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Oral Parasitic Infections - A Review

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ABSTRACT

A Parasite is an organism that lives in association with other organisms and completely dependent on its host for its life. It gets nourishment and protection from the host. Parasites enter the body through the mouth or skin. Parasites that penetrate through the mouth are swallowed and can remain in the intestine or sometimes burrow through the intestinal wall and attack other organs. Various parasitic infections affecting oral cavity are discussed in this review.

Keywords: Parasite, host relationship, intestine.

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INTRODUCTION

Oral microorganisms contain different groups, mainly of bacteria, fungi, parasites, and viruses. For centuries parasitic diseases continue to cause high morbidity especially in developing countries. Infection may be low among persons of temperate regions with good hygiene than unhygienic population of tropics. A parasite is an organism which spends momentous life time in on living tissue of a host organism, in addition to which causes harm to the host without immediately killing it. It is analysed by the WHO that one person in every four harbours parasitic worms [1].

Factors impacting the qualitative and quantitative composition of the permanent oral flora include many criteria. They are geographical environmental conditions and genetic determination, mainly contact with air, diet, and oral hygiene. Acquired immune defects mainly are immunosuppression, neutropenia, HIV infection, neutrophil dysfunction, leukemia, allergies, dental and periodontal disease, dental prosthesis, implants, surgical procedureand other microorganism carriers [2].

History of Parasites

The foremost written records reveals that nearly indeed parasitic infections come from an era of Egyptian medicine from 3000 to 400 BC, predominantly the Ebers papyrus of 1500 BC discovered at Thebes [3]. Amid the Egyptian medical papyri, the Eberspaprus refers to intestinal worms, and these reports can be long – established by the discovery of calcified helminth eggs in mummies dating from 1200 BC. The Greeks, chiefly Hippocrates (460 to 375 BC), knew about worms from fishes, domestic animals, and humans. Roman physicians together with Celsus (25 BC to AD 50) [4] and Galen (Galenus of pergamon, AD 129 to 200) were frequent with the human roundworms Ascarislumbricoides and Enterobiusvermicularis and tapeworms belonging to the genus taenia. Somewhat later, Paulus Aegineta (AD 625 TO 690) [5] evidently described Ascaris, Enterobius, and tapeworms and gave excellent clinical descriptions of the infection they cause, The medical literature of the middle ages is very partial, but there are numerous references to parasitic worms.

Parasite

A Parasite is an organism lives in a close affiliation with another organism as its host and completely dependent on its host for its life functions. The paraites that live inside the host so called endoparasite, outside the host called ectoparasites. It obtains nourishment and protection from the host, consequently, the host suffers from various diseases, infections and discomforts.

Host Parasite Relationship

Host parasite relationship refers to the association between the host and the parasite and the struggle for domination that takes place between them. Symbiosis is an association that both are dependent on each other that one cannot live without the help of other and none of the partner suffers from the association [6].

Commensalisms is an association in which parasite is deriving benefit without causing injury to its host. it is one form of symbiosis.mMutualism is an association where parasite and host both are benefited.

Parasitism is an association where parasite gets benefit and host gets nothing in return but always suffers some injury.

Types of Host

- Definitive Host: That harbours the adult parasites or sexually mature stages of the parasites.
- Intermediate Host: That harbours larval stages of parasites or sexually immature stages of the parasites.
- Reservoir Host: harbours the same species and same stages of the parasite as man. It maintains the life cycle of the parasite in environment and is therefore, a reservoir resource of infection for man.
- Transport Host: In whom the parasite does not undergo any maturity but remains alive and infective to another host.
- Vector: This is an arthropod that transmits parasites from one host to another [7].

Determination of virulence of parasites

Pathogenic bacteria are bacteria that are able to produce disease since they acquire certain structural or biochemical or genetic traits that deliver them pathogenic or virulent. The damage which pathogenic parasites generate in the tissues of the host may be discussed in the following two ways;

Direct effects of the parasite on the host

- Mechanical injury: The host may be inflicted by a parasite by means of pressure as it grows bigger, e.g the hydatid cyst causes blockage of ducts such as blood vessels producing infraction.
- Deleterious effect of toxic substances: The production of toxic substances may cause rigors and other symptoms in plasmodium falciparum.
- Deficiency of nutrients, fluids, and metabolites: parasite may generate disease by opposing with the host for nutrients.

Indirect effects of the parasite on the host

- Immunological reaction: tissue injury may be caused by immunological response of the host, e.g. in nephritic syndrome.
- Excessive proliferation of certain tissues due to invasion by some parasites can also cause tissue damage in man, eg, fibrosis of liver after deposition of the ova of schistosoma.

Oral Parasitic infection

The mouth is the entry harbour for many parasites modified to human host. Parasites frequently enter the body through the mouth or skin. Parasites that penetrate through the mouth are swallowed and can remain in the intestine or sometimes burrow through the intestinal wall and attack other organs. Parasites that enter through the skin bore openly through the skin or are introduced through the bites of infected insects most commonly called vectors since they convey or pass on organism that cause disease. Some parasites penetrate through the soles of the feet most commonly seen when a person walks barefoot or when a person swims or bathes in water containing the parasites. Infrequently, parasites are widening through blood transfusions, through injections with a needle formerly used by an infected person, or common women to her fetus.

Classification

PROTOZOA: Microscopic, single cell eukaryotes.

- Amoebae
- Flagellates
- Sporozoa
- Gliates

HELMINTHES [9]: Macroscopic,multicellular worms.

- Trematodes- eg, schisosoma
- Cestodes –eg, taenia
- Nematodes- eg hookworm

Protozoa of the human oral cavity

Investigations of microbiological and parasitological organisms are difficult by the occurrence of varied environmental conditions in different parts of the oral cavity. It is well known that the occurrence of protozoa may be well-known both in persons with pathological alterations in the oral cavity, and in those with no such symptoms. E.gingivalis, is a cosmopolitan amoeba that lies in the human oral cavity. It is a protozoon and has a simple development cycle. Only one stage is distinguished that is trophozoite, which is characterized by a variable shape. Humans are infected by E.gingivalis directly, frequently during oral contact or through the regular usage of unhygienic dishes and crockery. In the oral cavity, this protozoon occurs mainly on gingival edges, in interdental spaces, paranasal sinuses, carious lesions, tonsillary crypts, the alveolar pyorrhoea, and in bronchial mucus. It has also been present in the contents of lung abscesses. If the protozoan originate in bronchial secretion, it is necessary to distinguish between E.gingivalis and E.histolytica. This is based on the ability of E.gigivalis to phagocytose leucocytes. E.gingivalis occurs more often among people with alterations of the mucous membrane of the oral cavity, paranasal sinusesand inflammation of the palatal tonsils. Also it is frequently seen with bad oral cavity hygiene and the sick with a lowered body immunity [10].

Protozoa are single-cell animal organisms that can segregate within a host organism, the majority of them motile, unicellular and heterotrophic. They are the smallest of all animals and can see only under a microscope.

Classification of Protozoans [11]

- Mastigophora (flagella) – Visceral, cutaneous and mucocutaneous infection.
- Trypanosoma _ Sleeping disease, Chagaa's disease.
- Giardia _ Diarrhea
- Trichomonas _ Vaginitis
- Entamoeba _ Dysentry and liver abscess
- Dientamoeba _ Colitis
- Naegleria and Acanthoeba – central nervous system and corneal ulcers.
- Babesia _ Babesiosis
- Plasmodium - Malaria
- Cryptosporidium - Diarrhea
- Balanidium _ Dysentery

EntamoebaGingivalis

Entamoebagingivalis is a non-pathogenic protozoan and is identified to be the first amoeba in humans to be described. It is established in the mouth stuck between the gingival pockets and near the base of the teeth. Entamoebagingivalis is one of seven entamoeba species that generally infect humans and is frequently found in the oropharynx, where it is well thought –out a commensal organism. E,gingivalis is more familiar in patients with poor dentition, or periodontal disease, immune suppression. The majority entamoeba species exist in host's intestines, with the exemption of E.gingivalis, which inhabits the oropharynx and is a commensal organism in humans. E.gingivalis is more frequent in patients with, oral hygine, poor dentition or with immune suppression.

Entamoebatrophozoites include a single nucleus and a many number of pseudopods, which forms clear bulges noticeable on light microscopy. The common trophozoite feeds on bacteria and divides by simple binary fission to outline two small daughter cells. Almost all entamoeba species form cysts throughout the transmission stage; variation in size and nuclei aid in species recognition with the exception of E.Gingivalis. E.gingivalis is transmitted entirely through oral cotact [11].

Life cycle

Entamoebagingivalis, as the name implies characteristically lives around the gumline of the teeth. They are mainly deposited in gingival pokets of unhealthy mouths. In addition, the E.gingivalistrophozoites have been well known to dwell in the tonsillar crypts and the bronchial mucus. It is very important to diagnose E.gingivalis and E.histolytica properly because both organisms may be found in the sputum and in pulmonary abscesses. E.gingivalis resembles E.histolytica – like amoebae. Its trophozoite measures about 10-35microns in size. Mostly these parasites are transmitted through oral contact. Actinomyces is frequently found to co-colonize with the E.gingivalis. It was first reported in the year 1986,

by the johns Hopkins group. But their precise identification was made in the year 1992, by using ribosomal RNA gene sequencing [13].

TrichomonasTenax

Trichomonastenax are general flagellates of the tropical areas. They are pear-shaped body and measure 10-12microns in length and has ovoid nucleus. They are 3-5 free flagella, and a thicker flagellum passes backwards all along the side of the body forming the undulate membrane and upcoming out free at the posterior end.

Genus Trichomonas is classified into three species

- T.hominis: inhabit the ileo-caecal region
- T.tenax : inhabit the oral cavity
- T.Vaginalis : inhabit the female genital tract

Life cycle

Trichomonastenaxtrophozoites stay alive in the body as mouth scavengers. They nourish primarily on local microorganisms which are located in the tartar between the teeth, gingival margin, around the gums, and tonsillar crypts pyorrheal pockets. T.tenaxtrophozoites reproduce by longitudinal binary fission.

Clinical Symptoms

The characteristic Trichomonastenax infection does not generate any notable symptoms. On auncomman occasion, T.tenax has been known to occupy the respiratory tract. But this appear to have mostly occurred in patients with primary thoracic or lung abscesses of pleural exudates.

LeishmaniaDonovani

Leishmaniasis, caused by a heterogeneous collection of protozoan parasites belonging to the genus leishmania which produces a numerous of clinical syndromes. There are three clinical forms of leishmaniasis- cutaneous leishmaniasis, visceral leishmaniasis, and mucocutaneousleishmaniasis. Each of them is usually associated with definite species and concrete geographical settings. The occurrence of leishmaniasis as an opportunistic disease has increase greater than before in recent years due to the increasing number of patients with immune depression secondary to chronic illness, transplants, neoplasms, HIV infection and immunosuppressive treatments [14].

Clinical Features

Lesions are described in the mucosa of the nose, lips, soft palate, cheek, hard palate, tonsils tongue, and larynx. The lesions are in general red or purple in color and manifest as a nodule, granular inflammation, tumor, polypoid lesion.Ulcerations can establish on the tongue, lips, tonsils,, palate and vocal cords. The lesions are mostly painless [15] Mucosal

leishmaniasis frequently starts as erythema and ulceration, normally in the nasal fossa, and usually evolves towards perforation of the septum and are often described as a destructive inflammatory lesion.

Pathogenesis

Rodents and canines comprise the natural reservoir of Leishmania. Mostly which is transmitted from animals to humans, and infrequently from one human to another, via means of the female mosquito. The mosquito which sucks the blood of humans or mammals, containing the protozoon in its amastigote form which lacks a flagellum). Just the once within the intestine of the mosquito, the parasite converts into a promastigote which is equipped with a flagellum, and reproduces. In the intestine of the mosquito, then the protozoon then wander to the esophagus, where it is debarred into the skin of the host. When the insect bites it is followed by attack in to the bloodstream and diverse tissues. The promastigotes are phagocytosed by the macrophages of the host where they lose the flagellum and once againconvert into amastigotes. When the infected cells are damaged, the parasite infects new cells and thus enter throughout the body [16, 17].

Treatment

The treatment of choice in all medical forms of leishmaniasis is based on thedirection of pentavalent antimonial drugs such as meglumineantimoniate andsodium stibogluconate. The former drug is more extensively used, preferentially bymeans of the intramuscular route and with intravenous dosing as secondaryalternative.The potential adverse effects of these drugs are: joint pain, anorexia, nausea,myalgia,vomiting, electrocardiographic changes, headache, hypertransaminemia,thrombocytopenia and neutropenia . As an substitute to such treatment, patientscan be given amphotericin B, pentamidine, rifampicin or ketoconazole. Additionally drugs that have been used for treatment are: phenothiazines,, allopurinol,paromomycin cyclosporine, miltefosin, dapsone, and itraconazole [17].

Toxoplasma Gondii

Toxoplasmosis is a common disease caused by the intracellular protozoal organism toxoplasma gondii. Mostly it is patients. an asymptomatic infection. The diseases can be devastating for the developing fetus and immunocompromised patients. Cats are considered as definitive host. The organism multiplies in the intestinal tract of cats by means of a sexual life cycle. Then numerous oocysts are discharged in the cat feces. The oocysts can be then ingested by another animal or human which results in the production of diseases.

Clinical Features

Mostly it is asymptomatic [18]. The patients develop low grade fever, cervicallympadenopathy, muscle or joint pain, fatigue. The symptoms may last from several weeks to several months. The lympadenopathy develops involving one or more lymp nodes

in the paraoral region. Mostly it involves buccal lymph node. In many instances the oral health provider may sometimes discover the diseases.

The principal group of patients who are at risk are

- AIDS patients
- Transplant recipients
- Cancer patients
- Necrotizing encephalitis
- Pneumonia
- Myositis or myocarditis

The patient may often complain of headache, lethargy, hemiparesis and disorientation. Sometimes CNS infection is very serious.

Helminths of human oral cavity

Helminth is a common term meaning worm. The heliminthic parasites areorganism which is multicellular and bilaterally symmetrical animals which hasthree germ layers. They are generally invertebrates characterized by elongated, flat or round bodies. They are classified in to flatworms or platyhelminths, include flukes and tapeworms and intestinal round worms. Helminths develop in the course of egg, larval and adult stages. Understanding the different stages of helminths in their growth and development is the foundation for understanding the epidemiology and pathogenesis of helminth diseases, because the diagnosis along with treatment of patients harboring these parasites. The blood flukes and nematodes are almost bisexual. Every other flukesand tapeworm species so as to infect humans are hermaphroditic [19].

Helminthes are among the frequent parasitic causes of human suffering. They cause various diseases in humans, but a small number of helminthic infections cause life-threatening diseases. They cause anemia and malnutrition. There is age dependent distribution of infections. Since an outcome of predisposing behavioral and immunological status, children excessively carry the burden of schistosomes and geo-helminthes. The sources of the parasites are diverse [20].

Exposure of humans to the parasites may occur in one of the following ways:

- Contaminated soil, water and food.
- Blood sucking insects or arthropods.
- Domestic or wild animals which harbor the parasite.
- Person to person.
- Oneself as in Enterobiusvermicularis.

They enter the body through many routes including: mouth, skin and therespiratory tract through inhalation of airborne eggs.

The helminthes are classified into three major groups. These are:

- Trematodes (Flukes)
- Nematodes (Round worms)
- Cestodes (Tape worms)

Round worms (Nematodes)

Nematodes are cylindrical in structure than flattened, hence the common name round worms. The outer body wall is composed of a cuticle that has a noncellular, a thin hypodermis, chemically comple structure, and musculature. The cuticle in a few species has longitudinal ridges called alae. The bursa is a flat like extension of the cuticle which is situated in the posterior end of some species of male nematodes, which is used to grasp the female for the duration of copulation

Flukes

Adult flukes are leaf shaped flat worms. Oral and ventral suckers which have developed prominently, which helps to maintain position in situ. Flukes are hermaphroditic. Apart from blood flukes which are bisexual. The life cycle includes a snail intermediate host flukes are well developed in alimentary canal along with the muscular pharynx and oesophagus. The intestine is frequently a branched tube which consisting of a single layer of epithelial cells. The main branches might end blindly or open into an excretory vesicle. The excretory vesicle develops and accepts the two main lateral collecting ducts of the excretory system. A flame cell is a hollow, terminal excretory cell which contains a beating group of cilia.

Tapeworms (Cestodes)

Adult tapeworms are commonly elongated in structure, segmented, hermaphroditic flatworms that reside in the intestinal lumen. Larval forms, which are cystic or solid, reside in extraintestinal tissues. Anatomically, cestodes are separated into a scolex, or head, which contains the organs of attachment. A neck is the region shows of segment proliferation, and a chain of proglottids called strobila. The strobili elongates as new proglottis appearance in the neck region. The segments which are adjacent to the neck are immature and those more posterior are mature. The terminal segments are gravid, with contains the egg-filled uterus as the most prominent feature [21].

Oral Myiasis

Myiasis, a term, introduced by Hope in 1940 [22]. The termrefers to invasion of tissues, organs, and certain body cavities in human vertebratespecies by the dipteran eggs or larvae which generally manifests as furunculoidlesions. Zumpt defined Myiasis as an infestation of live human and vertebrateanimals by dipterous larva, which at least for certain period of its lifecycle feeds on host's dead or living tissue, liquid body secretions, and fluids or ingested food[23]. It is epidemic; prevalence is particularly related to latitude, lifecycle of variousspecies of flies, and third world countries. Higher incidence is reported in tropical,subtropical regions of Africa, South East Asia, America, and, where warm, humidclimate exist almost throughout the year; normally seen amongst people

wheresanitation, personal hygiene is frequently ignored and close association withdomestic pets exists.Myiasis of orodental complex is a rare entity frequently caused by familiar Indianhousefly MuscaNebulo. They are found usually in human habitats with poorhygiene and passable sanitation particularly during summer and rainy season.Clinically, myiasis can be classified as primary and secondary. They are basedupon host dependence.

Life Cycle

The lifecycle of a fly commences with egg stage which followed by the larvalstage, the pupal stage, and lastly the adult fly. The fundamentals for egg laying andcontinued existence of the larvae are mainly are the moisture, necrotic tissue, andsuitable temperature. Therefore wounds, open sores, scabs, and ulcerscontaminated with discharges make feasible way for the same. Modes ofinfestation in humans may take place in two ways, either accidentally with directinoculation by the fly and another by ingestion of infected material such as meat [2,4].

Clinical features

The main contributing factors are [25]:

- low socioeconomic status
- immunocompromised state
- debilitated and unhygienic living conditions

The risk factors are [26]:

- suppurative lesions
- facial trauma,
- mouth-breathers,
- extraction wounds,
- fungating carcinomas and others conditions

The extraction wound and lack of personnel hygiene was the most possible cause in the development of oral myiasis.

Hydatid Cysts

Hydatid disease is an essential infestation caused by the tapeworm parasite Echinococcus granulosus and is frequent in the temperate zones, including the Mediterranean countries, the Middle East, New Zealand, South America, SoutheastAsia and Australia.Hydatid cysts affecting human beings mostly involve the liver(65%) and lungs (25%). Hydatidosis of head and neck is unusual even in theregions where the disease is endemic [27].

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