

Indian Academy of Pediatrics (IAP)



GUIDELINES FOR PARENTS

Preventing Mosquito-borne Illnesses



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10 FAQs on PREVENTING MOSQUITO-BORNE ILLNESSES

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Preventing Mosquito-borne Illnesses

Q1

What are mosquito-borne diseases?

These are the diseases caused by mosquitoes. During the blood meal, the mosquitoes ingest disease producing microorganisms (viruses and parasites) from infected host (human or animal) which multiply in mosquitoes and later transmitted into other humans during next blood meal.

Common mosquito-borne diseases are malaria, dengue, chikungunya, Japanese encephalitis, and filariasis.

Each disease is specifically transmitted by specific mosquitoes. For example:

- *Anopheles* transmits (**Fig. 1**): Malaria
- *Aedes* transmits (**Fig. 2**): Chikungunya, dengue, and zika
- *Culex* transmits: Japanese encephalitis and filariasis



Fig. 1: *Anopheles* mosquito.
(Source: PHIL, CDC)



Fig. 2: *Aedes aegypti* mosquito.
(Source: PHIL, CDC)

Q2

How mosquito transmits these diseases to us?

During the blood meal, the mosquitoes ingest disease producing microorganisms (viruses and parasites) from infected host (human or animal) which multiply in mosquitoes and later transmitted into other humans during next blood meal.

Some important features of these mosquitoes to be kept in mind:

- *Malaria*: The female “*Anopheles* mosquito” is the only mosquito that transmits malaria. She primarily bites between 9 PM and 5 AM. Some feed indoor while others feed outdoor. After feeding, some prefer to rest indoors (endophilic) while others rest outdoors (exophilic).
- *Dengue*: It is transmitted by bites of infected *Aedes* species mosquito. They bite during the *daytime*. The peak biting periods are early in the morning and in the evening before dusk.

Q3

When do I suspect that my child is suffering from malaria, dengue, or chikungunya?

These three diseases are transmitted by mosquito bite. Hence, they are usually seasonal occurring during rainy season which helps both mosquito survival and breeding. They, at least in the initial stage, may resemble common viral fever such as flu with fever, headache, muscle pain, and occasional vomiting.

- *Chikungunya* along with the above features starts with severe pain in joints often with back pain. Small joints of the extremities are more affected than the large joints.
- *Dengue* may present with severe pain in or behind the eyes with more of muscle and bone pain rather than joint pain.
- *Malaria* may present with paroxysms of severe chills followed by shivering ushering high fever.

Unlike malaria, the other two may present with skin rash with or without minute bleeding spots in the skin and oral cavity. Dengue may have red flushing of the face, trunk, and extremities.

Q4

What are the danger signs of these diseases which need hospitalization?

Unlike all other fever where danger is during fever, in dengue danger period is while fever is settling down. Children having dengue with warning signs such as vomiting, stomach pain, restlessness or lethargy, and bleeding from any site need admission for close observation.

In malaria, a child who is unable to sit, stand, or drink needs admission. Those with impaired consciousness, fits, scanty urine, breathing difficulty or jaundice should be admitted.

Q5

Can malaria, dengue, and Japanese encephalitis be prevented? Is there any vaccine?

Unlike malaria both dengue and Japanese encephalitis do not have any drug to cure infection. Malaria must be treated as early as possible to prevent further spread. Vaccine is available for the prevention of Japanese encephalitis. It can be taken after discussion with the pediatrician, especially by the people living in endemic area. As of now, there is no vaccine available in India for other diseases mentioned. Vaccine against dengue is in the final phase of trial, if found safe and effective it might be available in near future. Prevention of all these diseases relies on avoiding mosquito bite and eliminating mosquito-breeding sites.

Q6

How can I protect my child from mosquito bites at home and in schools?

Every space that has mosquitoes is potential source for mosquito bites, be it home or school.

Prevention of mosquito bites involves two strategies, i.e., personal protection and mosquito control.

At Home

Personal Protection

- Put screens to all the doors and windows and regularly repair any holes in the screens.
- Use mosquito nets to beds, cribs. It should be compact, white rectangular with 156 holes per square inch, and long enough to tuck under the bed. Insecticide treated bed nets are superior.
- Dress your child in light color clothing that covers arms and legs completely.
- Apply mosquito repellents (Avoid child's hands, eyes, mouth, and cuts).

Mosquito Control

Control of breeding grounds of mosquitoes:

- *Never allow any stagnant water in and around your home.* This is the most important thing that has to be done to make house inhospitable for mosquitoes by preventing laying of eggs by mosquitoes.
 - Throw away tires, tins, cans, and other things which can store rain water and harbor mosquito eggs.
 - Keep changing water from cooler, flower pots, and birdbaths.
 - Clean the clogged rain gutters and drains which can be source for stagnation of water.
 - Tightly cover the water storage body or use mesh.
 - Water tanks not used for drinking can be treated with larvicidal agents.
 - If septic tank is around the home, repair all the cracks or gaps. Cover the vent with mesh.
 - *Litter patrol:* Once in a week stroll around your home and take every possible opportunity to throw away bottles, caps, cans, tires, and literally anything that can hold even the small amount of water. Ideally, this should be done more frequently.

- *Keeping the garden tidy:* Trim the lawn as short as possible. Even though it is not the breeding ground but it serves as possible hiding place for adult mosquitoes which are future breeders. Plant mosquito repelling plants and herbs such as peppermint, lavender, rosemary, citronella, and lemon eucalyptus. Change the water from pans for plant pots as well as bird baths. Larvicidal fish (guppies, koi, and minnows) are good option for the garden ponds.

Elimination of mosquitoes

- Use mosquito sprays in areas which are potential space where mosquito rests such as under the furniture, behind the curtains as well as outdoor areas such as garage, flower beds, and thick plantation around the home.
- Natural mosquito repellents such as lemon eucalyptus can also be sprayed.

At Schools

Personal protection

- Advise schools to have uniforms that cover whole arm and legs.
- Apply mosquito repellents while going to school.
- Use socks and shoes to cover the legs fully.

Mosquito control

- Put screens to windows and doors of the schools as well.
- Avoid creating damp and dark areas where mosquito rests.
- Regularly do fogging of the classrooms, playgrounds, and area around the school during holidays which is best if done just around dusk or dawn when mosquito activity is highest.
- Remove all the trash that may hold water such as tins, containers, and tires which are potential breeding grounds for mosquitoes.
- Do not construct artificial ponds or water bodies and if present use larvicidal agents or larvicidal fish in that.

Q7

Doctor, there are lots of mosquitos everywhere in our society. What can we do about that?

Reduction of the mosquitoes and its nuisance can be achieved by two ways. Prevention from mosquito bites by various means is easiest and effective way. Second thing is to eliminate the mosquitoes which can be achieved through removing breeding grounds as well as killing adult mosquitoes. Fogging is effective way to control the population of adult mosquitoes over large areas even though it is considered slightly harmful. It should be done at regular intervals during times of high mosquito activity such as dusk and dawn. Malathion is used generally for outdoors. The cloud of insecticide droplet remains suspended for considerable time. Legislative measures also need to be taken by societies for regulating the storage of the water by communities, disposal of wastes, and construction sites for reducing the mosquitogenic conditions. Health education of the communities regarding prevention of mosquito breeding sites as well as mosquito bites should be carried out at to sensitize the community.

Q8

How safe are mosquito repellent creams and coils for children?

Carbon dioxide (CO₂), lactic acid, and excretory products in sweat attracts mosquitoes and this is blocked by the repellent creams. Mosquito repellents are the essential components for mosquito bite prevention in outdoors. All available repellent agents can be grouped as chemical agents and natural agents. The chemical agents are DEET (diethyltoluamide), picaridin, permethrin, and PMD (P-menthan 3, 8-diol, a synthetic form of citronella). The natural mosquito repellents are neem oil, citronella (lemongrass) and eucalyptus. There are differences in opinion regarding the optimum concentration to achieve effective repellent action as well as safety; it is always wiser to follow the label instructions.

Q9

How to choose a mosquito repellent for babies?

It is very important to make a decision while choosing a mosquito repellent for your child because it has to be effective and safe.

What is safe to use?

Mosquito repellents come in various forms such as sprays, liquids, sticks, creams, and aerosols. A few are made from chemicals and some from natural ingredients. Let us know which ones are safe to use (**Tables 1 and 2**):

TABLE 1: Various forms of mosquito repellents.

Name of repellent	Ideal concentrations	Duration of action	Special precautions
DEET	10–30%	Around 2–5 hours	Be careful while using in child below 2 months
Picaridin	5–20%	A 20% concentration works for 8–14 hours, while a 10% concentration works for 5–12 hours	Be careful while using in child below 2 months
Essential oils	Might help to keep your baby away from a few bites, but ineffective to keep mosquito-borne diseases away	Reapplying is necessary	Be careful while applying the oils because allergic reactions are possible if it is not diluted or applied rightly
Oil of lemon eucalyptus	This has the action as 10% DEET.	Protects up to 6 hours	Safe for children above 3 years

TABLE 2: Safety profile of various mosquitoes repellent

Repellent	Pros	Cons	Safety verdict	Special precautions
Mosquito nets	<ul style="list-style-type: none"> Effective both indoors and outdoors No negative health effects 	<ul style="list-style-type: none"> Need to be maintained and checked for holes regularly Useless if mosquitoes get trapped inside 	Safest	<ul style="list-style-type: none"> Tie properly and make sure that the top net does not collapse over baby
Mosquito rackets	<ul style="list-style-type: none"> Work both indoors and outdoors and come with zero health effects 	<ul style="list-style-type: none"> You need to use these physically, every time, to kill mosquitoes that are hovering around Need regular recharging 	Very Safe	<ul style="list-style-type: none"> Make sure toddlers and children are not playing with the racket
Creams, lotions, roll-on sticks, wipes, and body sprays	<ul style="list-style-type: none"> Mobile protection for your child Effective both indoors and outdoors 	<ul style="list-style-type: none"> Need of reapplication Irritation and allergic reactions to skin 	Relatively safe	<ul style="list-style-type: none"> See Table 1

Contd...

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Repellent	Pros	Cons	Safety verdict	Special precautions
Liquid vaporizers and mats coils	Cover only limited space	<ul style="list-style-type: none"> Contain allethrin, parathrin, and permethrin which are less toxic. There is no conclusive evidence of negative health hazards Cannot be used during power cuts 	Mostly safe when used with caution	<ul style="list-style-type: none"> Take baby inside only when the vaporizer is switched off It should be kept away from the babies bed and near the entry point of mosquitoes Keep out of reach of children Can cause serious issues, if swallowed
Mosquito coils	Highly effective in indoors and in limited area	<ul style="list-style-type: none"> Smoke released can cause respiratory problems and can worsen respiratory co-morbidity, if present Smoke can be hazardous to health Risk of fire hazard 	Not safe	<ul style="list-style-type: none"> Do not use in closed rooms Burn near the doors and windows, i.e., entry points of mosquitoes Burn away from the inflammable materials
Pest control Fumes and sprays	Highly effective in a limited area	<ul style="list-style-type: none"> Not good for the babies Can cause allergic reactions and breathing problems 	Not safe	<ul style="list-style-type: none"> Keep your baby away from home when spraying the surroundings and inside of your home with pest control fumes Once treatment is over, open windows and doors to ensure the fumes go out of your home. Bring the baby inside only when the smell is gone completely

Do's and Don'ts of Mosquito Repellent (Tips for Using Repellents Rightly)

Do's

- Follow label instructions before use.
- Well-ventilated room is prerequisite before using mosquito repellent sprays.
- It is duty of an adult to apply repellent to children and should never be kept at their disposal.
- Repellents are to be used over the exposed areas.
- Always test the repellent over the small area of the skin to check for any allergic reaction.
- Person smearing repellent must wash hands after the application.

Don'ts

- Do not use DEET/Picaridin containing products before the age of 3 months. Mosquito nets are the best.
- Do not apply over the face, near the mouth, eyes, or broken skin.
- Do not use over the hands of children as there is risk of ingestion due to habit of putting hand in mouth.
- Do not mix different products used for various other purposes as this may diminish the efficacy of the repellents.
- Do not continue to use in case of any allergic reaction or irritation.
- Do not spray repellents near food or poorly ventilated rooms.

Q10

Doctor, we are going to visit a place where dengue and malaria are epidemic. What precautions should I take?

Things to Do Before Travel

- Pack an effective mosquito repellent spray and cream.
- Pack suitable mosquito net or be assure that is available.
- Start antimalarial chemoprophylaxis (This will vary depending upon the duration, risk factors, and place of visit) as recommended by your pediatrician.

During Travel

- All efforts should be made to avoid mosquito bite.
- Stay in a place with effective air conditioning with window screens. If this is not possible then make sure windows and doors are properly closed.
- Sleep under mosquito nets, preferably insecticide treated nets if sleeping outdoors or air-conditioned/ screened rooms are not available.
- Use effective repellent in the environment and also on your skin. Remember to reapply it frequently. If sunscreen has to be used, sunscreen should be applied first and insect repellent second.
- Avoid wearing shorts, skirts, and sleeveless shirts rather use light-colored trousers and long sleeves shirts especially during the time of mosquito bites.
- Remember, for malaria endemic area, avoid mosquito bites primarily between dusk and dawn as *Anopheles* has nocturnal feeding habit. Whereas, for dengue avoid daytime mosquito bite.

After Trip

Even if you are well, travelers returning from these areas should take steps to prevent mosquito bites, so that they do not spread the disease.