CHAPTER 8

PARASITIC INFECTIONS

INTESTINAL PROTOZOAL INFECTIONS

Amoebiasis and giardiasis are the commonest intestinal protozoal infections. Patients of amoebiasis and giardiasis commonly present as asymptomatic carriers.

Amoebiasis (intestinal)

Infection is caused by intestinal protozoa—*Entamoeba histolytica*. Infection usually spreads by infective cysts in stool which contaminate food and drinking water.

SALIENT FEATURES

- Lower abdominal pain, mild diarrhoea develop gradually and may lead to full blown dysentery.
- 0-12 stools per day with blood and mucous and little faecal matter.
- Caecal involvement may mimic acute appendicitis.
- Chronic form, i.e. amoebic colitis, can be confused with inflammatory bowel disease. Other form of chronicity may present as amoeboma.
- Untreated or incompletely treated intestinal infection may result in amoebic liver abscess and involvement of other extraintestinal site.
- Diagnosis made by demonstration of cysts and/or trophozoites of *Entamoeba histolytica* in the stool.

Treatment (asymptomatic cyst passers)

Tab. Diloxanide furoate 500 mg 8 hourly for 10 days.

Treatment (acute amoebic dysentery and chronic infections)

1. Tab. Metronidazole 400-800 mg 8 hourly orally with food for 10 days.
   In children, 15 mg/kg divided in three doses for 7 days.
   Or
   Tab. Tinidazole (300 mg, 500 mg and 1 g) 2 g orally as single dose with food. In children, 50 mg/kg as a single dose.

2. Tab. Diloxanide furoate 500 mg 8 hourly for 10 days. In children, 20 mg/kg/day in three divided doses for 10 days.

Fulminant amoebic colitis may occur and present with more severe diarrhoea, abdominal pain and fever leading to intestinal perforation. For treatment of amoebic liver abscess (see Chapter 6 on Gastrointestinal Diseases).

Giardiasis

Intestinal disease caused by protozoal parasite—*Giardia lamblia*. The disease spreads by direct faeco-oral transmission.

SALIENT FEATURES

- Acute giardiasis—Although diarrhoea is common, upper intestinal manifestations like abdominal pain, bloating, belching, flatus, nausea and vomiting may predominate. Duration is usually more than 1 week.
- Chronic giardiasis—History of one or more episodes of acute diarrhoea, increased flatus, loose stools, abdominal distension, borborygmi, eructation of foul tasting gas and passage of foul smelling flatus, and weight loss. Symptoms could be intermittent, recurring and gradually debilitating; Severe disease may result in malabsorption, weight loss, growth retardation and dehydration.
- Diagnosis is made by the demonstration of cysts and/or trophozoites of *G. lamblia* in the stools.

Treatment

Tab. Tinidazole 2 g as a single dose with food.

In children, 50 mg/kg as a single dose with food.

Or

Tab. Metronidazole 400 mg every 8 hours for 7 days with food.

In children, 15 mg/kg divided in three doses for 7 days.

Patient education

- These infections are spread by ingestion of food or water contaminated with cysts.
- Properly cooked food, use of clean drinking water, proper sanitation, good personal hygiene and hand washing with soap after defaecation and before meals may prevent infection.
- Infection can be minimized by avoiding eating unpeeled fruits and vegetables.
- Side effects of medications are usually mild and transient and include nausea, vomiting, abdominal discomfort, metallic taste and a disulfiram like reaction, therefore, avoid use of alcohol during treatment.

References

1. Infectious Diseases: Protozoal and Helminthic. In: Current Medical Diagnosis and Treatment. Lawrence M Turney Jr, Stephen J McPhee, Maxine A Papadakis (eds), 43rd Edition, McGraw-Hill Company Inc. USA, 2004; pp. 1400-1451.
2. Drugs Used in the Chemotherapy of Helminthiasis. In: The Pharmacological Basis of Therapeutics. Joel G Hardman, Lee E Limbird (eds), 10th Edition, McGraw Hill Company Inc., USA, 2001; pp. 1121-1140.
3. Drugs used in the Chemotherapy of Protozoal Infections: Amebiasis, Giardiasis, Trichomoniasis, Trypanosomiasis, Leishmaniasis and other Protozoal Infections. In: The Pharmacological Basis of Therapeutics. Joel G Hardman, Lee E Limbird (eds), 10th Edition, McGraw Hill Company Inc., USA, 2001; pp. 1097-1120.
4. Infectious Diseases In: Davidson's Principles and Practice of Medicine. Nicki R Colledge, Brian R Walker, Stuart H Ralston (eds), 21st Edition, Churchill Livingstone, 2010; pp. 289-382.

WORM INFESTATION

The majority of worm infestations are asymptomatic.

Hookworm Infestation

Infection is caused by *A. duodenale* and *N. americanus*. The infective larvae penetrate through skin usually foot and travels through subcutaneous tissue to the intestines. The adult forms live in the jejunum and feed on blood thus, leading to chronic blood loss and anaemia.

SALIENT FEATURES

- Most of the affected individuals may be asymptomatic. Patients usually present with symptoms of anaemia (hypochromic microcytic).
- Pruritic maculopapular dermatitis (ground itch) at the site of skin penetration by infective larvae.
- Serpigenous tracts of subcutaneous migration in previously sensitized hosts.
- Mild transient pneumonitis because of larvae migration through lungs.
- Intestinal manifestations—epigastric pain often with post-prandial accentuation, inflammatory diarrhoea.
- Major consequences—progressive iron deficiency anaemia and hypoproteinaemia leading to weakness, shortness of breath and skin depigmentation.
- The condition is diagnosed by the demonstration of ova of *A. duodenale* and/or *N. americanus* in the stool and occult blood.

Treatment

Tab. Mebendazole 100 mg 12 hourly for 3 days in children above 2 years of age.
(**Caution:** Contraindicated in children less than 2 years)
Or

Tab. Pyrantel Pamoate (250 mg); Syr. (250 mg/5 ml) 10 mg/kg body weight once daily for 3 days.

(**Caution:** Not recommended in children below one year of age)

In children more than 1 year, Susp. Pyrantal pamoate 10 mg/kg as a single dose.

Or

Tab. Albendazole 400 mg as a single dose.

In children between 1-2 years of age, Syr. Albendazole 200 mg as a single dose: In children more than 2 years, Syr. Albendazole 400 mg as a single dose.

For treatment of anaemia (see section on Anaemia).

Patient education

- Hookworm infestation occurs through skin penetration by the infective larvae.
- The disease can be prevented by use of boots and gloves while working in the fields.
- The deworming agents should not be used in pregnancy, lactation and along with alcohol.
- Side effects of these drugs are generally mild which may include nausea, abdominal pain, headache, dizziness, malaise and skin rash.

ASCARIASIS (ROUNDWORM INFESTATION)

Ascariasis is caused by *Ascaris lumbricoides*, the largest intestinal nematode parasite of humans reaching up to 40 cm in length. The worm is usually located in the small intestine. Infection spreads by orofaecal route.

SALIENT FEATURES

- Most infected individuals have low worm burden and are asymptomatic.
- Features of pulmonary involvement because of larval migration include irritating nonproductive cough, bronchospasm or pneumonitis and burning substernal discomfort aggravated by coughing or deep inspiration, dyspnoea, fever, eosinophilic pneumonitis.
- Heavy intestinal infection—pain abdomen, small bowel obstruction which may get complicated by perforation, intussusception or volvulus. Aberrant migration of a large worm may cause biliary colic, cholangitis, cholecystitis, pancreatitis and oral expulsion of the worm.

Treatment

Tab. Mebendazole 100 mg 12 hourly for 3 days.

(**Caution**: Contraindicated in children less than 2 years)

Or

Tab. Pyrantel pamoate 11 mg/kg as a single dose.

Or

Tab. Albendazole 400 mg as a single dose. In heavy infestation, however, a 2-3 day course is indicated.

(**Caution**: Contraindicated in pregnancy)

In children between 1-2 years: Albendazole Susp (200 mg/5 ml) 200 mg as a single dose; in children more than 2 years Syr./Tab. Albendazole 400 mg as a single dose.

Partial intestinal obstruction may be managed with nasogastric suction, IV fluid administration and instillation of piperazine through nasogastric tube. Complete obstruction and other surgical complications require surgical referral for intervention.

Patient education

- Infection occurs mainly via faecally contaminated soil and via eggs borne on vegetables and food.
- Proper sanitation and good personal hygiene – hand washing with soap after defaecation and before meals may prevent infection.
- Infection can be minimized by avoiding unpeeled fruits and vegetables and use of clean drinking water.

ENTEROBIASIS

Infection is caused by *Enterobius vermicularis* (pinworm). Adult pinworm is around 1cm long and dwells in the lumen in the small and large intestine around caecum area. The eggs are transmitted by hand to mouth passage.

SALIENT FEATURES

- Most pinworm infestations are asymptomatic.
- Cardinal symptoms are perianal pruritis because of deposition of eggs in the perianal area, worse at night due to migration of female worms. Excessive itching can lead to perianal excoriation and bacterial superinfection. Sometimes also associated with enuresis in children.
- Heavy infection causes abdominal pain and weight loss.
- Rarely, in females, vulvovaginitis and pelvic or peritoneal granulomas occur.
- Eosinophilia.
- Diagnosis is made by demonstration of the ova of *Enterobius vermicularis* in perianal swabs or a cellophane tape should be pressed against perianal skin. In the morning, when the child gets up, eggs stick to the tape and can be examined under the microscope.

Treatment

Tab. Mebendazole 100 mg as a single dose in adults and children more than 2 years of age.

(**Caution:** Contraindicated in pregnancy and in children below one year of age).

Or

Tab. Pyrantel pamoate 11 mg/kg body weight as a single dose.

Or

Tab. Albendazole 400 mg as a single dose.

Children (1-2 years) Syr. Albendazole 200 mg as a single dose; More than 2 years 400 mg as a single dose.

Repeat treatment after two weeks.

Assessment of response of worm infestation to therapy

- Clinical improvement.
- Repeat stool, perianal swab examination for ova of *Enterobius vermicularis*.
- Absolute eosinophil count, haemoglobin and peripheral blood smear examination at monthly intervals for 3-6 months.
- Serum albumin level in hookworm infection.

Patient education

- Treatment of all family members is required to eliminate asymptomatic reservoirs of potential reinfection.
- Proper sanitation and good personal hygiene, nail hygiene and clipping, hand washing with soap after defaecation and before meals may prevent infection.
- Infection can be minimized by avoidance of unpeeled fruits and vegetables and use of clean drinking water.
- Regular washing and disinfection of linen.

References

1. Infectious Diseases: Protozoal and Helminthic. In: Current Medical Diagnosis and Treatment. Lawrence M Turney Jr, Stephen J McPhee, Maxine A Papadakis (eds), 43rd Edition, McGraw-Hill Company Inc. USA, 2004; pp. 1400-1451.
2. Drugs Used in the Chemotherapy of Helminthiasis. In: The Pharmacological Basis of Therapeutics. Joel G Hardman, Lee E Limbird (eds), 12th Edition, McGraw Hill Company Inc., USA, 2011; pp. 1443-1462.
3. Drugs used in the Chemotherapy of Protozoal Infections: Amebiasis, Giardiasis, Trichomoniasis, Trypanosomiasis, Leishmaniasis and other Protozoal Infections. In: The Pharmacological Basis of Therapeutics. Joel G Hardman, Lee E Limbird (eds), 12th Edition, McGraw Hill Company Inc., USA, 2011; pp. 1419-1442.
4. Infectious Diseases In: Davidson's Principles and Practice of Medicine. Nicki R Colledge, Brian R Walker, Stuart H Ralston (eds), 21st Edition, Churchill Livingstone, 2010; pp. 289-382.

KALA-AZAR

Also called visceral leishmaniasis, caused by *Leishmania donovani*, a protozoan transmitted mostly through bite of sandfly. Endemic in areas of Bihar, Jharkhand, West Bengal and Eastern Uttar Pradesh.

LEISHMANIASIS

Leishmaniasis is caused by parasitic protozoa of the genus *Leishmania.* Humans are infected via the bite of phlebotomine sandflies, which breed in forest areas, caves, or the burrows of small rodents. There are four main types of the disease:

- In cutaneous forms, skin ulcers usually form on exposed areas, such as the face, arms and legs. These usually heal within a few months, leaving scars.
- Diffuse cutaneous leishmaniasis produces disseminated and chronic skin lesions resembling those of lepromatous leprosy. It is difficult to treat.
- In mucocutaneous forms, the lesions can partially or totally destroy the mucous membranes of the nose, mouth and throat cavities and surrounding tissues.
- Visceral leishmaniasis, also known as kala-azar, is characterized by high fever, substantial weight loss, swelling of the spleen and liver, and anaemia. If left untreated, the disease can have a fatality rate as high as 100% within two years.

SALIENT FEATURES

- Fever, abdominal discomfort due to a large spleen, weight loss, malaise and general debility.
- Physical signs usually depend upon the duration of disease. Early cases may present with asymptomatic splenomegaly. Late cases are generally wasted, febrile and show hyperpigmentation of face, hands and feet.
- Spleen is generally massively enlarged; liver is usually moderately enlarged and lymphadenopathy may be present.
- Complications include extreme wasting and intercurrent infections. Untreated, 80-90% of patients die.
- Diagnosis is suggested by clinical features, presence of pancytopenia, hypergammaglobulinaemia and hypoalbuminaemia and rapid dipstick test based on the recombinant K39 protein, confirmed by demonstration of LD bodies in the bone marrow/splenic aspirate. Serological tests (ELISA) are useful for field diagnosis.

Treatment

Blood transfusion.

Nonpharmacological

Cold sponging, rest and high protein diet.

Pharmacological

Nonspecific. (1) Tab. Paracetamol 500-1000 mg 6-8 hourly to reduce fever.

(2) Treatment of intercurrent infections.

Specific.

Inj. Sodium Stibogluconate 200 mg test dose followed by 20 mg/kg IM slow IV injection to reduce the risk of local thrombosis for 28 days. IM injection is painful thus IV route is preferred although cough is the common side effect specially when the volume is high.

Or

Inj. Amphotericin B 1 mg/kg/day on alternate day for 15 days. (**Caution**: Vomiting and diarrhoea seen commonly; cause hepatotoxicity, renal toxicity, cardiac toxicity, the treatment of the patients under strict supervision and on indoor basis should be undertaken.)

Drug of choice in patients not responding to Sodium Stibogluconate.

Or

Tab. Miltefosine in adults (>12 years and weight >25 kg) 100 mg/day in two divided doses after meals for a period of 28 days. In adults (<25 kg) 50 mg once daily after food for 28 days.

In children (2-11 years), 2.5 mg/kg daily after meals, i.e. 50 mg/day once a day for 28 days

(**Caution**: NOT to be used in children below 2 years and in pregnancy, or women in child bearing age not using any contraceptive or lactating mothers).

Treatment with Miltefosine is provided as Directly Observed Therapy (DOTS). Stop miltefosine, if any skin rashes or gastrointestinal symptoms develop and refer the patient to higher treatment centre. Consider monitoring of renal and hepatic functions wherever feasible as about 1% patients may develop nephrotoxicity or hepatotoxicity.

Other drugs that have been found useful are:

Inj. Pentamidine isoethionate 4 mg/kg/day for 15-30 days IV/IM or alternate day. **(Caution:** Adverse effects include nephrotoxicity, bone marrow suppression, hypoglycaemia, diabetes mellitus, pancreatitis and arrhythmia related sudden death)

Or

Inj. Aminosidine (Aminoglycoside) 12-15 mg/kg/day IM for 21 days per-orally particularly in HIV positive patients.

Clinically, patient feels better and becomes afebrile during the first week of treatment. Return of pancytopenia, abnormal liver function, serum albumin, splenomegaly and weight gain may take weeks or months.

Reassessment at 6 weeks and 6 months will usually detect any relapse.

Patient is said to be cured, if no clinical relapse occurs during the first 6 months of follow-up. There is no need to prove absence of parasite as a marker for cure.

Treatment of relapse

Inj. Sodium Stibogluconate 20 mg/kg/day for at least 8 weeks with frequent monitoring for parasite count.

Or

Inj. Amphotericin B in doses mentioned above.

Or

Liposomal Amphotericin B 2-5 mg/kg/day IV on days 1-5, 14 and 21 for a total of 21 mg/kg.

Post-kala-azar dermal leishmaniasis (PKDL)

Tab. Miltefosine in adults (>12 years and weight >25 kg) 100 mg/day in two divided doses after meals for a period of 28 days. In adults (<25 kg), 50 mg once daily after food for 12 weeks.

In children (2-11 years), 2.5 mg/kg daily after meals, i.e. 50 mg/day once a day for 12 weeks.

(**Caution**: NOT to be used in children below 2 years and in pregnancy, or women in child bearing age not using any contraceptive or lactating mothers). ***Treatment with Miltefosine is provided as Directly Observed Therapy (DOTS)***

Or

Patient not responding to the first-line of drug or the drug is discontinued due to toxic effect, women during pregnancy, lactating mothers and their babies, children less than two years of age, PKDL patient with liver or kidney disease Inj. Amphotericin B 1 mg/kg/day very slowly IV infusion in 6 to 8 hours in 5% dextrose after mixing the drug in water for injection for up to 60-80 doses over 4 months. (**Caution**: Vomiting and diarrhoea seen commonly; cause hepatotoxicity, renal toxicity, cardiac toxicity, the treatment of the patients under strict supervision and on indoor basis should be undertaken.)

(Caution: Follow standard protocols for hydration premedication and renal function monitoring). Adverse effects include nephrotoxicity).

Special situations

Patients co-infected with HIV respond slowly, require longer treatment and are more liable to relapse.

Monitoring for drug side effects.

- Sodium Stibogluconate: Patient may have myalgia, arthralgia, fatigue, elevated transaminases, chemical pancreatitis and ECG abnormalities in the form of increased QTc interval or concave ST segment may occur. LFT need to be monitored regularly.
- Pentamidine can cause nephrotoxicity and diabetes.
- Amphotericin B can cause nephrotoxicity, therefore, monitor for nephrotoxicity.

References

1. Leishmaniasis. In: Harrison's Principles of Internal Medicine. Fauci, Braunwald, Kasper et al (eds), 18th Edition, McGraw Hill Company Inc., New York, 2012; pp. 1709-1716.
2. Leismaniasis. In: Oxford Textbook of Medicine, Warrell DA, Cox TM, Firth JD, Benz EJ Jr. (eds), 4th Edition, Oxford University Press, 2003; 1.777-1.783.
3. Guidelines on Vector Control in Kala-Azar Elimination. Directorate of National Vector Borne Disease Control Programme. Government of India: www. namp.gov.in.
4. Antimicrobial therapy in visceral Leishmaniasis. Rational Antimicrobial Practice in Paediatrics (under IAP Action Plan 2006) pp. 271-273.
5. Guidelines on Use of Miltefosine. Directorate of National Vector Borne Diseases Control Programme. Government of India. http://nvbdcp.gov.in/Doc/Guidelines%20on%20Miltefosine.pdf. Accessed on 21.9.12
6. Guidelines for Treatment of Post-Kala-azar Dermal Leishmaniasis (based on WHO Technical Report Series 949) http://nvbdcp.gov.in/Doc/PKDL-Guidelines-220512.pdf 2012.