

## Vector-borne Infectious Diseases in Pakistan

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Vector-borne Disease:	Incubation Period:	Agent:	Mode of Transmission/ Vector:	Epidemiology:	Remarks:
Crimean-Congo Hemorrhagic Fever		Crimean-Congo hemorrhagic fever virus <i>Nairovirus</i> , Bunyaviridae	<b>Transmission:</b> Bite or exposure to hard tick cell material, mostly <i>Hyalomma</i> spp. <b>Primary vectors:</b> <i>Hyalomma marginatum</i> , <i>Boophilus microplus</i> <b>Secondary vectors:</b> <i>H. anatolicum</i> , <i>H. detritum</i> , <i>H. dromedarii</i> , <i>H. impeltatum</i> , <i>H. schulzei</i> , <i>H. Asiaticum</i> ; also, the argasid (soft) tick <i>Ornithodoros lahorensis</i>	<b>Transmission period:</b> Primary transmission (ticks) mainly from May-Oct. <b>Incidence and seroprevalence:</b> Nationwide evidence of CCHF viral antibodies; cases have increased rapidly in the last 10 years; May-Nov. 2000 epidemic with at least 15 deaths from CCHF in Baluchistan near the Iranian border; 21 official cases resulting in death from CCHF in 2000 (12 in Loralai; 5 in Karachi; 3 in Quetta); Islamabad and Peshawar	<b>Preventive measures:</b> - Avoidance of old animal stables, etc. - Use insect repellent and permethrin-treated uniform (permethrin is a more effective repellent than DEET) - Search/removal of hard ticks from self and companions - Never crush <i>Hyalomma</i> and <i>Boophilus</i> ticks, even attached ones (contact infection) - During outbreaks, do not handle dead animals, especially hemorrhaging ones, without protection

				<p>each had 2 deaths in 2001</p> <p><b>Habitat:</b> Vector ticks inhabit dry areas, animal stables and trails, and former pastures</p> <p><b>Bite properties:</b> Hard ticks of the genus <i>Hyalomma</i> feed at one spot for several days on the same host and fall off freely after feeding; larvae and nymphs bite small mammals; adults prefer larger mammals or humans and are not host specific; fasting adult ticks survive up to 4 years; members of this genus actively seek out hosts; <i>Hyalomma marginatum</i> is both a vector and reservoir of CCHF, which is transmitted transovarially, transstadially and venereally</p>	
Dengue Fever; Dengue Hemorrhagic Fever (DHF)		Dengue fever virus, serotypes 1 and 2 (Flaviviridae)	<p><b>Transmission:</b> Bite of <i>Aedes aegypti</i> or other <i>Aedes</i> species</p> <p><b>Primary vectors:</b> <i>Aedes aegypti</i> (yellow fever mosquito), <i>Ae. albopictus</i> (Asian tiger</p>	<p><b>Transmission period:</b> May to Oct.</p> <p><b>Incidence and seroprevalence:</b> Evidence of dengue fever in southeastern Pakistan since 1985; DHF first</p>	<p><b>Preventive measures:</b></p> <ul style="list-style-type: none"> <li>- Larval mosquito control and abatement</li> <li>- Use insect repellent and permethrin-treated uniform</li> <li>- Install mosquito screens</li> </ul>

			<p>mosquito)</p> <p><b>Secondary Vectors:</b>  <i>Ae. scutellaris</i>, other  <i>Aedes</i> species</p>	<p>occurred in Karachi in 1994 with 5 deaths; 1995 outbreak in a factory in Baluchistan Province, in which 57 of 76 workers were infected; currently (1998), it is assumed that in the Karachi area up to 26% of all undifferentiated fevers are JE infections; no further epidemiological data are available at this time</p> <p><b>Bite properties:</b>  <i>Aedes aegypti</i> and <i>Ae. albopictus</i> bite outdoors during the day but also at dusk and indoors (endophilic, endophagic); extremely aggressive biters; flight radius up to approx. 500 m; transmission mode <i>Ae. aegypti</i>: urban; <i>Ae. albopictus</i>: rural</p> <p><b>Breeding properties:</b>  <i>Aedes aegypti</i> breeds in any available bodies of water in urban areas, also in the drainage dishes of flowerpots, automobile tires, cans, etc. <i>Aedes</i></p>	<p>on windows and doors and treat with permethrin or other long-acting pyrethroid</p>
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				<i>albopictus</i> usually breeds in tree knots, cisterns, etc.	
Sand Fly Fever (Papatasi Fever)		Sandfly fever virus, <i>Phlebovirus</i> , Bunyaviridae, Sicilian, Naples, Karimabad and Salehabad serotypes	<p><b>Transmission:</b> Sand fly bite</p> <p><b>Primary vector:</b> <i>Phlebotomus papatasi</i> (nationwide)</p> <p><b>Secondary vectors:</b> <i>P. sergenti</i> (nationwide), <i>P. major</i> (nationwide except in the extreme north and south), <i>P. salehi</i> (southern 2/3 of the country), <i>P. longiductus</i> (extreme north), <i>P. argentipes</i> (along the entire Indian border)</p>	<p><b>Transmission period:</b> April-Sept. (peaks in early June and in August), transovarial transmission possible</p> <p><b>Incidence and seroprevalence:</b> Sicilian and Naples serotypes are endemic nationally; Karimabad and Salehabad are focally endemic, particularly in urban and rural areas; seroprevalence in Pakistani soldiers 27 - 70% (Naples+Sicilian), Karimabad + Salehabad 0.3 - 2.1% in the general population</p> <p><b>Breeding grounds:</b> see <i>L. t. major</i></p> <p><b>Bite properties:</b> see <i>L. t. major</i></p>	Same as cutaneous leishmaniasis ( <i>L. t. minor</i> )
West Nile Fever		West Nile fever virus, <i>Flavivirus</i> , Flaviviridae	<p><b>Transmission:</b> Bite of <i>Culex</i> house mosquito</p> <p><b>Primary vector:</b> <i>Culex tritaenorrhynchus</i></p> <p><b>Secondary vectors:</b> various mosquitoes, such</p>	<p><b>Transmission period:</b> Year-round with peak in May-June</p> <p><b>Incidence and seroprevalence:</b> Endemic nationally and</p>	<p><b>Preventive measures:</b></p> <p>- <b>Indoors:</b> Permethrin-treated mosquito nets or insect repellent; Install mosquito screens</p>

			<p>as <i>Culex modestus</i>; also, the hard tick <i>Hyalomma marginatum</i></p> <p><b>Reservoirs:</b> Birds</p>	<p>known to be present since 1982; in Karachi approx. 50% of patients with encephalitis were WNV seropositive; Chiniot region (1983-85) 32.8% seropositivity; Changa Manga National Forest region 38.5% seropositivity; seroprevalence in Pakistani soldiers (1996) 33-41%</p> <p><b>Bite properties:</b> <i>Culex</i> mosquitoes bite at dawn and dusk as well as indoors (endophilic, endophagic); <i>Cx. tritaeniorrhynchus</i> is endo- and exophagic in urban areas; infectious females overwinter in buildings, cellars, and animal stables, sometimes in large numbers</p> <p><b>Breeding grounds:</b> Though there is some species-specific variation, the principal vectors (<i>Culex pipiens</i>, <i>Cx. modestus</i>) thrive in any available small, stagnant</p>	<p>on windows</p> <p><b>- Outdoors:</b> Larval mosquito control; use insect repellent combined with permethrin-treated uniform; eliminate potential breeding sites, such as cans and containers</p>
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				or polluted small bodies of water (cisterns, buckets, cans, old tires, etc.) in urban areas	
Sindbis Fever		Sindbis fever virus, <i>Alphavirus</i> , Togaviridae	<p><b>Transmission:</b> Mosquito bite</p> <p><b>Primary vectors:</b> <i>Culex modestus</i>, <i>Cx. tritaeniorhynchus</i></p> <p><b>Secondary Vectors:</b> Other mosquitoes, such as <i>Cx. pseudovishnui</i>, <i>Aedes</i> ssp.</p> <p><b>Reservoirs:</b> Birds, rarely rodents (rats and mice)</p>	<p><b>Transmission period:</b> May-Sept.</p> <p><b>Incidence and seroprevalence:</b> At least in the north; probably endemic nationally; seroprevalence between 1.3 and 1.6% (1983)</p> <p><b>Bite properties:</b> <i>Culex</i> mosquitoes bite at dawn and dusk and also indoors; the females winter in basements, etc.,</p> <p><b>- Breeding grounds:</b> Vectors thrive in any available small, stagnant or polluted bodies of water (cisterns, buckets, cans, old tires, etc.) in urban areas</p>	<p><b>Preventive measures:</b></p> <p><b>- Indoors:</b> Permethrin-treated mosquito nets or insect repellent</p> <p><b>- Outdoors:</b> Larval mosquito control; use insect repellent combined with permethrin-treated uniform</p>
Japanese Encephalitis		Japanese encephalitis virus, <i>Flavivirus</i> , Flaviviridae	<p><b>Transmission:</b> Bite of <i>Culex</i>, <i>Anopheles</i> or other mosquitoes</p> <p><b>Primary vectors:</b> <i>Culex tritaeniorhynchus</i> (nationwide), <i>Cx. pseudovishnui</i></p>	<p><b>Transmission period:</b> Year-round with peak from June-Jan.</p> <p><b>Incidence and seroprevalence:</b> Nationwide, similar to the range of the JE primary</p>	<p><b>Preventive measures:</b></p> <p><b>- Indoors:</b> Permethrin-treated mosquito nets or insect repellent; install mosquito screens on windows</p> <p><b>- Outdoors:</b></p>

			<p><b>Secondary vectors:</b> <i>Cx. gelidus</i>, <i>Mansonia uniformis</i>, <i>M. indiana</i>, other mosquito species</p> <p><b>Reservoirs:</b> Humans, hogs</p>	<p>vector <i>Cx. tritaeniorhynchus</i>; endemic in at least the southern half of the country; 9 possible cases in 1983 in Karachi; seroprevalence 3.2% in 1983; approx. 4% of encephalitides in the Karachi area were JE seropositive in 1992; occurrence of other cases in 1995; no further epidemiological data are available at this time</p> <p><b>Bite properties:</b> Female <i>Culex</i> mosquitoes bite at dawn and dusk as well as indoors; females winter in basements etc.; flight radius up to 2 km</p> <p><b>Breeding grounds:</b> <i>Culex</i> mosquitoes thrive in small, stagnant or polluted bodies of water (cisterns, buckets, cans, old tires, etc.) in urban areas</p>	<p>Larval mosquito control; use insect repellent combined with permethrin-treated uniform; eliminate all potential mosquito breeding sites, such as containers, cans, buckets</p>
Bhanja Fever, Bhanja Encephalitis		Bhanja fever virus (unclassified Bunyavirus)	<p><b>Transmission:</b> Infectious hard tick bite</p> <p><b>Primary vectors:</b> <i>Hyalomma marginatum</i>, <i>H. detritum</i> (sheep ticks)</p>	<p><b>Transmission period:</b> May to Oct.</p> <p><b>Incidence and seroprevalence:</b> Disease is probably</p>	<p><b>Preventive measures:</b> - Avoidance of sheep stables, sheep pastures, etc. - Search/removal of hard</p>

			<p><b>Secondary vectors:</b> Other hard ticks</p> <p><b>Reservoirs:</b> Sheep, goats, cattle</p>	<p>endemic nationally; seroprevalence 12.1% (1983); no additional epidemiological data are available at this time</p> <p><b>Bite properties:</b> Sheep ticks also afflict humans; they feed at one spot for several days; adults linger near sheep stables, pastures, etc., where they can fast for 2 - 3 years</p>	<p>ticks from self and companions</p> <p>- Use insect repellent and permethrin-treated uniform</p>
Dhori Fever Virus		Dhori virus, <i>Thogotovirus</i> , Orthomyxoviridae	<p><b>Transmission:</b> Bite of various hard ticks</p> <p><b>Primary vectors:</b> <i>Hyalomma dromedarii</i> (camel tick), <i>H. marginatum</i> (sheep tick) (both nationwide)</p> <p><b>Secondary Vectors:</b> <i>Dermacentor marginatus</i> (sheep tick), other hard ticks</p> <p><b>Reservoirs:</b> Camels, horses, goats,</p>	<p><b>Transmission period:</b> May to Oct.</p> <p><b>Incidence and seroprevalence:</b> Probably endemic nationwide, but at a low level; seroprevalence (1983) 0.3 to 2.1%; no additional epidemiological data are available at this time</p> <p><b>Habitat:</b> Vector ticks inhabit dry areas, animal stables and trails, and former pastures</p> <p><b>Bite properties:</b> Hard ticks of the genus <i>Hyalomma</i> feed at one spot for several days on</p>	<p><b>Preventive measures:</b></p> <p>- Use insect repellent and permethrin-treated uniform</p> <p>- Search for attached ticks on self and companions</p> <p>- For infestations indoors, use an acaricide or barrier spray (e.g., Propoxur(=B5))</p>

				the same host and fall off freely after feeding; larvae and nymphs bite small mammals; larger nymphs and adults prefer larger mammals or humans and are not host specific; fasting adults survive up to 4 years	
Chikungunya Fever		Chikungunya fever virus, <i>Alphavirus</i> , <i>Togaviridae</i>	<p><b>Transmission:</b> Bite of <i>Aedes</i> mosquitoes</p> <p><b>Primary vectors:</b> <i>Aedes aegypti</i> (yellow fever mosquito), <i>Culex tritaeniorhynchus</i></p> <p><b>Secondary vectors:</b> other <i>Aedes</i>, <i>Mansonia</i> and <i>Culex</i> species</p>	<p><b>Transmission period:</b> Year-round with peaks after rainy periods</p> <p><b>Incidence and seroprevalence:</b> Probably endemic nationally; seroprevalence 1.3-1.6% (1983); antibodies have been found in animal reservoirs (monkeys, rodents) in central and southern provinces; human cases have not yet been reported; human seroprevalence data are not available at this time</p> <p><b>Bite properties:</b> Because of the multiplicity of potential vectors, CHIK is transmitted during the day, at dawn and dusk, indoors and outdoors, and in both rural and urban</p>	<p><b>Preventive measures:</b></p> <ul style="list-style-type: none"> <li>- Larval mosquito control and abatement</li> <li>- Use insect repellent and permethrin-treated uniform</li> <li>- Mount fly screens on openings in buildings during urban transmission cycles</li> </ul>

				<p>areas</p> <p><b>Breeding grounds:</b>  <i>Aedes aegypti</i> und <i>Culex tritaeniorrhynchus</i> thrive in any available small, stagnant or polluted bodies of water (cisterns, buckets, cans, old tires, etc.) in urban areas; other vector species inhabit forests and forest edges, where they breed mostly in stagnant water, wetlands, knotholes and plants</p>	
Hemorrhagic Fever with Renal Syndrome		Hantaviruses of the Seoul, Hantaan, and Puumala serotypes	<p><b>Transmission:</b> Contact with infectious dust or aerosols (rodent excrement, rodent urine), contact with infectious feces or urine; secondarily, by vectors such as hematophagous mites</p> <p><b>Primary vectors/reservoirs</b> (nationwide incidence)</p> <p>- <b>Seoul serotype:</b> House and brown rats</p> <p>- <b>Hantaan serotype:</b> <i>Apodemus agrarius</i> (striped field mouse),</p> <p>- <b>Puumala serotype:</b> <i>Clethrionomys glareolus</i></p>	<p><b>Incidence and seroprevalence:</b> Endemic in at least the country's extreme north; there are no official case data on Hantaan virus in Pakistan; a Hantaan virus serosurvey of 570 Pakistani soldiers (1996) showed no positive results; HFRS is still a serious problem in neighboring China, with more then 100,000 cases/year; all rodent reservoirs, especially rats, striped field mice (<i>Apodemus agrarius</i>), and prairie voles (<i>Microtus</i></p>	<p><b>Preventive measures:</b></p> <p>- In urban/camp areas: eradication of synanthropic rodents (rats and mice) by the combined implementation of rodenticide (poison-baiting) with structural preventive measures, as well as hygienic measures ( optimized waste disposal, for example); cleansing of all affected areas of rodent excrement, including upstream</p> <p>- In rural and sylvatic areas, use pourable poison bait for epidemic control</p>

			(bank vole), <i>Microtus</i> sp. (prairie vole) <i>Ondatra zibethicus</i> (muskrat)	spp.) are endemic in the northern 1/3 of the country <b>Transmission period:</b> Peaks in spring and fall, year-round transmission possible in synanthropic rodents (rats) <b>Mode of transmission:</b> - Transmission can be sylvatic, rural or urban, depending on the behavior patterns of the vector/reservoir species and their level of synanthropy - Rodents release urine in tiny droplets (micromicturition) to mark territory; transmission of virus via aerosol or dust is therefore very efficient	of prairie voles and field mice, if licensed
Boutonneuse Fever (Mediterranean Fever)		<i>Rickettsia conorii</i>	<b>Transmission:</b> Bite of various hard ticks <b>Primary vectors:</b> <i>Rhipicephalus sanguineus</i> (brown dog tick) (nationwide), <i>Haemaphysalis</i> spp. (eastern 1/2 of the country) <b>Secondary vectors:</b> <i>Dermacentor</i> spp.,	<b>Transmission period:</b> May-Oct., year-round in cases of building infestations or chronic infestations in dogs and other house pets <b>Incidence and seroprevalence:</b> Endemic nationally; 1991 seroprevalence for tick-borne rickettsia was 18%;	<b>Preventive measures:</b> - Avoid contact with dogs, house pets and livestock - Use insect repellent and permethrin-treated uniform - For infestations indoors, use an acaricide or barrier spray (e.g., Propoxur(=B5)), since the tick species listed actively

			<p><i>Haemaphysalis</i> ssp., <i>Hyalomma</i> ssp., <i>Boophilus</i> ssp., <i>Rhipicephalus</i> ssp.,</p> <p><b>Reservoir:</b> Wild rodents, other mammals</p>	<p>for tick-borne epidemic typhus fever rickettsia 13%; no further epidemiological data are available at this time</p> <p><b>Bite properties:</b> Hard ticks also afflict humans; they feed at one spot for several days; females lay up to 2,000 eggs (depending on species) in residential buildings, where the larvae hatch and attack humans and domestic animals</p>	<p>seek out humans</p>
Siberian Tick Typhus		<i>Rickettsia sibirica</i>	<p><b>Transmission:</b> Bite of hard ticks, especially sheep ticks of the genera <i>Dermacentor</i>, <i>Hyalomma</i> and <i>Haemaphysalis</i></p> <p><b>Primary vector:</b> <i>Hyalomma marginatum</i></p>	<p><b>Transmission period:</b> March-Oct.</p> <p><b>Incidence and seroprevalence:</b> Endemic, at least in the north; 1991 seroprevalence for tick- borne rickettsia was 18%; for tick-borne epidemic typhus fever rickettsia 13%; no further epidemiological data are available at this time</p> <p><b>Bite properties:</b> Sheep ticks also afflict humans; they feed at one spot for several days;</p>	<p><b>Preventive measures:</b></p> <ul style="list-style-type: none"> <li>- Avoidance of sheep stables, sheep pastures, etc.</li> <li>- Search/removal of hard ticks from self and companions</li> <li>- Use insect repellent and permethrin-treated uniform</li> </ul>

				adults linger near sheep stables, pastures, etc., where they can fast for 2 to 3 years; sheep ticks cannot reproduce in heating living quarters	
Mite-borne Typhus (Tsutsugamushi Fever)		<i>Orientia</i> (formerly <i>Rickettsia</i> ) <i>tsutsugamushi</i> , Karp und Gilliam serotypes	<p><b>Transmission:</b> Bite from larval red (trombiculid) mites (about 0.1mm in size)</p> <p><b>Primary vectors:</b> <i>Leptotrombidium deliense</i>, <i>L. akamushi</i>, <i>L. fletcheri</i>, possibly other species</p> <p><b>Reservoirs:</b> Rodents and red mites</p>	<p><b>Transmission period:</b> Year-round with peak from April-December</p> <p><b>Incidence and seroprevalence:</b> Focal at an unknown epidemiological level; regional occurrence of the disease is strongly localized (“hot-spots”) in mountainous regions of greater Quetta and Peshawar as well as in the Kardu region (mostly southern slopes); transovarial transmission possible; vectors inhabit mountains up to 3,200 m; current epidemiological data are not available</p> <p><b>Bite properties:</b> The larval mites are six-legged (but are not insects), very small (ca. 0.1mm), very fast, red to dark in color, and bite at</p>	<p><b>Preventive measures:</b></p> <ul style="list-style-type: none"> <li>- Use insect repellent and permethrin-treated uniform; permethrin is a more effective repellent than skin protectants with the active ingredient DEET</li> <li>- Minimize exposed skin (long pants)</li> <li>- Avoid known red mite habitat (grassy savannahs).</li> <li>- Due to their small size, larval mites are very hard to see; conduct surveys by placing a sheet of white paper on the ground</li> </ul>

				any opportunity, day or night; scratching itchy, bitten skin may lead to secondary infections	
Louse-borne Typhus, Epidemic Typhus		<i>Rickettsia prowazeki</i>	<p><b>Transmission:</b> Intake of infectious body louse material</p> <p><b>Primary vector:</b> <i>Pediculus humanus</i> (body louse)</p> <p><b>Reservoir:</b> Humans (Brill-Zinsser disease)</p>	<p><b>Transmission period:</b> Predominantly during the winter months from Dec. - April.</p> <p><b>Incidence and seroprevalence:</b> Hyperendemic along the Afghan border and in the mountainous areas of the country's northern 1/3; no further epidemiological data are available at this time</p> <p><b>Bite properties:</b> Lice live in human clothing and deposit their eggs (nits) there; they reach sexual maturity 2-3 weeks after hatching and require a blood meal at least every 6 days; transmission of the agent occurs via inhalation of louse feces or by scratching infected louse material (crushed louse tissue) into bite wounds; louse-borne typhus is highly dependent on the</p>	<p><b>Preventive measures:</b></p> <p><b>- In endemic and epidemic regions:</b></p> <ul style="list-style-type: none"> <li>- Report every case of louse infestation</li> <li>- Since insect powders for the mass control of body lice are no longer available NATO-wide, treatment of clothing is the only available recourse</li> <li>- Never “break off” body lice; this is one of the primary modes of infection (by scratching into the wound infectious louse cells under the fingernails)</li> <li>- Resistance: DDT</li> </ul>

				socio-economic environment (i.e., refugees, refugee camps)	
Five-Day Fever, Wolhynia (Trench) Fever		<i>Bartonella quintana</i>	<p><b>Transmission:</b> Intake of infectious body louse material</p> <p><b>Primary vector:</b> <i>Pediculus humanus</i> (body louse)</p> <p><b>Reservoir:</b> Humans</p>	<p><b>Transmission period:</b> Predominantly in mountain regions and during the winter months from Dec. - April.</p> <p><b>Incidence and seroprevalence:</b> Hyperendemic along the Afghan border and in mountainous areas of the country's northern 1/3; no further epidemiological data are available at this time</p> <p><b>Bite properties:</b> Lice live in human clothing and deposit their eggs (nits) there; they reach sexual maturity 2-3 weeks after hatching and require a blood meal at least every 6 days; transmission of the agent occurs via inhalation of louse feces or by scratching infected louse material (crushed louse tissue) into the bite wound; louse-borne typhus is highly</p>	<p><b>Preventive measures:</b></p> <p><b>- In endemic and epidemic regions:</b></p> <ul style="list-style-type: none"> <li>- Report every case of louse infestation</li> <li>- Since insect powders for the mass control of body lice are no longer available NATO-wide, treatment of clothing must be relied on as the only available recourse</li> <li>- Never “break off” body lice; this is one of the primary modes of infection (by scratching into the wound infectious louse cells under the fingernails)</li> <li>- Resistance: DDT</li> </ul>

				dependent on the socio-economic environment (i.e., refugees, refugee camps)	
Murine Typhus, Endemic Typhus Fever		<i>Rickettsia typhi</i>	<p><b>Transmission:</b> Intake of infectious rodent flea material (cellular or fecal)</p> <p><b>Primary vectors:</b> <i>Xenopsylla astia</i> (rat flea), <i>X. cheopis</i> (southern rat flea), <i>Pulex irritans</i> (human flea)</p> <p><b>Secondary Vectors:</b> Other flea species</p> <p><b>Reservoirs:</b> Rats harboring the enzootic vector <i>Polyplax spinulosa</i> (rat louse), <i>Ornithonyssus bacoti</i> (tropical rat mite)</p>	<p><b>Transmission period:</b> Year round in cases of rat infestation</p> <p><b>Incidence and seroprevalence:</b> Endemic nationwide except for the extreme north and south; no additional epidemiological data are available at this time</p> <p><b>Bite properties:</b> Rat fleas are nest specific, not host specific; all animal fleas also bite humans; fleas survive approx. 10 days without a blood meal, up to two months in low temperatures; transmission of the agent occurs by inhalation or by absorption (scratching) of infectious flea material (crushed fleas or flea feces) into wounds</p>	<p><b>Preventive measures:</b></p> <p>- <b>Indoors:</b> Regular eradication of rats and cleaning of buildings</p> <p>- <b>Outdoors:</b> Flea control with subsequent rat and rodent control (urban rodent plague)</p>
Epidemic Relapsing Fever		<i>Borrelia recurrentis</i>	<p><b>Transmission:</b> By scratching of infected body louse material into</p>	<p><b>Transmission period:</b> Predominantly during the winter months from Dec. -</p>	<p><b>Preventive measures:</b></p> <p>- <b>In endemic and epidemic regions:</b></p>

			wounds <b>Primary vector:</b> <i>Pediculus humanus</i> (body louse)	April. <b>Incidence and seroprevalence:</b> Endemic nationally at a low, but rising level; further epidemiological data are not available at this time <b>Bite properties:</b> Lice live in human clothing and deposit their eggs (nits) there; they reach sexual maturity 2-3 weeks after hatching and require a blood meal at least every 6 days; transmission of the agent occurs by scratching of infected louse material (crushed louse tissue) into the bite wound; epidemic louse-borne relapsing fever is extremely dependent on the socio-economic environment (i.e., refugees, refugee camps)	- Report every case of louse infestation - Since insect powders for the mass control of body lice are no longer available NATO-wide, treatment of clothing is the only available recourse - Never “break off” body lice; this is one of the primary modes of infection (by scratching into the wound infectious louse cells under the fingernails) - Resistance: DDT
Plague		<i>Yersinia pestis</i>	<b>Transmission:</b> (only urban rodent plague): fleas <b>Primary vectors:</b> <i>Xenopsylla astia</i> (Indian rat flea; country’s southern 1/3), <i>X. cheopis</i> (southern	<b>Transmission period:</b> Possible year-round in cases of house rat infestation <b>Incidence and seroprevalence:</b>	<b>Preventive measures:</b> - <b>Indoors:</b> Permethrin-treated mosquito nets; insect repellent, rat control - <b>Outdoors:</b> Use insect repellent and permethrin-

			<p>rat flea; eastern ½ of the country), <i>Pulex irritans</i> (human flea)</p> <p><b>Secondary vectors:</b> <i>Ctenocephalides canis</i> (dog flea), <i>C. felis</i> (cat flea), <i>Pulex irritans</i> (human flea), various rodent fleas</p> <p><b>Urban reservoir:</b> House rats (<i>Rattus rattus</i>)</p> <p><b>Sylvatic reservoirs:</b> <i>Meriones</i> ssp. (various gerbils), Microtinae (meadow mice)</p>	<p>Enzootic sylvatic rodent plague is endemic in the extreme north (Lasht, Gilgit, Skardu); cases of human bubonic plague tend to be isolated; further epidemiological data are not available at this time</p> <p><b>Breeding grounds:</b> Fleas are nest specific, occurring chiefly in the resting places of their hosts</p> <p><b>Bite properties:</b> Rat fleas are nest specific, not host specific; all animal fleas also bite humans; fleas survive approx. 10 days without a blood meal, up to 2 months at low temperatures; a plague-infested flea lives an average of 3.2 days, since fleas inject adjuvant into the wound when they bite, and plague-infected fleas experience a “blood thrombus” in the esophagus because of the coagulase activity of <i>Y. pestis</i> (thus clotting blood); fleas take a test bite that strongly increases</p>	<p>treated uniform</p> <p><b>- In urban plague focus:</b> First, rat flea control with nondispersive insect powder (e.g., Nexion, active agent: Bromophos), then rat eradication using rodenticides</p> <p><b>- Flea monitoring:</b> If more than 5 rat fleas per rat are found in a rodent plague-endemic region (accumulation on the surviving rodents), a rodent plague epidemic is to be assumed</p>
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				the probability of transmission of the plague agent to humans	
Endemic Relapsing Fever (Tick-borne Relapsing Fever)		<i>Borrelia persica</i>	<p><b>Transmission:</b> Bites of soft ticks or fluid from coxal glands of male or female <i>Ornithodoros</i> spp.</p> <p><b>Primary vectors:</b> <i>Ornithodoros tholozani</i> and <i>O. lahorensis</i> (both nationwide)</p> <p><b>Secondary vectors:</b> Other <i>Ornithodoros</i> species</p> <p><b>Reservoirs:</b> Wild rodents</p>	<p><b>Transmission period:</b> May-Oct., year-round in cases of building infestations</p> <p><b>Incidence and seroprevalence:</b> Endemic in the country's northern 1/3; cases tend to be sporadic and are increasing in frequency; further epidemiological data are not available at this time</p> <p><b>abitat:</b> Soft ticks live hidden in walls, cracks, animal stables, well walls, and other protected areas, often up to 1 m deep</p> <p><b>Bite properties:</b> Soft ticks (all stages) bite primarily at night for 5-10 min.; due to the release of a neurotoxin, the bite is seldom noticed; life cycle may exceed 10 years, depending on species and living conditions; capable of fasting in infectious state for several years</p>	<p><b>Preventive measures:</b></p> <p>- <b>Indoors:</b> Soft tick monitoring and control with acaricide barrier spray. Use treated mosquito nets</p> <p>- Never camp in houses where livestock are kept</p> <p>- <b>Outdoors:</b> Use insect repellent and permethrin-treated uniform; acaricide barrier (with Propoxur (=B5)), avoidance of old animal stables, caravansaries, etc.</p>

Leptospirosis		<i>Leptospira icterohaemorrhagiae</i> , <i>Leptospira</i> ssp.	<p><b>Transmission:</b> Via contaminated water through active skin penetration by the bacteria (agrarian mode of transmission), as well as through contact with infectious rodent urine and animal material (rural/urban by rodent infestation or infected livestock)</p> <p><b>Primary vectors:</b> Brown rat (<i>Rattus norvegicus</i>), hogs, mice, livestock</p> <p><b>Secondary vectors:</b> Other mammals</p> <p><b>Reservoirs:</b> Rats, other mammals</p>	<p><b>Transmission period:</b> Year-round</p> <p><b>Incidence and seroprevalence:</b> Endemic nationally; seroprevalence in Pakistani soldiers 1-6% (1996); 11% of patients with non-A non-B hepatitis had acute antibody levels against leptospire (1996); no further epidemiological data are available at this time</p> <p><b>Mode of transmission:</b> - Special note: micromicturition of infected synanthropic rodents, such as rats, which constantly emit urine in tiny droplets. Leptospiral reservoirs spread the agent very efficiently over large areas; therefore, after rodents have been successfully cleared from an area, disinfection of the entire area must be considered</p>	<p><b>Preventive measures:</b></p> <ul style="list-style-type: none"> <li>- Avoid contaminated waters</li> <li>- Rat and rodent control over a large area around the camp with subsequent surface disinfection</li> <li>- Minimize contact with livestock</li> </ul>
Cutaneous Leishmaniasis		<i>Leishmania tropica major</i>	<b>Transmission:</b> Sand fly bite	<b>Transmission period:</b> Year-round with a peak	<b>Preventive measures:</b> - <b>Indoors:</b> Use

(Zoonotic)			<p><b>Primary vectors:</b> - <i>Phlebotomus papatasi</i> (human transmission cycle; nationwide), <i>P. salehi</i>, <i>P. papatasi</i> (zoonotic transmission cycle)</p> <p><b>Secondary vectors:</b> <i>P. sergenti</i> (nationwide), <i>P. major</i> (nearly nationwide), <i>P. longiductus</i> (only in the north), <i>P. argentipes</i> (entire Indian border)</p> <p><b>Reservoirs:</b> Wild rodents such as <i>Rhombomys opimus</i> (gerbil), <i>Meriones erythrorurus</i>, <i>M. hurricanae</i>, <i>M. meridianus</i></p>	<p>from April - Oct.</p> <p><b>Incidence and seroprevalence:</b> Endemic at least in southern Punjab and the northern half of Sindh; no further epidemiological data are available at this time, but the disease is increasing rapidly and contributing to widespread epidemics</p> <p><b>Breeding grounds:</b> Sand flies breed in decaying matter; larvae develop in moist, dark places, especially in the nests of reservoir rodents</p> <p><b>Bite properties:</b> Female sand flies bite at dusk and dawn; poor fliers, only active when no wind is present; actively migrate indoors to bite (endophilic, endophagic); regularly penetrate mosquito nets due to their small size; generation time 5-7 weeks; prefer to bite in the calf region</p>	<p>permethrin-treated mosquito nets; move to the second floor (out of range)</p> <p>- <b>Outdoors:</b> Use insect repellent and permethrin-treated uniform; don't wear shorts; eliminate breeding grounds through rodent control and the removal of bushes and shrubs in camp areas (greater clearance)</p>
Cutaneous Leishmaniasis		<i>Leishmania tropica minor</i>	<b>Transmission:</b> Sand fly bite	<b>Transmission period:</b> Same as <i>L. t. major</i>	Same as <i>L. t. major</i> ; do not keep dogs in camp areas

(Anthroponotic)			<p><b>Primary vectors:</b> <i>Phlebotomus sergenti</i>, <i>P. papatasi</i> (both nationwide)</p> <p><b>Secondary vectors:</b> <i>P. major</i> (nearly nationwide), <i>P. longiductus</i> (only in the north), <i>P. argentipes</i> (entire Indian border)</p> <p><b>Reservoirs:</b> Canids and humans</p>	<p><b>Incidence and seroprevalence:</b> Endemic in the entire western half of the country, with strong evidence of spreading; epidemic in large cities; 1998/99: among 9,300 Afghani refugees in Pakistan, 38% with active infections and an additional 13% with healed scars (agent contact); 2% of patients report unusual ulcers, which may indicate a special, atypical strain; epidemic in Kabul since 1997 with an estimated &gt;100,000 cases/year; no further epidemiological data are available at this time</p>	
Visceral Leishmaniasis		<i>Leishmania donovani</i> , <i>L. infantum</i>	<p><b>Transmission:</b> Sand fly bite</p> <p><b>Primary vectors:</b> <i>Phlebotomus major</i> (nearly nationwide), <i>P. chinensis</i> (along the Indian border), <i>P. longiductus</i> (extreme north)</p> <p><b>Secondary vectors:</b> <i>P. papatasi</i> (nationwide);</p>	<p><b>Transmission period:</b> Same as <i>L. t. major</i></p> <p><b>Incidence and seroprevalence:</b> Endemic at least in the north, particularly in the Dir district; possibly endemic nationally with sporadic cases; seroprevalence rates in dogs 18-26%; 8-16% of</p>	Same as <i>L. t. major</i> ; do not keep dogs in camp areas

			<p><i>P. salehi</i> (southern 1/3 of the country)  <b>Reservoirs:</b>          Canidae (jackals, foxes, dogs)</p>	<p>dogs with clinical symptoms; further epidemiological data are not available at this time</p>	
Malaria		<p><i>Plasmodium vivax</i>,  <i>Pl. falciparum</i>,  <i>Pl. malariae</i></p>	<p><b>Transmission:</b> Bite of <i>Anopheles</i> mosquitoes  <b>Primary vectors:</b>          - <i>An. fluviatilis</i> (nationwide), <i>An. superpictus</i> (western 1/2 of the country), <i>An. stephensi</i> (does not exist in northern 1/3), <i>An. culicifacies</i> (does not exist in extreme north), <i>An. pulcherrimus</i> (nationwide), <i>An. sergenti</i> (along the southern coast), <i>An. sinensis</i> (in extreme north)  <b>Secondary vectors:</b>          Other <i>Anopheles</i> species</p>	<p><b>Transmission period:</b>          Year-round with peak from July-August (monsoon)  <b>Incidence and seroprevalence:</b>          Endemic nationally below 2000 m; hyperendemic in all rice producing areas; annual incidence is between 80,000 and 95,000; however, there are presently 2-3 million new cases/year in this region; <i>Plasmodium falciparum</i> ratios: Baluchistan: 80%; Sindh: 50%; Punjab: 26%; northwestern region: 21% with increasing tendency; chloroquine resistance (44-76%) increasing markedly nationwide, whereby RII/RIII resistance is 11% (2001); Fansidar resistance 4-25% (Punjab)  <b>Breeding grounds:</b> A</p>	<p><b>Preventive measures:</b>          - <b>Indoors:</b> Use permethrin-treated uniform and mosquito net; do not use ultraviolet lamps          - <b>Outdoors:</b> Use insect repellent and permethrin-treated uniform; minimize exposed skin          - Continuous larval control and abatement in camp areas; elimination of breeding grounds          - Resistance:  <i>Anopheles stephensi</i>, <i>An. culicifacies</i>, <i>An. hyrcanus</i>, <i>An. pulcherrimus</i>: DDT and dieldrin;  <i>An. stephensi</i>, <i>An. culicifacies</i>: lindane</p>

				<p>variety of standing waters in urban areas, ranging from small (cans, buckets, old tires)(<i>An. stephensi</i>) to large, slowly flowing ponds with water plants, rice paddies (<i>An. hyrcanus</i>), mountain lakes (<i>An. superpictus</i>), etc.</p> <p><b>Bite properties:</b> Female <i>Anopheles</i> bite at dawn and dusk; <i>An. superpictus</i> and <i>An. fluviatilis</i> do not bite indoors (exophilic, exophagic); other species actively move indoors and bite there (endophilic, endophagic); very small species, such as <i>An. stephensi</i>, penetrate untreated mosquito nets; flight radius 1-2 km</p>	
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Brugian Filariasis		<i>Brugia malayi</i>	<p><b>Transmission:</b> Bite of <i>Mansonia</i> mosquitoes</p> <p><b>Primary vectors:</b> <i>M. annulifera</i></p> <p><b>Secondary vectors:</b> other <i>Mansonia</i> species</p>	<p><b>Transmission period:</b> Year-round</p> <p><b>Incidence and seroprevalence:</b> Endemic in the Indus Delta in western Pakistan, with sporadic cases; no further epidemiological data are available at this time</p> <p><b>Breeding grounds:</b> <i>Mansonia</i> species breed only in ponds, lakes, rivers and, occasionally, rice paddies with special plants; breeding grounds are often difficult to find; flight radius up to 2 km</p> <p><b>- Bite properties:</b> <i>Mansonia annulifera</i> is anthropophilic and endophagic; other <i>Mansonia</i> species may also display anthropophilic and endophagic characteristics, depending on species; primarily bite at dawn and dusk; aggressive biters; transmission is predominantly rural; flight radius up to 2 km</p>	<p><b>Preventive measures:</b></p> <p><b>- Indoors:</b> Use permethrin-treated uniform and mosquito net; do not use ultraviolet lamps</p> <p><b>- Outdoors:</b> Use insect repellent and permethrin-treated uniform; minimize exposed skin</p> <p>- Continuous larval control in camp areas (urban vectors); eliminate breeding grounds</p>
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Bancroftian Filariasis		<i>Wuchereria bancrofti</i>	<p><b>Transmission:</b> Bite of <i>Culex</i> and <i>Aedes</i> mosquitoes</p> <p><b>Primary vectors:</b> <i>Culex quinquefasciatus</i> (southern 1/3 of the country), <i>Culex pipiens molestus</i> (northern 2/3 of the country)</p>	<p><b>Transmission period:</b> Year-round</p> <p><b>Incidence and seroprevalence:</b> Endemic in the Indus Delta in west Pakistan, with sporadic cases; epidemiological situation is unclear at this time; primary vectors are present nationwide</p> <p><b>Breeding grounds:</b> Any small, stagnant or polluted bodies of water in urban areas</p> <p><b>Bite properties:</b> Both <i>Culex</i> vectors bite at dawn and dusk and migrate indoors to bite (endophilic, endophagic); infectious adult females congregate and overwinter in houses, animal stables, etc.; flight radius up to 2 km</p>	<p><b>Preventive measures:</b></p> <ul style="list-style-type: none"> <li>- <b>Indoors:</b> Use permethrin-treated uniform and mosquito net; do not use ultraviolet lamps</li> <li>- <b>Outdoors:</b> Use insect repellent and permethrin-treated uniform; minimize exposed skin</li> <li>- Continuous larval control in camp areas (urban vectors); eliminate breeding grounds</li> </ul>
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### Endemic Venomous Animals in Pakistan

Venomous Animal Group:	Name:	Toxicity:	Remarks:
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Poisonous Snakes, annual incidence of venomous snake bites in Pakistan: >100/100,000	<i>Naja naja</i> , Indian cobra (Elapidae)	Extremely toxic; large quantity of poison injected	Occurs chiefly in the country's southeastern region; 1.5 to 2 m long, max. 2.4 m, massive body, base coloring on back is dark brown-black to yellowish- white, characteristic spectacle marking on back of head; variable habitat from grasslands to rainforest, steppes, rice paddy areas, encroaches upon residential areas; usually diurnal, fast moving; not immediately aggressive, makes chewing motions, does not spit poison; has a potent neuro- and hemotoxin, mortalities reported as soon as 15 hours after bite; antivenom available
	<i>Naja naja oxiana</i> (= <i>Naja oxiana</i> ), Transcaspian cobra, oxus or brown cobra (Elapidae)	Extremely toxic; large quantity of poison injected	Common in northern Pakistan; up to 1.5 m long, brown with black zigzag band; avoids desert regions but occurs in mountains up to 1800 m; specific antivenom available
	<i>Bungarus caeruleus</i> , common Indian krait (Elapidae)	Extremely toxic	Prevalent in the country's southeast; 1-1.5 m long, max. 1.8 m, base coloring is black or brown-black with approx. 40 white horizontal stripes, flat head; habitat is open cultivated land and fields up to 1700 m, avoids rocky-sandy terrain; since the snake needs to drink water, it often hides in termite nests, rat holes and rooftops; strictly nocturnal and extremely dangerous and aggressive at that time; moves quickly; possesses a potent neurotoxin; often bites its victims while they are sleeping, so that bite marks may not be visible; few local symptoms but bite is always life threatening if not treated quickly; specific antivenom available
	<i>Agkistrodon himalayanus</i> , Himalayan pit viper (Crotalidae)	Mildly toxic	Common in northern Pakistan; 0.7 to 0.9m long, triangular head, base coloring (back) is dark brown with unevenly formed light horizontal stripes, stomach is whitish with black and red spots;

		prevalent in steppes, high mountain meadows, and riverbank slopes from 1500 to 5000 m; nocturnal; moves very slowly, rarely bites; mild toxin, no serious systemic envenomizations reported; no antivenom available
<i>Daboia russelli</i> , Russell's viper (Viperidae)	Extremely toxic	Very common; 1 to 1.3 m long, max. 2 m, variable base coloring from light grayish-brown/reddish to dark brown with large dark rows of spots on the back and sides, light V or X pattern on head; prevalent in rice paddies and cultivated land up to 3000 m; not common in thick forests; primarily nocturnal and terrestrial; hisses loudly when in danger, extremely aggressive and fast; possesses a very potent hemotoxin; systemic hemorrhaging begins after a few hours, often with kidney failure; specific antivenom available
<i>Echis multisquamatus</i> ( <i>E. carinatus multisquamatus</i> ), Central Asian sand viper (Viperidae)	Extremely toxic	Very common in Pakistan and probably the most dangerous poisonous snake there; extremely aggressive; 40-60 cm long, rarely up to 80 cm, base coloring is grayish, greenish or yellowish-brown with light and dark zigzag band along the sides as well as black and white markings on the back, belly is white with brown or black markings; prevalent in dry sandy and bushy habitats but also rocky areas; nocturnal in warm weather, diurnal in cold weather; when in danger, makes a rattling noise by rubbing its scales against each other (body in figure-8 pattern); very aggressive, bites quickly; mortality rate up to 36%, severe injury in 30% of all bite cases; specific antivenom available (Institut d'Etat des Serums et Vaccines, Iran)
<i>Echis sochureki</i> , Sochurek's or	Extremely toxic	Maximum length 0.8 m, base coloring on back is

Eastern saw-scaled viper (Viperidae)		grayish-beige, belly is whitish with large gray spots, light black-rimmed rows of spots may form a zigzag pattern on dorsal side, gray cruciform pattern on topside of the head; variable habitats, common in sandy, rocky and cultivated land, but generally avoids wetlands; primarily nocturnal and terrestrial; poison is a potent hemotoxin; pain and swelling begin soon after bite, systemic bleeding begins approx. 6 hours after bite; known fatalities; specific antivenom is not available; partial cross-neutralization with <i>Echis</i> antivenom is debatable
<i>Echis carinatus</i> , common saw-scaled viper (Viperidae)	Extremely toxic	Up to 80 cm long with brownish-beige base coloring, black and white zigzag band along the sides, and black and white markings on the back, cruciform pattern on topside of the head; variable habitats but avoids moist areas; primarily nocturnal; very aggressive, emits a rattling sound when in danger; poison is extremely hemotoxic; mortality rate up to 30%, severe injury in 30% of all bite cases; specific antivenom available
<i>Eristocophis macmahoni</i> , Asian sand viper (Viperidae)	Moderately to extremely toxic	Common in desert areas of Pakistan up to 1200 m; length 0.6 to 0.7 m, max. length up to 1 m, base coloring is reddish-brown with dark rows of spots on the sides, thin white lines over the eyes, tail tip is yellowish without spot markings; active at dawn and at night, buries itself in sand during the day; "sidewinder" movements when fleeing, hisses loudly and raises its head noticeably, aggressive when disturbed; toxin is extremely hemorrhagic, fatalities reported; antivenom is not available
<i>Pseudocerastes persicus persicus</i> , Persian horned viper	Moderately toxic	Especially common in the southern half of Pakistan; 0.5 to 0.7 (max 0.9) m long, base coloring

(Viperidae)		is light gray or brown-gray to khaki with darker spots on the back, tail tip is always black, head is wide and triangular with scaly horns over each eye; lives underground in sandy rocky areas up to 2000 m; nocturnal, rarely bites during the day; very aggressive at night, hisses loudly when disturbed; venom is primarily neurotoxic with systemic paralysis; specific antivenom available
<i>Trimeresurus erythrurus</i> , redbelt tree viper (Viperidae)	Mildly toxic	Prevalent in the country's southeast; length 0.5 to 0.7 m, max. 1.1 m, base coloring on back is leaf green, belly is light green; usually found in trees, occasionally comes to ground to forage; venom is primarily hemotoxic; rarely bites, fatalities have not been reported to date; specific antivenom available
<i>Trimeresurus mucrosquamatus</i> , Chinese Habu Snake (Viperidae)	Extremely toxic	Common in the country's southeast; length 0.8 to 1 m, max 1.3 m, base coloring on back is light brown or grayish brown, purple or dark brown rows of dots on the back, belly is whitish with brown spots, narrow body; prevalent in cultivated land up to 1400 m in bamboo forests, river bank slopes, tea fields, etc.; avoids human habitats; primarily nocturnal and terrestrial; moves forward slowly, bites when in danger; possesses a potent hemotoxin, fatalities reported; specific antivenom available
<i>Vipera lebetina turanica</i> , Levantine viper (Viperidae)	Extremely toxic	Common throughout Pakistan, most common poisonous snake there; inhabits rocky areas; very aggressive when disturbed; mortality rate 6.6%, severe injury in 28% of bite cases; specific antivenom available
<i>Enhydrina schistosa</i> (Hydrophidae)	Extremely toxic	Sea snake found in coastal areas; prefers mouths of rivers; up to 1.2 m long; usually slightly aggressive;

			most dangerous of Pakistan's sea snakes
	<i>Hydrophis cyanocinctus</i> (Hydrophidae)	Extremely toxic	Sea snake found in coastal areas; up to 1.8 m long; swims up to 30 km from the coast
	<i>Hydrophis ornatus</i> (Hydrophidae)	Moderately toxic	Sea snake found in coastal areas; up to 90 cm long; distinguishable by its large head
	<i>Hydrophis spiralis</i> (Hydrophidae)	Mildly toxic	Sea snake found in coastal areas; colored gold-yellow or yellow-green with black rings; up to 1.8 m long; often occurs in deep water
	<i>Pelamis platurus</i> (Hydrophidae)	Mildly toxic	Sea snake found in coastal areas; eel-like appearance, up to 75 cm long; does not inhabit rivers; very few envenomizations reported
Arachnids	<i>Latrodectus</i> spp., black widow (web) spider	Moderately toxic	Lives in dry badlands; immobile web spider; does not actively move indoors; very seldom causes lethal systemic poisoning; specific antivenom available
	<i>Lycosa</i> spp., as well as other species of wolf spider	Mildly toxic	Mobile predator with wasp-like bite; usually only localized symptoms
	Sun spiders (Solifugae)	Nontoxic	Very large (up to 10 cm) spider-like animals with crablike jaws but without poison glands; display pedipalps (pincers) when endangered, and emit a hissing sound by rubbing jaws; actively jump at humans from up to 30 cm away; bite painfully, bite has cruciform appearance and high secondary infection rate
	Several scorpion species are prevalent; the lethally poisonous ones are: - <i>Androctonus crassicauda</i> - <i>Buthotus</i> spp. - <i>Scorpio maurus</i>	Mildly to extremely toxic	Most scorpion venom in Pakistani species acts hemolytically, with local pain, swelling, and necrosis; systemic poisoning is generally acute; the extremely toxic thick-tailed scorpion ( <i>Androctonus crassicauda</i> ), very poisonous <i>Buthotus</i> spp. and <i>Scorpio maurus</i> are widespread in Pakistan; polyvalent specific antivenom available

Centipedes	<i>Scolopendra</i> sp., megarian banded centipede as well as other large species	Mildly toxic	An aggressive predator common in populated places, living among humans; up to 10 cm long, some endemic species are even longer, front pair of legs transformed into jaws with poison glands; systemic symptoms are generally acute but rarely last longer than a day; a bite mark from a large centipede is seldom distinguishable from that of a mid-sized viper
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