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PARASITIC DISEASES: ETIOLOGY, GLOBAL DISTRIBUTION, AND DISTINCTIVE DIAGNOSTIC FEATURES

H.R.Ibraximova
Sh.R.Yusupov
Sh.S.Masharipova
Sh.Z.Otajanov
O.U.Matyakubova
I.A.Artikov
R.R.Nurllayev
Urgench State Medical Institute

Introduction

Parasitic diseases are caused by organisms that live in or on a host, deriving nutrients at the host's expense. They are a significant cause of morbidity worldwide, with children and immunocompromised individuals being particularly susceptible. Protozoan parasites, such as *Plasmodium spp.*, *Giardia lamblia*, and *Entamoeba histolytica*, and helminths, including *Ascaris lumbricoides*, *Schistosoma spp.*, and *Enterobius vermicularis*, represent the most common human-infecting species .The prevalence and distribution of parasitic diseases are closely linked to environmental conditions, sanitation infrastructure, hygiene practices, vector density, and human behavior. Helminth infections are often endemic in regions with warm, humid climates and inadequate sanitation, whereas vector-borne protozoal diseases, such as malaria, are concentrated in areas where mosquito vectors thrive.Diagnosis is challenging due to overlapping clinical manifestations, intermittent parasite shedding, and variability in host immune responses. Conventional methods, including stool microscopy, blood smear examination, and serology, are widely used, while molecular techniques, such as polymerase chain reaction (PCR), provide higher sensitivity and specificity .This review aims to provide a comprehensive overview of the etiology, global distribution, and distinctive diagnostic features of parasitic diseases, with a focus on clinical and epidemiological relevance.

Human parasitic infections are broadly classified into protozoan and helminthic diseases.

- *Plasmodium spp.*: Causes malaria, transmitted via Anopheles mosquitoes.
- *Entamoeba histolytica*: Causes amoebiasis, transmitted through fecal-oral contamination.
- *Giardia lamblia*: Causes giardiasis, primarily through ingestion of contaminated water.
- *Trypanosoma spp.*: Responsible for African sleeping sickness and Chagas disease, transmitted via tsetse flies or triatomine insects.
- *Ascaris lumbricoides*: Causes ascariasis, transmitted via ingestion of contaminated soil or food.
- *Schistosoma spp.*: Causes schistosomiasis, transmitted through contact with freshwater infested with cercariae.
- *Enterobius vermicularis*: Causes enterobiasis, transmitted by fecal-oral route.
- *Hookworms (Ancylostoma duodenale, Necator americanus)*: Cause anemia and malnutrition, transmitted through skin penetration by larvae.

Parasitic infections show specific geographic patterns influenced by ecological, climatic, and socio-economic factors.

- **Tropical and Subtropical Regions**: High prevalence of malaria, schistosomiasis, lymphatic filariasis, and soil-transmitted helminths.
- **Developed Countries**: Low endemicity, but imported cases and sporadic outbreaks occur due to travel and migration.

- **Urban vs. Rural Areas**: Rural populations experience higher rates of soil-transmitted helminths due to inadequate sanitation, whereas urban settings may see more foodborne protozoan infections.

Environmental factors, including temperature, humidity, and rainfall, affect vector populations and parasite survival. Socio-economic status determines access to healthcare, clean water, and hygiene education, which directly impacts infection risk

Accurate diagnosis is essential for effective treatment and epidemiological monitoring.

- **Microscopy**: Examination of stool, blood, or tissue samples remains a cornerstone for identifying protozoa and helminth eggs, cysts, or larvae.
- **Serological Assays**: Detect parasite-specific antibodies or antigens, useful for chronic or low-intensity infections.
- **Molecular Techniques**: PCR and nucleic acid amplification tests offer high specificity and sensitivity, enabling species identification.
- **Imaging Modalities**: Ultrasound, CT, and MRI assist in visualizing organ involvement in infections such as cystic echinococcosis or liver fluke infestations.
- **Clinical Indicators**: Symptoms such as perianal itching in enterobiasis or hematuria in urinary schistosomiasis can aid initial diagnosis.

Challenges include intermittent parasite shedding, overlapping clinical signs, co-infections, and host immune variability. Combining multiple diagnostic approaches increases accuracy and reliability.

Effective control measures combine public health interventions and clinical management:

- **Sanitation Improvements**: Safe water supply, proper sewage disposal, and hygiene promotion.
- **Vector Control**: Insecticide-treated nets, chemical interventions, and environmental vector management.
- **Mass Drug Administration**: Preventive chemotherapy programs for high-risk populations in endemic areas.
- **Health Education**: Promoting awareness of transmission routes and hygienic practices.
- **Vaccination and Immunoprophylaxis**: Research ongoing for malaria, schistosomiasis, and other parasitic diseases.

Conclusion

Parasitic diseases remain a substantial global health burden, shaped by environmental, socio-economic, and behavioral factors. Understanding their etiology, distribution, and distinctive diagnostic features is critical for effective prevention, timely diagnosis, and successful management. Advances in molecular diagnostics and immunological assays complement traditional methods, enhancing detection accuracy. Continuous research, public health interventions, and community education are essential to mitigate the impact of parasitic infections worldwide**.**

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