Lecture **Parasite**

Parasite , Worms and Protozoa -

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Parasite: is an organism that depends upon a living host for one or more of its essential metabolic requirement . It is of two types :

***Endoparasites : are** parasites which lives within the body , like some intestinal worms , may not invade the tissue .

***Ectoparasite :** are those living on the body surface , like the scabies mite , may in fact burrow into it .

Definitive (final) host – is the host in which the parasite reaches sexual maturity , e.g. human is the definitive host for *Tinea solium* .

Intermediate host – is the host in which the parasite undergoes larval development or an asexual phase , e.g. human may act as intermediate host for the bladder worm (Cysticercus stage) .

The Cutaneous lesions may result from direct damage by or presence of the parasite , or occurs in sites that are not themselves infected , e.g. scabies , the inflammatory lesions present at the sites and away from the presence of ***Sarcoptes scabieii* .**

Leishmaniasis :

Definition- are a group of diseases caused by several species of the genus **leishmania.** It has been estimated that 1.5million new cases of Cutaneous leishmaniasis occurs annually and more than 80%of the total cases affect individuals in developing countries .

Leishmania spp. under go a cycle of development in the gut of **female sand flies ,** of the genera **Phlebotomus** in the Old World , and **Lutzomyia** and **Psychodopygns in the New world . In its vertebrate host , the amastigote** form of the parasite is found in cells of the reticuloendothelial system or in the dermis following severe parasite load and mononuclear cell necrosis , it is **round or oval , 2-3um in diameter , with no protruding flagellum , with nucleus and kinetoplast** , stain deeply with Geimsa or Romannovsky stain . **In the sand fly and in artificial culture media , leishmania spp. are the elongated promastigote stage , motile** with an anterior flagellum .

Infection is transmitted by the bite of the fly , usually at night and outdoors , however infected vectors can take a blood meal during the day if disturbed and also are responsible for inoculating parasites indoors within the household environment . **Commonly the infection** is **zoonotic ,** one species of leishmania may be associated with one , or many , natural vertebrate hosts , which provide the reservoir of infection. Humans are commonly accidental hosts , although there are situations in which they may be the reservoir in anthroponotic cycle .

Human leishmaniasis is usually classified as **Cutaneous and visceral ,** but the species that cause visceral disease may also cause skin lesions .

Old world Cutaneous leishmaniasis (Oriental sore , Baghdad boil , Delhi boil , Aleppo boil) .

Aetiology & epidemiology **–** it is caused by :***Leishmania major , L. tropica , L. Ethiopiaca , and L.donovoani infantum*** **.** In endemic areas where transmission is stable , children are usually especially 100%afected , in less stable situation for example around oases , epidemics occurs affecting all ages and sexes .

Pathogenesis **–** sandfllies bite the skin , inoculate the infective metacyclic **promastigotes when taking** a blood meal from the superficial vascular network in the human dermis . Inoculated promastigotes are taken up by histiocytes and newly immigrated monocytes , in which they multiply , most inoculations are killed by phagocytosis and complement – mediated functions , only a minority of successful parasite inoculations results in localized or disseminated clinical Cutaneous leishmaniasis . **After a period of time (incubation)** , which depends on ***parasite species** , ***size of inoculum ,** *and the **host's cellular immune response** , a clinical lesion appears .

Clinical features **–** all previously uninfected individuals are susceptible , the **incubation period** is usually measured in months , but ranges from a few days to over a year . **One or more lesions** occurs on the unclothed (exposed) parts of the body , particularly on acral skin (face, neck, and arms) , easily bitten by phlebotomus , usually in child . In endemic areas more than one children in the same family are affected (infected fly bites them) . The sequence of lesions in all species are nodule , crusting , ulceration and healing with scare formation is common in all self healing sores . **The clinical forms are :**

1. Cutaneous leishmaniasis due to *L. major (Wet , rural , or zoonotic):-*

After a short incubation period of less than 2months , a red furuncle-like nodule , appears at the site of inoculation , 2weeks later on a central crust forms , which may persist or fall a way revealing the underlying ulcer , the **ulcer** and the raised , red margin enlarge over the next 2-3months , and reaches a diameter of 3-6cm . **Multiple ,** small secondary nodules (2-4mm) some times occurs around the lesion in lymphatics , **healing** takes place in 2-6months and leaves a scare . This type of **C.L.** is acquired in a rural area , where the infecting organisms are also rodent parasites (Zoonosis) .

2. Cutaneous leihmaniasis due to *L. tropica (Dry , urban or anthroponotic):-*

After an incubation period of more than 2months , a small brownish –red nodule appears , which extend slowly to form a plaque of 1-2cm in diameter in about 6months , at this stage a shallow ulcer appears in the center , which develops a closely adherent crust . **Multiple** secondary nodules occurs much less frequently than in the **wet form** , after 8-12months , the lesion starts to regress and ulcer heals , leaving a scare . The average time from nodule to scare is about 1year , approximately twice as long as in the **wet-form** . Rarely ***L. tropica***

causes **viscerotropic infections in war-veterans** in the middle East and in cases of Indian kala-azar .

3. Cutaneous leihmaniasis due to *L. aethiopica :-*

The lesions are most commonly central on the **face and single** , satellite papules acuminate into large , spreading nodules , that may note crust or ulcerate , lesions are seldom much inflamed and heal over 2-5years . If the sand fly bite has been on the mucosal border of the nose and mouth , **primary muco-cutaneous leishmaniasis (MCL)** , may develop , producing swelling of the lips , nose and persist for many years , but without the gross destruction seen in Latin America caused by ***L. brasiliensis* .**

4. Cutaneous leishmaniasis due to *L. donovani infantum :-*

Infants infected with this parasite tend to get **visceral leishmaniasis** , adults are more likely to develop simple self-healing cutaneous disease , with out concurrent or subsequent visceral involvement . The appearance and evolution of the lesions is typically slow and mild , when compared with that of ***L. major*** , with which it coexists in North Africa . **Solitary mucosal** lesions have occasionally been reported .

5. Other types of cutasneous leishmaniasis :-

a. Leishmaniasis recidivans (*Chronic , lupoid leishmaniasis) :-* Approximately 4%of *L. tropica* infections from Iran and Afghanistan will develop this chronic form of the disease . Brown –red or brown-yellow papules appears , usually close to a scar of an old lesion of cutaneous leishmaniasis or actually in the scar , they coalesce and form a plaque closely resembling lupus vulgaris , even to the formation of **apple-gelly** nodules . The lesions frequently worsen in the summer and may ulcerate to form concentric rings , rarely keloidal and verrucous or psoriasiform forms occurs on the limps . The recidivans lesion is the result of the failure of cellular immunity to sterilize the lesion . Investigations to demonstrate the parasite or leishmanial DNA in the infected skin are commonly negative .

b. Diffuse cutaneous leishmaniasis (*Disseminated Cutaneous leishmaniasis , leishmaniasis cutis diffusa) :-* In the Old-World this form of the disease id due to ***L. aethiopica*** , and has certain characteristic features , which include :-

1. There is an initial lesion , which spreads locally and from which the disease disseminates to other parts of the skin often involving large area .
2. The lesions are nodules that do not ulcerate .
3. There is a superabundance of parasites in the lesions .
4. The histology is characteristic in that the macrophage full of amastigotes .
5. Internal organs are not invaded and there is no history of kala-azar .
6. The leishmanin test and other tests of specific cellular immunity are negative .
7. The disease progresses slowly and become chronic .
8. Treatment produce only gradual improvement and relapse is the rule .

c. Post-kala-azar dermal leishmaniasis (*Dermal leishmanoid ,PKDL):-* In 5% of East African patients , and 20% of Indian patients , a rash develops after the **visceral disease** has healed , either spontaneously or following treatment . A small proportion of patients with PKDL give no previous history of visceral disease . The rash in **Africa** begins during convalescence , appearing on the **cheeks , chin , ears , extensor aspects of forearms , buttocks and lower legs** , which consists of discrete papules , with tuberculoid histology and scanty parasites , **leishmanin test is positive .** The rash heals spontaneously over a few months . **In Indian** , by contrast the rash appears 1-2 years after recovery of kala-azar , as hypopigmented macules , similar in appearance and distribution to those of lepromatous leprosy . After a variable period of years or months , diffuse nodulation begins to develop in these macules , the rash is progressive over many years and seldom heals spontaneously , **tongue , palate , and genitalia** may be involved , lymphadenopathy , **leishmanin test is negative .**

Diagnosis :- A positive diagnosis of Cutaneous leishmaniasis (Old and New World types) can be suggested , and in most cases **confirmed** by the presence of one or more of the following criteria :

1. History of exposure to an endemic area in the previous weeks or months .
2. History of sand fly bites in the previous weeks or months .
3. History of high risk activities such as sleeping outdoors , desert trek .
4. Non-healing chronic nodular violaceous ulcer for 4-6weeks or longer .
5. Demonstration of amastigotes in Giemsa-stained smears from infected skin .
6. Demonstration of intracellular amastigotes in dermis of H&E section of skin .
7. Presence of leishmanial granulomas in the dermis in H&E specimens .
8. Growth of promastigotes in Nicole –Novy-MacNeal (NNN) culture medium from lesional specimens .

Confirmation of diagnosis is through the : **a. Demonstration of the parasite in : either** a smear of material from the sore and staining it with **Wright's , Giemsa or Leishman's stains** (by needle aspirate , dental broach or slit-skin smear) , **or** smear material should be cultured on NNN or similar medium .

b. Lesional skin biopsy for culture and histological examination (granuloma with plasma cells) .

c. Leishmanin test will be positive in all forms of cutaneous leishmaniasis once the stage of crusting has been reached , it is negative in diffuse anergic forms . It is called **Montenegro test .** *L. major* is commonly used as culture containing 5000000promastigotes /ml of 0.5% phenol saline , dose of 0.1ml is injected , intradermally in the volar surface of forearm , read it after 48-72hours , **induration >5mm** , means positive test .

d. PCR to detect leishmanial DNA .

Treatment- although most sores will heal **spontaneously** , but the role of treatment is to reduce the duration of the lesions and to minimize the scars formation . There are 2types of therapy :-

1. Local therapy- which includes :-

a. Heating the sore to40-42degree C. for several hours each day by infrared light to promote healing .

b. Freezing by CO2 snow .

c. Local infiltration of the lesions by 1-2ml Na. stibogluconate (pentostam) or meglumine antimoniate (one or two injections of few days apart) , also Nacl solution 7% , or zinc sulphat solution 2%(Iraqi) .

2. Systemic therapy – by Na. stibogluconate or meglumine antimonite by IV or IM injection in a single daily dose of 20mg/kg body weight for 15-21days . **L. aethiopica is** not sensitive to antimony so should be treated with **pentamidine isethionate in dose of 4mg salt/kg** , once weekly for as long as necessary .

For patients with diffuse cutaneous leishmaniasis , treatment for many months beyond clinical and demonstrable parasitic cure was required .

Leishmaniasis recidivans (lupoid) , may respond to local infiltration after nodulectomy or systemic antimonies .

Sever scaring may require plastic surgery .

Diseases caused by Arthropods :-

Mechanisms of skin injury by arthropods : Arthropods produces their effects on the skin by a variety of mechanisms , more than one of which may be implicated simultaneously , which includes :

1. **Mechanical trauma –** the puncture wound or laceration produced by the penetration of the skin seldom causes serous disturbance to the host . There are two methods of feeding on blood : ***vessels feeders** ; which insert tip of their mouthparts into capillary , e.g. lice , mosquito , ***pool feeders ; which lacerate the skin** and damaging the blood vessels and feed on the extravasated blood e.g. flies .
2. **Injection of irritant , cytotoxic or pharmacologically active substances –** salivary secretions and sting venoms may contain various enzymes such as hyaluronidase , proteases , peptidases , phospholipases , kinins , histamine liberating agents , histamine , 5-hydroxytryptamine or acetylcholine , which produce local or if sufficient quantity , systemic effects .
3. **Injection of potential allergens –** the vast majority of reactions to arthropods bites or stings depend upon the presence of specific antibodies to antigenic substances in the

saliva or venom , manifested clinically as an itchy papule , weal reaction , or in some patients as anaphylaxis .

4. **Secondary infections –** e.g. bacteria infections like impetigo , strep. cellulites.
5. **Invasion of the host's tissues –** certain flies causes myiasis (larvae invasion) .
6. **Contact reactions –** ACD or ICD develops by contact with the secretions , living or dead bodies of certain arthropods .
7. **Reactions to retained mouthparts –** as forgin body granuloma .
8. **Transmission of diseases –** arthropods as vectors for many diseases e.g. malaria (mosquitoes) , leishmaniasis (sand fly) and typhus (lice) .

Myiasis:

Definition- is the infestation of the body tissues of humans and animals by the larvae of *Diptera (flies)* . From **entomological** point of view **myiasis** is classified into 3types: **a. Obligatory-** which always pass their larval stage parasitically in the body of an animal **. b. Facultative which usually** developed on decaying flesh or vegetable matter , but may infest wounds **. c. Accidental- in which** the eggs or larvae of *Diptera are ingested* in food or drink , producing intestinal myiasis **. While clinically** myiasis is classified according to the part of the body affected , there are :- **a. Cutaneous myiasis (wound myiasis and furuncular myiasis) . b. Nasopharyngeal myiasis . c. Ophthalmomyiasis . d. Intestinal myiasis . e. Urogenital myiasis .**

Clinical features- the habits of the flies and their larvae determined the variations in the clinical manifestations . **Traumatic or wound** myiasis has been a serious complication of War wounds in tropical areas , and is some times seen in neglected ulcers or wounds in most part of the World .

Obligatory Cutaneous myiasis – occurs in two main clinical forms , in both , there may be mild constitutional symptoms and eosinophilia . **Both** occurs mainly on exposed skin , often **the face , scalp , arms and legs . 1. Furuncular form , boil-like** lesions developed gradually over a few days , each lesion has a central punctum , which discharges serosanguineous fluid . The posterior end of the larvae , equipped with a group of spiracles , is usually visible in the punctum and its movement may be noticed by the patient . The lesions are often extremely painful , and may be accompanied by lymphangitis and regional lymphadenopathy . Once the larvae has emerged , or has been removed , the lesions rapidly resolve , the flies causing furuncular myiasis in humans are Dermatobia hominis , Cuterebra , Cordylobia , and Hypo derma species .

2. Creeping eruption – in which a tortuous , thread –like red line with a terminal vesicle marks the passage of the larvae through the skin . The larvae lies ahead of the vesicle in apparently normal skin , this form is produced by Gasterophilus larvae .

***Treatment* –** by removal of larvae by expression , surgically or application of mineral oil , petrolatum or butter (Vaseline) .

Lice (Phthiraptera) :

Lice are members of the order ***Phthiraptera and suborder Anoplura*** , they are wingless , dorso-ventrally flattened insects , which are obligate blood-sucking ectoparasites of birds and mammals . The *Phthiraptera* are highly host-specific and spend their entire lives on the host .The Anoplura are vessels feeders (solenophages) , introducing their mouthparts directly in to a blood vessels to withdraw blood .

Humans are parasitized by three species of **Anoplura : *Pediculus capitis (head louse) , Pediculus humanus (clothing or body louse) , and Pthirus pubis (pubic or crablouse) .*** Head lice and clothing lice are morphologically almost identical , and are capable of interbreeding , pthirus pubis is morphologically quite distinct from .

Pediculus (Pediculosis) capitis :

The adult female is a grayish –white insect 3-4mm long , the male is slightly smaller , the claws on the legs are adapted for clinging to hair . During her lifespan of approximately 40days , the female is capable of laying about 300eggs at the rate of 7-10daily , the eggs are cemented to hair shafts with a chitinous cement material secreted by the female's accessory glands , close to the surface of the scalp , they are oval , flash cloured , hatch in about 8days , and the louse nymph reaches maturity in approximately 10days , the empty egg (nit) appears white and easily seen .

Prevalence- it has a worldwide distribution , common both in developed and developing countries , more common in rural areas , and in children between 3-11years age , frequently girls , with long hair . The majority of head louse infections are acquired by direct head to head contact , spread of lice is encouraged by poverty , poor hygiene and overcrowding .

Clinical features- scalp pruritis is the characteristic feature of head louse infection (may be asymptomatic) , secondary bacterial infection (impetigo) may occur as a result of scratching . **Pruritic papular** lesions may occur on the nape of the neck , and occasionally a generalized non-specific pruritic eruption develops . The empty egg cases (nits) are easily identified , and occur in greatest density on the parietal and occipital regions , they may be confused with peripilar keratin casts . **Detection** of adult lice and nymphs provides evidence of an active infection , whereas the presence of eggs and egg cases alone merely indicates that infection has occurred at some time.

Treatment :

a. Chemical treatment – which include :

1. Malathion and carbaryl (carbaril) – are acetyl cholinesterase inhibiting insecticides , both are efficient pediculicides and have good , but not complete , ovicidal activity , it is recommended that lotion (alcoholic basis) , and liquid (aqueous basis) formulation of both

should remain on the scalp for 12ho. , before being washed off . Hot-air-hair dryer should not be used after their application , because both are degraded by heat , treatment should be repeated after 10dayes , to deal with any nymphs which emerge from the eggs .

2. Pyrethrins synergized with piperonyl butoxide and the synthetic pyrethroids permethrin and phenothrin – lotion and liquid formulation are preferable to shampoos (latter one exposed the insects to relatively low concentrations , which lead to development of resistance) . Aqueous basis are less likely to irritate an excoriated scalp , than alcoholic solutions , also do not irritate asthmatics , and are not flammable.

3. USA head louse treatment – a combination therapy containing 1% lindane , 1%permethrin , 0.5%malathion and pyrethrin synergized with piperonyl butoxide , carried out on lice and eggs .

b. Physical treatment : is an alternative to the use of chemical agents :-

1. Bug Busting (wet-combing method) – this technique involves ordinary shampooing of the hair , followed by application of generous amounts of conditioner , and combing using a fine –tooth comb to remove lice , is repeated every 4days for 2weeks . malathion lotion was twice as effective as this method .

2. A battery –powered device (Robi-comb) , which kills lice as it used to comb through the hair . **Notes-** family members should be examined , development of resistance changed to an other insecticides .

c. Other therapies :- 1. Topical crotamiton (escabule) lotion .

2. Topical and oral ivermectin (orally 200ug/kg body weight) , as single dose , repeated after 10days , but not ovicidal .

3. Oral co-trimaxazol – which is ingested by the louse and affects its symbiotic bacteria , which are essential for vitamins B synthesis , so the louse cannot survive .

Pediculus (pediculosis) humanus (clothing , body lice , pediculosis corporis) :

It is almost identical in appearance and development to the head louse , it's natural habitant is the clothing of it's host , and it only visits the skin to feed , its eggs are cemented to clothing fibers , with a preference for clothing close to the skin . It is the parasite of individuals whose clothing is rarely changed or washed , because the louse and it's eggs will not survive high temperature washing and ironing , and it is intolerant of temperature changes in it's environment .

Prevalence- it occurs through out the world , although it is now uncommon in developed countries , it is the louse of poverty and neglect , flourished in over crowded , who rarely remove their clothing . In most infected individuals the population is small , but in some there may be thousands of lice . This louse is the **vector of epidemic typhus , trench fever and louse –borne relapsing fever .**

Clinical features- itching is the principle complaint , which is the result of sensitization to louse salivary antigens , other acquired tolerance to the bites are asymptomatic . Itching causes excoriations and there may be secondary bacterial infections , later on the skin often become hyperpigmented (so called **'Vagabonds' disease , morbus errorum) . Lice and eggs should be sought in the clothing .**

***Treatment* –** the clothing , not the patient requires treatment . ***Tumble-drying** is the most effective means of killing both lice and eggs , high temperature **laundering of undergarments and dry** cleaning of outer clothing are also effective .

***Malathion dusting powder , and** more recently **permethrin** treated clothing has been shown to be toxic to clothing lice .

***Previously DDT** (dichlorodiphenyltrichloroethane) and **lindane** are used , but lice resistance was developed .

<u>Phthirus pubis</u> (Crab lice , phthiriasis pubis) :

It is quite distinctive , it's body is squat and the second and third pairs of legs carry heavy , pincer-like claws , to grip adjacent hairs close to the skin surface . The eggs are light brown in colour and cemented to the hair of the host , it colonize axillary hair , eyebrows , eyelashes , beard hair , scalp margins and hair on the trunk and limbs , in addition to pubic hair . The crab louse become active at night , when the host is sleeping , has difficulty in moving when taken from its host , where as the head and body lice are quite mobile out off the host . **Phthirus pubis** is a specific parasite of humans , but it's transfer to a **dog** has been recorded .

Prevalence- crab lice are transmitted by close physical contact , usually sexual , it appears to be a common disorder among sexually active young adults , who are found to be suffering from other sexually transmitted infections (STDS) .

Clinical features- itching mainly in the evening and at night , is the principal symptom , close inspection of affected areas will reveal lice grasping hair close to the skin surface , and louse eggs attached to the hair shafts , louse feces are often visible as rust-coloured speckles on the skin and hair , and the under clothes may be spotted with altered blood . **Blue-grey macules (maculae caeruleae)** are occasionally seen on the skin . In children crab lice may colonize the eyelashes and scalp , which is usually acquired by close physical contact with infected parents and occasionally as a result of sexual abuse .

***Treatment*- malathion , pyrethrins with piperonyl butoxide , pyrethroids and carbaryl** , may be used to eradicate crab lice , it is preferable to treat the whole of the trunk and limbs , and the scalp may also require treatment , an aqueous base is preferable . Treatment should be repeated after an interval of 7-10days , all sexual contacts should also be treated .

Eyelashes infection (phthiriasis palpebrarum) is treated by either mechanical removal of lice and eggs with fine forceps or epilation of the lashes with their attached eggs and lice ,

but petrolatum ointment used as a thick application twice/day for 2-3weeks is the treatment of choice , other methods are criotherapy , argon laser .

Bugs (Hemiptera) including bedbugs :

Bedbugs are blood sucking , temporary ectoparasites of birds and mammals , it is 4-5mm in length , with dorsoventrally flattened , oval bodies , the four wings reduced to scale-like pads , and the hind wings are absent , each female lays about 300eggs in her life-time , in the crevices of floors and walls , furniture , bed frames and mattresses , which hatched after about 10days to nymphal stage , which last approximately 6weeks . Bedbugs normally feed at night , usually about an hour before dawn , but they may feed during the day , in the absence of a suitable food supply , however , adult bedbugs can survive starvation , in ideal circumstances for a year or more .

***Clinical features*-** the bites of the bedbugs are painless , but it produces a reaction on the sites , commonly affected areas are the **face , neck , hands and arms ,** but occasionally be generalized . In the first exposure , only a purpuric macule indicates the site of the bite , but in previously exposed , sensitized subjects , intensely irritating weals or papules surmounted by haemorrhagic puncta , and in some cases in which the reaction is sever , bullae predominate . **Bedbugs act as a possible vectors for transmission of hepatitis B and HIV .**

Bedbugs are one of the causes of papular urticaria .

Papular urticaria :

It is an immediate IgE –mediated reaction , results from injection of forgin protein by biting of insects into skin of the most sensitive subjects , these insects includes : **bedbugs , fleas , mosquito , sand fly and some time sarcoptus scabiaii mite .**

***Clinical features*-** there is a punctum visible on the weal which may blister . Some times the reaction evolves into delayed hypersensitivity reaction leading to intensely itchy , indurated papules lasting weeks or months , with signs of excoriation and some times secondary bacterial infection . It is most commonly seen on the legs of children , also on the forearms , sometimes on the face , during early summer and autium times , usually recurrent for several years .

***Treatment*-** eradication of insects by insecticide (DDT, malathion) , **topical steroid mixed with antibiotic if infection are present , oral antihistamine** to control the itching .

Scabies :

***Definition*-** it is parasitic contagious disease of humans and other animals , caused by mites of the family *Sarcoptidae* , which includes *Sarcoptes scabiei* (scabies mite human) , and *Notoedres cati (a mange mite of cats , which cause scabies in other animals)* .

Human scabies : it is of two types **ordinary and Norwegian scabies .**

1. Ordinary scabies :

Morphology – *Sarcoptes scabiei var-hominis* has ovoid body , flattened dorsoventrally , the adult female measures approximately 0.4mm long by 0.3mm broad , and the smaller male 0.2mm long by 0.15mm broad . The body is creamy white and is marked by transverse corrugations , and on its dorsal surface by bristles and spines (denticles) , has four pairs of short legs . Copulation occurs in a small burrow excavated by the female , the fertilized female enlarges the burrow and begins egg laying . Eggs and mite feces are deposited behind the female in burrow (seballa) , approximately 40-50eggs are laid by each female during lifespan of 4-6weeks , during which time she dose not leave the burrow . After 3-4days the egg hatched , and a six –legged larvae emerge and escape from the burrow , in which they transform into naphs , than maturation to adult males and females . The mites avoid areas with high density of pilosebaceous follicles , the average number of adult female mites on an individual suffering from the common form of scabies is about 12 , while in crusted (Norwegian) scabies , a large number of mites are present .

Prevalence and epidemiology- scabies affects all races and social classes worldwide , both sex affected equally , most common in children and young adults and in winter than summer . In developed countries scabies shows cyclic fluctuation , with an interval of approximately 10-15years , between the end of one epidemic and the beginning of another , this fluctuation suggests that an epidemic of scabies confier a degree of immunity , so that a further epidemic will not occur until a new susceptible population has arisen . **Overcrowding , poverty , poor hygiene and War** encourages the spread of scabies , which is usually transmitted by close physical contact , such as prolonged –hand –holding or the sharing of bed . A way from the host , **scabies mite survive for 24-36hours** , in room conditions (21degree centegrat and 40-80% relative humidity) .

Immunology- evidence suggests that both immediate and delayed type hypersensitivity are involved , IgE level may be normal or elevated in many individuals . **Delayed –type hypersensitivity** in the production of inflammatory papules and nodules is suggested by the histological changes and predominance of T-lymphocytes in the Cutaneous infiltrate , other immunological findings includes high serum IgG and IgM and low IgA , with levels returning to normal after treatment , HLA-A11 is higher among patients with scabies , than in normal population .

Clinical features – itching is usually the most obvious manifestation of scabies , generally worst at night and when the patient is warm . The onset occurs 3-4weeks after the infection is acquired , and coincides with a widespread eruption of inflammatory papules , reification of previously cured individuals , however provokes immediate symptoms . The **pathognomonic** lesions of scabies are burrows , which appears as slightly raised , brownish , tortous lesions . The point of entry of the mite , is the most superficial part of the burrow , has slightly scaly appearance , and the distal end there may be a tiny vesicle adjacent to

which is the female mite . There may be few or many burrows and difficult to find in patients with a good standard of hygiene , burrows occurs on the **wrists , borders of the hands , the sides of the fingers and the finger web spaces , the feet , particularly the instep , and males genitalia .** They are often present on the **palms and soles of the infants , elderly and in adult women , but less frequently found on the palms in men ,** the trunk may be involved in the elderly and in infants , **head and neck in babies , scalp was however** involved in an adult who apply a topical steroid for seborrhoeic dermatitis and scalp involvement in ordinary scabies may be reason for relapse . The reason for this distribution of burrows is not understood , but the mites appears to prefer , non-hairy skin and areas of low sebum production .

The pruritic papules that accompany the development of hypersensitivity occurs predominantly around the axillae , periareolar regions , abdomen , particularly the periumbilical region , buttocks and thighs . **Indurated inflammatory nodules** some times occurs , particularly on the axillae , groins , scrotum and penis , which are intensely itchy , and may persist for weeks or months after the scabies has been effectively treated . Inflammatory papules or nodules on the male genitalla are characteristic of scabies and may provide an important diagnostic clue if burrows are difficult to find .

Nail involvement is uncommon in ordinary scabies , but frequent in crusted (Norwegian) scabies , it's presence may be a reason for relapse . In addition to these primary lesions , secondary features may frequently confuse the clinical picture , eczema , secondary infection (impetigo , folliculitis , glomerulonephritis) , bullous pemphigoid –like eruption .

Scabies in infants and young children , in addition to the more extensive distribution of burrows mentioned above , vesicular and vesiculopustular lesions on the hands and feet are frequent with extensive eczematization is often present .

Diagnosis- the typical history of pruritis , with nocturnal exacerbation , and distribution of the eruption , genital lesions in males are pathognomonic , **The absolute confirmation** can only be made by scraped material placed in a drop of 10%KOH , or mineral oil on a microscopic slide , the **presence of mites , eggs , or fragments of egg shells** confirms the diagnosis , **PCR** is the diagnostic tool in difficult situations .

Treatment- there have been many suggested remedies for scabies :

1. **Sulpher ointment –** 10% sulpher in yellow soft paraffin , is in general , safe and effective for adults , daily application for 3-5days , after path or without , which may cause irritant dermatitis (controlled by mixing with steroid) , **in infants and young children** , a concentration of 2.5-5% may be used .
2. **Benzyl benzoate –** it occurs naturally in balsams of Peru , and now is synthesized , employed as a 25%emulsion , it should remain on the skin for 24%hours , two or three applications , either within 24hours , on successive days or separated by intervals of a week , it is irritant and patients should be warned about overuse .

3. **Monosulfiram –** a 25% solution in industrial methylated spirit is diluted with 2or3parts of water to form emulsion immediately prior to application , as the suspension is unstable , applied once daily for 2-3days , may cause flashing , sweating and tachycardia , monosulfiram soap has been used as a prophylactic , where scabies is endemic .
4. **Malathion -**0.5% in aqueous base , for 24hours , repeated after a week .
5. **Permethrin-** 5% dermal cream is an effective , scabicidal , washed of after 8-12hours , repeated after an interval of a week .
6. **Gamma benzene hexachloride (lindane)-** a single application of 1%washed off after 12-24hours is usually recommended , it is absorbed through the skin , especially if the barrier function of the epidermis is compromised , which may be result in adverse neurological effects , principally seizures .
7. **Other topical treatments-** includes thiabendazole and crotamiton , both have limited scabicidal activity , and several applications on consecutive days are required .
8. **Ivermectin –** is structurally similar to the macrolide antibiotics , but dose not have antibacterial activity , it is active against a number of ecto-andoparasites . Can be used topically or orally and is safe in both children and adult , a single dose of 200ug/kg of body weight will be effective in many cases of ordinary scabies , but presumably because of a lack of ovicidal activity , higher cure rates are obtained with two doses separated by an interval of a week , it is indicated in institutional outbreaks of scabies e.g. in prisoners .

It was suggested that permethrin 5% , is the preferred treatment for scabies in the present time .

Liquid scabicides are most conveniently applied with 2-inch (5cm) pain brush , to the whole body except the head and neck , although the latter should be included if there is clinical evidence of involvement and a non-irritant agent employed . **Advice that itching** will persist for a few days up to 2weeks , **All members** of the family and close physical contacts should be treated , whether symptomatic or not , and ordinary laundering of clothing and bedding , with treatment of secondary infection and eczematization .

Treatment of infants and young children –benzyl benzoate should be diluted with 2or3 parts of water , permethrin cream is the treatment of choice .All scabicides must have been used on **pregnant women , in breast feeding women** , it would appear preferable to stop breast feeding during and for few days after treatment , to allow plasma levels of any percutaneously absorbed scabicide to fall .

Crusted scabies (Norwegian scabies) :

It is firstly described in Norway , so called Norwegian scabies , in which **huge number of mites** were presented , it's name was replaced by crusted scabies .

***Aetiology and pathogenesis* –** in common or ordinary scabies there are few mites , probably because scratching destroys the burrows and a good standard of hygiene may also help to control the mite population . **In crusted scabies** , the host's response to the mites is modified , allowing them to multiply , skin anesthesia secondary to sensory neuropathy or spinal injury , mental retardation , dementia and down's syndrome is frequent association , immunosuppression is also important factor (either due to disease or therapy) .

Clinical features- large , warty , crusts form on the hands and feet , the palms and soles may be irregularly thickened and fissured , masses of horny debris accumulate beneath thickened and discoloured nail . Erythema and scaling occurs on the face , neck , scalp and trunk and may be generalized , the extent of the erythroderma and the warty plaques varies greatly and either may predominant , itching is often absent or slight , but may occasionally be sever . **Generalized lymphadenopathy** and blood eosinophilia are common .

Diagnosis – DD. from hyperkeratotic eczema , psoriasis , Dariers's disease and contact dermatitis , the clinical diagnosis is readily confirmed by examination of scraping for mites and eggs .

Treatment- admission to hospital , treated by topical scabicides , but several applications for prolonged period is often required and incomplete response is not uncommon . Recently ivermectin has become the treatment of choice , either alone or in combination with topical agent , **two doses of (200ug/kg)** , separated by an interval of week and cut the nails shortly .