, Rathi A. Rickettsial infections: Indian perspective. *Indian Pediatr* 2010; 47:157-164.
16. Watt G, Chouriyagune C, Ruangweerayud R, Watcharapichat P, Phulsuksombati D, Jongsakul K, et al. Scrub typhus infections poorly responsive to antibiotics in northern Thailand. *Lancet* 1996; 348:86-89.
17. Liu Q, Panpanich R. Antibiotics for treating scrub typhus. *Cochrane Database Syst Rev* 2002; 3:CD002150.
18. Elisabeth BN, Cristina S, Didier R, Philippe P. Treatment of Rickettsia spp. infections: a review. *Expert Rev Anti Infect Ther* 2012; 10:1425-1437.
19. Volovitz B, Shkap R, Amir J, Calderon S, Varsano I, Nussinovitch M. Absence of Tooth Staining With Doxycycline Treatment in Young Children. *Clin Pediatr (Phila)* 2007; 46:121-126.
20. WHO position paper, in 2015. Guidelines for the treatment of malaria. Third edition April World Health Organization, 2015.
21. World Health Organization. Guidelines for the treatment of malaria. Geneva World Health Organisation 2006. WHO/HTM/MAL/2006.1108.
22. National Vector Borne Disease Control Programme (NVBDCP), Ministry of Health & Family Welfare, Government of India. Designed and Developed by Center for Health Informatics Updated On: October 15, 2020.
23. Infectious diseases chapter, Indian Academy of pediatrics. Management of malaria in children - Update 2008. *Indian Pediatr* 2008; 45:731-735.

**GENERAL ARTICLE****DENGUE VACCINES UPDATE****\*Shyamala J**

**Abstract:** Dengue is a widely prevalent arbovirus infection with a large number of symptomatic infections occurring every year across the world. Severe dengue can contribute to significant morbidity and mortality and has no specific treatment. With the non-availability of an effective vaccine, the only known preventive measure was mosquito control which was difficult to achieve. The first vaccine that was licensed, Dengvaxia, brought many safety issues to the fore, on account of antibody dependent enhancement. Many newer vaccines are currently being developed, keeping these issues in mind - some in phase III and phase I trials, some in the pre-clinical stage. It is a matter of time before a safe and effective dengue vaccine becomes available.

**Keywords:** Dengue, Vaccine, Safety, Pre-clinical, Antibody dependent enhancement, Dengvaxia, TAK 003, Virus like particles.

**Points to Remember**

- *Dengvaxia was the first dengue vaccine to be licensed. Though the response was good in the first 2 years, it was mired in controversy after many deaths were noted among vaccinated children in the Philippines.*
- *No dengue vaccine is yet approved for widespread use.*
- *Several vaccines - live attenuated, inactivated, DNA vaccines, subunit vaccines are in advanced stages of trial and many in pre clinical trials.*
- *Burgeoning vaccine technology in recent times may help develop an effective vaccine against all serotypes of dengue with minimal side effects in the near future.*

**References**

1. Messina JP, Brady OJ, Golding N, Kraemer MUG, Wint GRW, Ray SE, et al. The current and future global distribution and population at risk of dengue. *Nat Microbiol* 2019; 4:1508-1515. <https://doi.org/10.1038/s41564-019-0476-8>.
2. World Health Organization. Dengue and severe Dengue. [Internet] June 2020. Accessed on 30/3/2021. Available from: <https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue#>
3. Gubler DJ. Epidemic dengue/dengue hemorrhagic fever as a public health, social and economic problem in the 21<sup>st</sup> century. *Trends Microbiol* 2002; 10(2):100-103.
4. Bollati M, Alvarez K, Assenberg R, Baronti C, Canard B, Cook S, et al. Structure and functionality in flavivirus NS-proteins: Perspectives for drug design. *Antiviral Res* 2010; 87(2):125-148. doi: 10.1016/j.antiviral.2009.11.009.
5. Halstead SB. Neutralization and antibody dependent enhancement of dengue viruses. *Adv Virus Res* 2003; 60:421-467. PMID: 14689700.
6. Qamar MTU, Maryam A, Muneer I, Xing F, Ashfaq UA, Khan FA, et al. Computational screening of medicinal plant phytochemicals to discover potent pan-serotype inhibitors against dengue virus. *Scientific Reports* (IF 3.998) Pub Date: 2019-02-05, DOI: 10.1038/s41598-018-38450-1.

---

\* Senior Consultant Pediatrician and Neonatologist,  
Apollo Children's Hospitals,  
Chennai.

email: shyamala.dr@gmail.com

7. Prompetchara E, Ketloy C, Thomas SJ, Ruxrungtham K. Dengue vaccine: Global development update. *Asian Pac J Allergy Immunol* 2020; 38:178-185. DOI: 10.12932/AP-100518-0309).
8. Torresi J, Ebert G, Pellegrini M. Vaccines licensed and in clinical trials for the prevention of dengue. *Hum Vaccin Immuno ther* 2017; 13(5):1059-1072. Published online 2017 Feb 14. doi: 10.1080/21645515.2016.1261770.
9. Thomas SJ, Yoon IK. A review of Dengvaxia: development to deployment. *Hum Vaccin Immuno ther* 2019; 15(10):2295-2314. <https://doi.org/10.1080/21645515.2019.1658503>(open access).
10. World Health Organization. Dengue vaccine: WHO position paper-September 2018. *Wkly Epidemiol Rec* 2018; 93(36):457-76.
11. WHO. Safety of dengue vaccine in the Philippines. Extract from report of GACVS meeting of 6-7 June 2018, *Weekly Epidemiological Record*, NO.29/30, 20 JULY 2018, 93th YEAR / 93,389-396 <http://www.who.int/wer>. [https://www.who.int/vaccine\\_safety/committee/topics/dengue/June\\_2018/en/published\\_in\\_the\\_WHO\\_Weekly\\_Epidemiological\\_Record\\_of\\_20\\_July\\_2018](https://www.who.int/vaccine_safety/committee/topics/dengue/June_2018/en/published_in_the_WHO_Weekly_Epidemiological_Record_of_20_July_2018).
12. Hadinegoro SR, Arredondo-García JL, Capeding MR, Deseda C, Chotpitayasunondh T, Dietze R, et al. Efficacy and Long-Term Safety of a Dengue Vaccine in Regions of Endemic Disease. *N Engl J Med* 2015; 373:1195-1206. DOI: 10.1056/NEJMoal506223
13. World Health Organization. Dengue vaccine: WHO position paper, July 2016-recommendations. *Vaccine* 2017; 35(9):1200-1. <https://doi.org/10.1016/j.vaccine.2016.10.070>. (<https://www.sciencedirect.com/science/article/pii/S0264410X16310192>)
14. Bharati K, Jain H. Dengue Vaccines: Current Status and Future Prospects. *J Clin Diagn Res* 2019; 13(6):AB01-AB03.
15. Huang CY, Kinney RM, Livengood JA, Bolling B, Arguello JJ, Luy BE, et al. Genetic and phenotypic characterization of Manufacturing seeds for a tetravalent dengue vaccine (DENVax). *PLoS Negl Trop Dis* 2013; 7(5):e2243.
16. Biswal S, Reynales H, Saez-Llorens X, Lopez P, Borja-Tabora C, Kosalaraksa P, et al (for the TIDES Study. Efficacy of a Tetravalent Dengue Vaccine in Healthy Children and Adolescents. *N Engl J Med* 2019; 381:2009-2019, DOI: 10.1056/NEJMoal1903869 (Nov 2019).
17. Biswal S, Borja-Tabora C, Vargas LM, Velásquez H, Alera MT, Sierra V, et al. Efficacy of a tetravalent dengue vaccine in healthy children aged 4-16 years: a randomised, placebo-controlled, phase 3 trial. *The Lancet* 2020 2; 395(10234):1423-1433.
18. Tricou V, Sáez-Llorens X, Yu D, Rivera L, Jimeno J, Villarreal AC, et al. Safety and immunogenicity of a tetravalent dengue vaccine in children aged 2-17 years: a randomised, placebo-controlled, phase 2 trial. *The Lancet* 2020; 395(10234):1434-1443.
19. Swaminathan S, Khanna N. Dengue vaccine development: Global and Indian scenarios. *Int J Infect Dis* 2019; 84:S80-S86. <https://doi.org/10.1016/j.ijid.2019.01.029>.
20. Gromowski GD, Henein S, Kannadka CB, Barvir DA, Thomas SJ, de Silva AM, et al. Delineating the serotype-specific neutralizing antibody response to a live attenuated tetravalent dengue vaccine. *Vaccine* 2018 25; 36(18):2403-2410. doi: 10.1016/j.vaccine.2018.03.055. Epub 2018 Mar 27.
21. Danko JR, Kochel T, Teneza-Mora N, Luke TC, Raviprakash K, Sun P, et al. Safety and Immunogenicity of a Tetravalent Dengue DNA Vaccine Administered with a Cationic Lipid-Based Adjuvant in a Phase 1 Clinical Trial. *Am J Trop Med Hyg* 2018; 98(3): 849-856. Published online 2018 Jan 22. doi: 10.4269/ajtmh.17-0416.
22. Manoff SB, George SL, Bett AJ, Yelmene ML, Dhanasekaran G, Eggemeyer L, et al. Preclinical and clinical development of a dengue recombinant subunit vaccine *Vaccine* 2015; 33:7126-7134.
23. Ramasamy V, Arora U, Shukla R, Poddar A, Shanmugam RK, White LJ, et al. A tetravalent virus-like particle vaccine designed to display domain III of dengue envelope proteins induces multi-serotype neutralizing antibodies in mice and macaques which confer protection against antibody dependent enhancement in AG129 mice. *PLoS Negl Trop Dis* 2018; 12(1): e0006191. Published online 2018 Jan 8. doi: 10.1371/journal.pntd.0006191. Accessed on 30/3/21.

<b>DRUG PROFILE</b>
---------------------

## MEDICATIONS TO MANAGE ACUTE EXACERBATION OF ASTHMA IN CHILDREN

\***Jeeson C. Unni**

\*\***Ranjit Baby Joseph**

**Abstract:** *Acute exacerbation of asthma is one of the common pediatric emergencies that require early identification and prompt management. There are number of reliever medications that are recommended for use during these episodes, of which short acting beta-2 agonists and systemic corticosteroids are the established first line agents. When these medications fail, second line agents should be administered without delay since risk of mortality is high once the child progresses to respiratory failure. Careful dosing of medications and monitoring for side effects are important for successful management.*

**Keywords:** *Acute asthma, Children, Beta agonists, Corticosteroids, Anticholinergics, Magnesium sulphate, Aminophylline*

### Points to Remember

- *Treatment of acute asthma exacerbations should target the bronchospasm as well as the underlying airway inflammation.*
- *Short acting beta-2 agonists and corticosteroids are the first line medications used.*
- *Whenever possible pressurized metered dose inhaler is the ideal device to deliver beta-2 agonists and in severe exacerbations when nebulizer is used, oxygen must be supplemented.*
- *Early initiation of systemic steroids reduces the need for hospitalization.*
- *Ipratropium, an anticholinergic bronchodilator can be considered along with short acting beta-2 agonists to improve their efficacy.*
- *Magnesium sulphate is more recognized as a second line agent in severe asthma exacerbation not responding to first line agents.*

### References

1. Consensus guidelines for diagnosis and management of asthma in children. Asthma By Consensus (ABC). Indian Academy of Pediatrics, Respiratory chapter; 2016: pp40-62.
2. Gibson PG, Powell H. Written action plans for asthma: an evidence-based review of the key components. *Thorax* 2004;59(2):94-99. doi: 10.1136/thorax.2003.011858. PMID: 14760143; PMCID: PMC1746945.
3. Sarkar M, Niranjana N, Banyal PK. Mechanisms of hypoxemia [published correction appears in *Lung India*. 2017;34(2):220]. *Lung India* 2017;34(1):47-60. doi:10.4103/0970-2113.197116.
4. Lipworth BJ. Revisiting interactions between hypoxaemia and  $\beta$ 2agonists in asthma *Thorax* 2001;56:506-507.
5. Unni JC, Joseph RB. Oxygen as a prescription. *Indian JPractPediatr* 2020; 22(1):86-91.
6. Kantor DB, Hirshberg EL, McDonald MC, Griffin J, Buccigrosso T, Stenquist N, et al. Fluid Balance Is Associated with Clinical Outcomes and Extravascular Lung Water in Children with Acute Asthma Exacerbation. *Am J Respir Crit Care Med* 197(9):1128-1135.

---

\* Editor-in-chief, IAP Drug Formulary, Senior Lead Consultant in Pediatrics,

\*\* Senior Specialist in Pediatrics, Asthma and allergy specialist, AsterMedcity, Kochi.

email.jeeson1955@gmail.com

7. Lin YZ, Hsieh KH. Metered dose inhaler and nebuliser in acute asthma. *Arch Dis Child* 1995;72(3):214-218. doi:10.1136/adc.72.3.214.
8. Global Initiative for Asthma. Global Strategy for Asthma Management and Prevention, 2021. Available from: [www.ginasthma.org](http://www.ginasthma.org). Accessed on 30 August 2021.
9. Lodha R, Gupta G, Baruah BP, Nagpal R, Kabra SK. Metered dose inhaler with spacer versus dry powder inhaler for delivery of salbutamol in acute exacerbations of asthma: a randomized controlled trial. *Indian Pediatr* 2004;41(1):15-20. PMID: 14767083.
10. Lavorini F. The challenge of delivering therapeutic aerosols to asthma patients. *ISRN Allergy* 2013;:102418. . doi:10.1155/2013/102418.
11. Chandra P, Paliwal L, Lodha R, Kabra SK. Comparison of terbutaline and salbutamol inhalation in children with mild or moderate acute exacerbation of asthma. *Indian J Pediatr* 2004; 71:961-963.
12. Jantikara A, Brashiera B, Maganjia M, Raghupathya A, Mahadikb P, Gokhaleb P, et al. Comparison of bronchodilator responses of levosalbutamol and salbutamol given via a pressurized metered dose inhaler: A randomized, double blind, single-dose, crossover study. *Respir Med* 2007; 101(4):845-849.
13. Craig S, Tuszynski M, Armstrong D. It is time to stop prescribing oral salbutamol. *AustFam physician* 2016; 45(4):245-247.
14. Kulalert P, Phinyo P, Patumanond J, Smathakane C, Chuenjit W, Nanthapisal S. Continuous versus intermittent short-acting  $\beta_2$ -agonists nebulization as first-line therapy in hospitalized children with severe asthma exacerbation: a propensity score matching analysis. *Asthma Res Pract* 2020; 6:6. <https://doi.org/10.1186/s40733-020-00059-5>.
15. Travers AH, Milan SJ, Jones AP, Camargo CA Jr, Rowe BH. Addition of intravenous beta(2)-agonists to inhaled beta(2)-agonists for acute asthma. *Cochrane Database Syst Rev* 2012;12:CD010179. doi: 10.1002/14651858.CD010179. PMID: 23235685.
16. Hsu E, Bajaj T. Beta 2 Agonists. [Updated 2021 May 28]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK542249/> Accessed on 30 August 2021.
17. Øymar K, Halvorsen T. Emergency presentation and management of acute severe asthma in children. *Scand J Trauma Resusc Emerg Med* 2009;17:40. doi:10.1186/1757-7241-17-40.
18. National Heart Lung and Blood Institute (NHLBI). Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma Full Report 2007. Published Online First:2007. Available from [https://www.nhlbi.nih.gov/sites/default/files/media/docs/asthgdln\\_1.pdf](https://www.nhlbi.nih.gov/sites/default/files/media/docs/asthgdln_1.pdf). Accessed on 30 August 2021.
19. Joseph RB. Allergic disorders. In: IAP Drug Formulary 2019. 5<sup>th</sup>Ed. EdsJeerson C Unni, Menon PSN, Nair MKC, Bansal CP. 2019, Publication of IAP. Pixel Studio, Cochin: pp236-238.
20. Rachelefsky G. Treating Exacerbations of Asthma in Children: The Role of Systemic Corticosteroids. *Pediatrics* 2003; 112(2):382-397; DOI: 10.1542/peds.112.2.382.
21. Aksoy MO, Mardini IA, Yang Y, Bin W, Zhou S, Kelsen SG. Glucocorticoid effects on the beta-adrenergic receptor-adenylyl cyclase system of human airway epithelium. *J Allergy Clin Immunol* 2002;109(3):491-497. doi: 10.1067/mai.2002.122154. PMID: 11897997.
22. Dembla G, Mundle RP, Salkar HR, Doifoide DV. Oral versus intravenous steroids in acute exacerbation of asthma-randomized controlled study. *J Assoc Physicians India* 2011;59:621-623. PMID: 22479740.
23. Manser R, Reid D, Abramson M. Corticosteroids for acute severe asthma in hospitalised patients. *Cochrane Database Syst Rev*. 2001;(1):CD001740. doi: 10.1002/14651858.CD001740. PMID: 11279726.
24. DoymazaS, Ahmed YE, Francois D, Pinto R, Gist R, Steinberg M, et al. Methylprednisolone, dexamethasone or hydrocortisone for acute severe pediatric asthma: does it matter? *J Asthma* 2020. <https://doi.org/10.1080/02770903.2020.1870130>.
25. Rowe BH, Vethanayagam D. The role of inhaled corticosteroids in the management of acute asthma. *Eur Respir J* 2007; 30(6):1035-1037; DOI: 10.1183/09031936.00119907.
26. Aaron SD. The use of ipratropium bromide for the management of acute asthma exacerbation in adults and children: a systematic review. *J Asthma* 2001;38(7):521-530. doi: 10.1081/jas-100107116. PMID: 11714074.
27. Bratteby LE, Foucard T, Lönnnerholm G. Combined treatment with ipratropium bromide and beta-2-adrenoceptor agonists in childhood asthma. *Eur J Respir Dis* 1986;68(4):239-247. PMID: 2874047.
28. Short PM, Williamson PA, Lipworth BJ. Effects of hydrocortisone on acute  $\beta$ -adrenoceptor blocker and histamine induced bronchoconstriction. *Br J ClinPharmacol* 2012;73(5):717-726. doi:10.1111/j.1365-2125.2011.04143.x.
29. DavalosBichara M, Goldman RD. Magnesium for treatment of asthma in children. *Can Fam Physician* 2009;55(9):887-889.
30. Powell C, Kolamunnage-Dona R, Lowe J, Boland A, Petrou S, Doull I, Hood K, Williamson P; MAGNETIC study group. Magnesium sulphate in acute severe asthma in children (MAGNETIC): a randomised, placebo-controlled trial. *Lancet Respir Med* 2013;1(4):301-8. doi: 10.1016/S2213-2600(13)70037-7. Epub 2013 Apr 22. Erratum in: *Lancet Respir Med*. 2013 Jun;1(4):285. PMID: 24429155.

31. Pleasants RA. Clinical Pharmacology of Oral Maintenance Therapies for Obstructive Lung Diseases. *Respir Care* 2018; 63(6):671-689. DOI: 10.4187/respcare.06068.
32. Hendaus MA, Jomha FA, Alhammadi AH. Is ketamine a lifesaving agent in childhood acute severe asthma? *TherClin Risk Manag* 2016;12:273-279. Published 2016 Feb 22. doi:10.2147/TCRM.S100389.
33. Golding CL, Miller JL, Gessouroun MR, Johnson PN. Ketamine Continuous Infusions in Critically Ill Infants and Children. *Ann Pharmacother* 2016;50(3):234-241. doi: 10.1177/1060028015626932. Epub 2016 Jan 18. PMID: 26783355.
34. Gupta VK, Cheifetz IM. Heliox administration in the pediatric intensive care unit: an evidence-based review. *Pediatr Crit Care Med* 2005;6(2):204-211. doi: 10.1097/01.PCC.0000154946.62733.94. PMID: 15730610.



## ADOLESCENCE

### BODY IMAGE DURING ADOLESCENCE

**\*Amitha Rao Aroor**  
**\*\*Preeti M. Galagali**

**Abstract:** *Body image plays an important role in identity development during adolescence. It is influenced by pubertal changes and various psychological and socio-cultural factors. Negative body image during adolescence can be associated with risky behaviours and poor health outcomes. Pediatricians should screen for body image concerns and promote development of healthy body image during annual health visits. Referral to mental health specialist must be made when indicated.*

**Keywords:** *Body image, Adolescence, Screening.*

### Points to Remember

- *Body image is dynamic perception of one's body and is determined strongly by self-evaluation.*
- *Development of body image follows biopsychosocial model and body image disturbance can be associated with negative health outcomes.*
- *Adolescents should be screened for body image concerns during well visits with detailed history, HEEADSSS assessment and examination. SCOFF and EAT 26 are the common questionnaires used for screening. If indicated appropriate timely referral to a mental health specialist / Psychiatrist should be made.*
- *Promotion of healthy body image should be included as a part of the anticipatory guidance to all adolescents. It includes explaining the normal pubertal changes, encouraging to follow healthy life style, media education and mastering the life skills.*

### References

1. Hartman-Munick SM, Gordon AR, Guss C. Adolescent body image: influencing factors and the clinician's role. *Curr Opin Pediatr* 2020; 32(4):455-460.
2. Tort-Nasarre G, Pollina Pocallet M, Artigues-Barberà E. The meaning and factors that influence the concept of body image: Systematic review and meta-ethnography from the Perspectives of Adolescents. *Int J Environ Res Public Health* 2021; 18:1140.
3. Yadav VP. Understanding the body image of adolescents: A psychological perspective. *Int J Appl Res* 2017; 3(6):588-594.
4. Voelker DK, Reel JJ, Greenleaf C. Weight status and body image perceptions in adolescents: current perspectives. *Adolesc Health Med Ther* 2015; 6:149-158.
5. Kartha GK, Navya CJ, Aswathy M, Joshy V. Body image perception among adolescent students in a private School in Thrissur, Kerala. *Public Health Review: Int.J Public Health Res* 2019; 6(2):68-75.
6. Adithyan AG, Shroff H, Sivakami M, Jacob J. Body image dissatisfaction in adolescents from rural Tamil Nadu, India. *Indian J Soc. Work* 2018; 79:309-326.
7. Soohinda G, Mishra D, Sampath H, Dutta S. Body dissatisfaction and its relation to Big Five personality

---

\* Professor in Pediatrics and Adolescent Health Specialist, A.J Institute of Medical Sciences, Mangalore, Karnataka.  
email: amithaaroor@gmail.com

\*\* Director and Adolescent Health Specialist, Bengaluru Adolescent Care and Counseling Centre, Bengaluru, Karnataka.

- factors and self-esteem in young adult college women in India. *Indian J Psychiatry* 2019; 61(4):400-404.
8. Ganesan S, Ravishankar SL, Ramalingam S. Are body image issues affecting our adolescents? A cross-sectional study among college going adolescent girls. *Indian J Community Med* 2018; 43(Suppl 1): S42-S46.
  9. Upadhyah AA, Misra R, Parchwani DN, Maheria PB. Prevalence and risk factors for eating disorders in Indian adolescent females. *Natl J Physiol Pharm Pharmacol* 2014; 4(2):153-157.
  10. Nivedita N, Sreenivasa G, Rao TSS, Malini SS. Eating disorders: Prevalence in the student population of Mysore, South India. *Indian J Psychiatry* 2018; 60(4):433-437.
  11. Gaddad P, Pemde HK, Basu S, Dhankar M, Rajendran S. Relationship of physical activity with body image, self-esteem sedentary lifestyle, body mass index and eating attitude in adolescents: A cross-sectional observational study. *J Family Med Prim Care* 2018; 7(4):775-779.
  12. Dixit S, Agarwal GG, Singh JV, Kant S, Singh N. A study on consciousness of adolescent girls about their body image. *Indian J Community Med* 2011; 36(3):197-202.
  13. Shroff H, Thompson JK. Body image and eating disturbance in India: media and interpersonal influences. *Int J Eat Disord* 2004; 35(2):198-203.
  14. Klein DA, Goldenring JM, Adelman WP. HEEADSSS 3.0: The psychosocial interview for adolescents updated for a new century fueled by media. *Contemp Pediatr* 2014; 31(1):16-28.
  15. Galagali P, Luiz N. Poor school performance in adolescence, *Ind J Pract Pediatr* 2015; 17(2):116-121.
  16. Morgan JF, Reid F, Lacey JH. The SCOFF questionnaire: assessment of a new screening tool for eating disorders. *Br. Med. J.* 1999; 319(7223): 1467-1468.
  17. Garner DM, Olmsted MP, Bohr Y, Garfinkel PE. The eating attitudes test: psychometric features and clinical correlates. *Psychol Med* 1982; 12(4):871-878.
  18. Garner DM, Garfinkel PE. The eating attitudes test: An index of the symptoms of anorexia nervosa. *Psychol Med* 1979; 9(2):273-279.
  19. Shashank KJ, Gowda P, Chethan TK. A cross sectional study to assess the eating disorder among female medical students in a rural medical college of Karnataka state. *Ntl J Community Med* 2016; 7(6):524-527.
  20. American Psychiatric Association: Diagnostic and statistical manual of Mental disorders, 5<sup>th</sup> edn. Arlington VA, American Psychiatric Association, 2013.
  21. Mountford VA, Koskina A. Body Image. In: Wade T. (eds) *Encyclopedia of Feeding and Eating Disorders*. Springer, Singapore. 2015; pp76-80.
  22. Phillips KA, Rogers J. Cognitive-behavioral therapy for youth with body dysmorphic disorder: current status and future directions. *Child Adolesc Psychiatr Clin N Am* 2011; 20(2):287-304.
  23. Greco LA, Barnett ER, Blomquist KK, Gevers A. Acceptance, body image, and health in adolescence. In L. A. Greco & S. C. Hayes (Eds.), *Acceptance and mindfulness treatments for children and adolescents: A practitioner's guide*. New Harbinger Publications 2008; Oakland, CA. pp187-214.
  24. Riva G, Gaudio S, Serino S, Dakanalis A, García MF, Gutiérrez-Maldonado José. Virtual reality for the treatment of body image disturbances in eating and weight disorders: In. *Body image eating and weight, A guide to assessment, treatment, and prevention*. Eds, Cuzzolaro M, Fassino F, Springer Nature Switzerland AG, Cham, Switzerland, 2018: pp333-352. DOI:10.1007/978-3-319-90817-5\_25.

**CASE REPORT****LEFT VENTRICULAR NON-COMPACTION CARDIOMYOPATHY ASSOCIATED WITH CONGENITAL CYTOMEGALOVIRUS INFECTION**

**\*Ram Babu Sharma**  
**\*\* Shashank Sharma**  
**\*\*\* Neelam Singh**

**Abstract:** *Left ventricular-noncompaction cardiomyopathy, is a rare and new association with congenital cytomegalovirus infection. It is characterized by distinctive trabeculated or spongy appearing left ventricle associated with left ventricular hypertrophy and systolic/diastolic dysfunction. A 3 months old infant with bilateral cataract, severe respiratory distress and congestive heart failure is described herewith. Serum ELISA of cytomegalovirus (CMV) IgM and IgG were positive. Urine for CMV PCR was positive. Echocardiography revealed grossly hypertrophied noncompacted left ventricle with multiple trabeculations and global left ventricular hypokinesia with moderate tricuspid regurgitation and pulmonary hypertension.*

**Keywords:** *Left ventricular-noncompaction cardiomyopathy, Congenital CMV, Bilateral cataract.*

**References**

1. Bennett CE, Freudenberger R. The Current Approach to Diagnosis and Management of Left Ventricular Noncompaction Cardiomyopathy: Review of the Literature. *Cardiol Res Pract* 2016; 2016:5172308. doi: 10.1155/2016/5172308.
2. Dong X, Fan P, Tian T, Yang Y, Xiao Y, Yang K, et al. Recent advancements in the molecular genetics of left ventricular noncompaction cardiomyopathy. *Clin Chim Acta* 2017; 465:40-44.
3. Chin TK, Perloff JK, Williams RG, Jue K, Mohrmann R. Isolated noncompaction of left ventricular myocardium. A study of eight cases. *Circulation* 1990; 82(2):507-513.
4. Hershberger RE, Lindenfeld J, Mestroni L, Seidman CE, Taylor MRG, Towbin JA, Heart Failure Society of America. Genetic evaluation of cardiomyopathy - a Heart Failure Society of America practice guideline. *J Card Fail* 2009; 15(2):83-97.
5. Petersen SE, Selvanayagam JB, Wiesmann F, Robson MD, Francis JM, Anderson RH, et al. Left ventricular non-compaction: insights from cardiovascular magnetic resonance imaging. *J Am Coll Cardiol* 2005; 46(1):101-105.
6. Alhabshan F, Smallhorn JF, Golding F, Musewe N, Freedom RM, Yoo SJ. Extent of myocardial non-compaction: comparison between MRI and echocardiographic evaluation. *Pediatr Radiol* 2005; 35(11):1147-1151.
7. Demir F, Yilmazer MM, Dalli S, Yolbas I, Uluca U, Bilici M, et al. Hypertrophic Cardiomyopathy as a Clinical Component of Congenital Cytomegalovirus Infection. *West Indian Med J* 2015; 65(2):409-411.
8. Zhou J, Liao XH, Wu C, Li J, Xiao R, Cheng C, et al. The synergistic effects of cytomegalovirus IE2 and myocardin on cardiomyocyte hypertrophy. *FEBS Lett* 2011; 585(7):1082-1088. doi:10.1016/j.febslet.2011.03.007.

---

\* Professor

\*\* Intern

\*\*\* Assistant Professor,  
Pediatric Cardiology Division,  
SPMCHI, SMS Medical College,  
Jaipur.  
email: drneelamsingh1@gmail.com

<b>CASE REPORT</b>
--------------------

## PAN OPHTHALMITIS - A RARE, YET PREVENTABLE COMPLICATION OF DENGUE INFECTION

\***Mayuri Yeole**

\*\***Himaal Dev**

\*\*\***Raghu Nagaraju**

***Abstract:** Dengue fever, one of the most common mosquito borne flavivirus diseases affecting humans, spreads by *Aedes aegypti* mosquito. A small proportion have life-threatening forms such as dengue hemorrhagic fever and dengue shock syndrome. One of the complications in dengue that is being observed more frequently in recent times is the ophthalmic manifestation. Ophthalmic manifestations can involve both the anterior and posterior segment. However, only a few isolated case reports have been published so far.*

**Keywords:** *Dengue, Panophthalmitis.*

### References

1. Halstead SB. Global epidemiology of dengue hemorrhagic fever. The Southeast Asian J Trop Med Public Health 1990; 21(4):636-641.
2. Kapoor HK, Bhai S, John M, Xavier J. Ocular manifestations of dengue fever in an East Indian epidemic. Can J Ophthalmol 2006; 41(6):741-746.
3. Su DH, Bacsal K, Chee SP, Flores JV, Lim WK, Cheng BC, et al. Dengue Maculopathy Study Group. Prevalence of dengue maculopathy in patients hospitalized for dengue fever. Ophthalmology 2007; 114 (9):1743-1747.
4. Chan DP, Teoh SC, Tan CS, Nah GK, Rajgopalan R, Prabhakar Gupta MK, et al. The Eye Institute Dengue-Related Ophthalmic Complications Workgroup: Ophthalmic complications of dengue. Emerg Infect Dis 2006; 12:285-289.
5. Lim WK, Mathur R, Koh A, Yeoh R, Chee SP. Ocular manifestations of dengue fever. Ophthalmology 2004; 111: 2057-2064.
6. Sriram S, Kavalakatt JA, Pereira AD, Murty S. Bilateral panophthalmitis in dengue fever. Ann Trop Med Public Health 2015; 8:217-218.
7. Okada AA, Johnson RP, Liles WC, D2Amico DJ, Baker AS. Endogenous bacterial endophthalmitis. Report of a 10-year retrospective study. Ophthalmology 1994; 101:832-838.
8. Teoh SC, Chan DP, Nah GK, Rajagopalan R, Laude A, Ang BS, et al. A Re-look at Ocular Complications in Dengue Fever and DHF. Dengue Bull 2006:30.
9. Nagaraj KB, Jayadev C, Yajmaan S, Prakash S. An unusual ocular emergency in severe dengue. Middle East Afr J Ophthalmol 2014; 21:347-349.

---

\* Consultant Pediatrician

\*\* Consultant Intensivist

\*\*\* Consultant Ophthalmologist,  
Apollo Hospitals Sheshadripuram,  
Bangalore, Karnataka.  
email : dr.yeolemayuri@gmail.com

**CASE VIGNETTE****CANTU SYNDROME**

**\*Senthil Kumar P**  
**\*\*Ahila Ayyavoo**

**References**

1. Grange DK, Nichols CG, Singh GK. Cantú Syndrome and Related Disorders. In: Adam MP, Ardinger HH, Pagon RA, Wallace SE, Bean LJ, Stephens K, Mirzaa G, Amemiya A, editors. GeneReviews® [Internet]. Seattle (WA): University of Washington, Seattle; 1993. Available from:<http://www.ncbi.nlm.nih.gov/books/NBK246980/>. Accessed on 12 July 2020.
2. Grange DK, Roessler HI, McClenaghan C, Duran K, Shields K, Remedi MS, et al. Cantú syndrome: Findings from 74 patients in the International Cantú Syndrome Registry. *Am J Med Genet Part C Semin Med Genet* 2019; 181:658-681.
3. Shawky RM, Gamal R. Cantu syndrome in an Egyptian child. *Egypt J Med Hum Genet* 2018; 19:429-432.
4. Grange DK, Lorch SM, Cole PL, Singh GK. Cantu syndrome in a woman and her two daughters: Further confirmation of autosomal dominant inheritance and review of the cardiac manifestations. *Am J Med Genet Part A* 2006; 140(15):1673-1680.

---

\* Consultant Pediatrician

\*\* Visiting Consultant in Pediatric Endocrinology,  
Masonic Medical Centre for Children,  
Coimbatore.

email: [drvpsk1978@gmail.com](mailto:drvpsk1978@gmail.com)