Research Article

Prevalence of cutaneous leishmaniasis in suspected population of District Peshawar Khyber Pakhtunkhwa Pakistan

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Abstract

The present study was performed for the purpose of exposing the prevalence of Cutaneous Leishmaniasis across district Peshawar. The study was fulfilled by a collection of 1023 prepared smear slides for seeking *Leishmania* parasite in the lesions containing population. Microscopic examination was carried out and 370 (36.17%) cases were confirmed positive and in the remaining 653 (63.83%) cases no evidence of parasite was observed. The study was analyzed through different angles of prevalence such as gender wise which concluded; male=18.48%, female=17.69%, age wise where maximum witness of parasite was observed in pre-school aged (14.56%) and school going aged individuals (6-15%). Whereas, month-wise statistics showed 9.38% cases in March and 8.70% in April however, the least number of infections occurred in June (2.93%) followed by July (2.34%). Further molecular study is needed to analyze the genotypes of the *Leishmania* parasites in the studied area.

Keywords: Cutaneous Leishmaniasis; *Leishmania*; Peshawar; Smear formation

Introduction

Leishmania is a protozoan parasite, causes complex diseases called Leishmaniasis. After malaria and filariasis, it is the third most prevalent parasite-borne disease in the world [1]. Leishmaniasis can be presented as a model for other parasitic diseases [2]. To understand the developmental processes, mice and rats are being used for experiments [3]. Leishmaniasis

can be; Cutaneous leishmaniasis (CL), Mucocutaneous leishmaniasis (MCL) and visceral Leishmaniasis (VL) [4]. It is further divided into Old World Leishmaniasis and New World Leishmaniasis. Old World leishmaniasis consists of CL which is confined to skin and VL which includes bloodstream and inner organs. But the New World Leishmaniasis includes both CL and MCL

with the involvement of mucous membrane along with skin [5]. In Pakistan anthroponotic Cutaneous leishmaniasis is caused by *Leishmania tropica* whereas zoonotic Cutaneous leishmaniasis is caused by *Leishmania major*. *Leishmania major* is common in rural areas while *Leishmania tropica* is commonly present in urban area [6]. *Leishmania* parasites are transmitted by the sand fly [7]. The *Phlebotomine* sand-flies transmit the infection not only in tropical regions but also in subtropical and temperate

regions of round about hundred countries [8]. Studies showed that nearly 15,000 cases of CL arise annually in Iran. But the actual cases are 4-5 times more than the reported [9]. Around 1,500,000 cases of Cutaneous Leishmaniasis are reported annually [10]. This parasite is mostly found in tropical region of developing countries [11]. Rodents serves as reservoir host for the parasite of Leishmaniasis, they become infected while vector feeding blood [12]. The (Table 1) shows the prevalence, main diseases, and reservoir hosts of *Leishmania* species [13].

Table 1. Agents of zoonotic Leishmaniases, their distribution and main reservoirs [13]

<i>Leishmania</i> species	Disease in humans	Geographical distribution	Main reservoir host
<i>Leishmania</i> (<i>Leishmania</i>) <i>infantum</i>	Visceral leishmaniasis; Localised cutaneous leishmaniasis	Mediterranean basin; Middle East and Central Asia to Pakistan; China; Central and South America	Dog
<i>Leishmania</i> (L) <i>major</i>	Localised cutaneous leishmaniasis	North Africa, Middle East and Central Asia, Sub-Saharan Africa and Sahel belt	Gerbillidae rodents
<i>Leishmania</i> (L) <i>aethiopica</i>	Localised cutaneous leishmaniasis; Diffuse cutaneous leishmaniasis	Ethiopia, Kenya	Rock hyraxes
<i>Leishmania</i> (L) <i>Mexicana</i>	Localised cutaneous leishmaniasis	Central America	Various forest rodents
<i>Leishmania</i> (L) <i>amazonensis</i>	Localised cutaneous leishmaniasis	South America, north of the Amazon	forest rodents
<i>Leishmania</i> (L) <i>venezuelensis</i>	Localised cutaneous leishmaniasis	Venezuela	Unknown
<i>Leishmania</i> (<i>Viannia</i>) <i>braziliensis</i>	Localised cutaneous leishmaniasis; Mucocutaneous leishmaniasis	South America, Central America and Mexico	Numerous rain forest mammals (suspected)
<i>Leishmania</i> (V) <i>peruviana</i>	Localised cutaneous leishmaniasis	South America, Central America and Mexico	Dog

Visceral Leishmaniasis (VL) or Kala-azar (KA) occurs mostly in India, Nepal, Sudan,

Bangladesh, Iran and Brazil [14]. Whereas 90% of the cases of Cutaneous Leishmaniasis

occur in Brazil, Iran, Afghanistan, Algeria, Iraq, Syria, Peru and Saudi Arabia [15]. In Europe, cases of MCL were reported in Portugal, Holland, the United Kingdom, Italy, France, Austria, Spain and Malta. Incidences of MCL were also observed in Tunisia. MCL existed in Pakistan, Iran, Saudi Arabia, Sri-Lanka, Sudan and India, outside the Mediterranean region. Travelers regularly add in the increase of ML [5]. Principally, *L. major* is the cause of CL in Iran, Egypt, Pakistan, Iraq, Afghanistan, Morocco, Tunisia, Palestine, Saudi Arabia, Sudan, Syria, Yemen, Jordan and Libya [12]. In Pakistan Leishmaniasis is reported from all provinces

but the endemic austerly is in hilly areas [16]. Epidemiology of *Leishmania* is changing with the emergence of the diseases in different parts of the world. The variations in epidemic circumstances are due to the migration of population and manmade environment [17].

Materials and Methods

The current study was based on the collection of prepared slides for cutaneous Leishmaniasis. The slides and tests results were collected from different localities of district Peshawar.

Study area

The present study work was carried out in district Peshawar (Fig. 1).

Figure 1. Map showing Peshawar district with the shaded area representing Federal administrated tribal areas

Laboratory analysis

The bite of sand fly may not be painful. At the beginning of infection, there are no symptoms but after a week the sore enlargement starts and also the number of sores (lesions) increases. After ten to fifteen days the sore appears as volcano shaped structure i.e. the raised margins of ulcer and central crater. It is then confirmed by laboratory analysis whether the lesion is leishmanoid or not.

Instruments utilized

The diagnostic methods available at present for Leishmaniasis are based on clinical and ep

idemiological features, parasitological detection (stained smears, culture and histopathology) and immunological methods. The result of current study was obtained by smear formation of slides. Parasites visibility was checked through the binocular microscopes (KYIWA-BIOLUX-12 and OLYMPUS-C-12) with the power of x100 oil immersion

Results

Overall prevalence of Cutaneous Leishmaniasis in Peshawar region

A total of 1023 slides were taken from suspected population of different regions

located in district Peshawar. Out of the suspected population 370 (36.17%) individuals were effected with cutaneous leishmaniasis (Positive) and the rest 653 (63.83%) indicated no parasite of *Leishmania* (Negative). The (Fig. 2) illustrated the total incidences of Cutaneous Leishmaniasis in Peshawar.

Gender wise prevalence of cutaneous leishmaniasis in Peshawar region

The (Table 2) demonstrates that in the present study collected samples were 1023. Out of the total suspected population 522 (51.03%) were

male and 501 (48.97%) were female. By microscopic analysis result was as; there were 189 (18.48%) males infected with Cutaneous leishmaniasis whereas 181 (17.69%) infected females.

Age wise prevalence of cutaneous leishmaniasis in Peshawar region

The occurrence of cutaneous leishmaniasis in different age groups is given in (Table 3). The data shows that highest percentage of cutaneous leishmaniasis i.e. 14.56% was found in people of age ranged between 6-15 year of age.

Figure 2. Overall prevalence of Cutaneous Leishmaniasis in Peshawar region

Table 2. Gender wise prevalence of Cutaneous Leishmaniasis in Peshawar

Category	Number	Percentage (%)
Total samples	1023	
Total number of Male	522	51.03
Total number of Female	501	48.97
Total number of Male infected with Cutaneous Leishmaniasis	189	18.48
Total number of Female infected with Cutaneous Leishmaniasis	181	17.69

Table 3. Age wise prevalence of cutaneous leishmaniasis in Peshawar region

Age group (Years)	Number	Percentage
≤5	95	9.29
6-15	149	14.56
≥16	126	12.32

Month wise prevalence of cutaneous leishmaniasis in Peshawar region

In the present study month wise prevalence of cutaneous leishmaniasis was also observed. It was detected that 40 (3.91%) people were infected in January, 42 (4.11%) were in

February, 96 (9.38%) in March, 89 (8.70%) in April. May, June and July were gradually showed lesser incidence 49 (4.79%), 30 (2.93%) and 24 (2.35%) respectively, shown in (Fig. 3).

Figure 3. Month wise prevalence of cutaneous leishmaniasis in Peshawar region

Discussion

A study was conducted by Sami *et al.* [18] in which a total 224 patients were examined, 114 were positive, indicating 51% prevalence of leishmaniasis. The study showed the highest prevalence (43.8%) in 1-15 years group and lowest (7.0%) in 46-60 years group. The gender wise prevalence exposed the presence of parasite 60.5% in male and 39.5% in female [18]. The recent study detailed that total of 1023 people were screened, out of 1023 cases 370 (36.17%) were positive while 653 (63.83%) were negative. The difference in the result is noticeable but the environment and climate greatly affect the prevalence of leishmaniasis. The climate of Dir favors the biological vector of leishmaniasis (sand-fly) greatly than Peshawar. That's why the distinction is shown in the current study and the study of Sami *et al.* [18]. The age-wise

prevalence of CL in the present study correlated with that of the Sami *et al.* [18]. The study also showed maximum existence of the disease in lower aged group as the current study showed 14.56% were of age 6-15 years and 9.29% were of age ≥ 5 years. Likewise in older age the degree of infection shown decrease in both studies. Greater incidences in lower age may be due to the non-educated minds and low resistance of immune system towards the parasite. The gender wise prevalence in the current study showed a little difference as compared to previous study. The male sum was 189(18.48%) in addition female were 181(17.69%). Present study showed negligible variation of the infection in both genders may be due to the same housing life, habitat as well as it may be the reason that the parasite of Cutaneous Leishmaniasis equally affects male and female and the infected

female were less in number by a few, incase, the reason of culture that female are preferred to live inside houses in district Peshawar. Kakarsulemankhel [19] conducted a study in South-West of Pakistan. The prevalence of active CL in the school-aged children (11-16 years) was 45.12% cases and in children of younger age group (5-10 years) active CL was 44.11 %. Mostly children in the age group of 5-10 and 11-16 were infected [19]. Similar result was obtained in the recent study. The CL leishmaniasis showed precise increase in pre-school aged and school-aged groups (≤ 5 and 6-15 years, respectively).

An investigation was conducted by Durrani *et al.* [20] to determine the prevalence of Cutaneous Leishmaniasis across different regions of Pakistan. The study pointed up that cases of occurrence were most prevalent in April (518 cases) and the least number of cases during June (308 cases) and July (9% cases) [20]. Current analysis strongly matched up with the above study. In the current study the cutaneous leishmaniasis was highly prevalent in the month of March and April while the lowest number of contaminated patients was recorded in June and July in district Peshawar.

Conclusion and Recommendations

The present study mainly prescribed that Cutaneous leishmaniasis which intensely occurred in childhood age, ranges ≤ 5 -16 years followed by older age. Overall positive cases found were 36.17% after microscopy of the slides. As the present study was not based on the species type but it was founded in a lot of studies that *Leishmania tropica* is the main cause of Cutaneous leishmaniasis in Peshawar moreover *L. pepatasi* is also observed in some studies. The recent study showed that the incidences of Cutaneous leishmaniasis were almost equally distributed in male and female. Recent observations demonstrated that CL is intensely occurring in spring season. As the month-wise record of CL showed that there were 96 infected individuals in March and likewise in April there were 89. The incidence

of the disease was steadily decreased through the next months. Lowest rate of occurrence recorded in July. Studies through advanced equipment are suggested in the study area.

Cutaneous leishmaniasis is one of the major health problems. It lasts for years if left untreated and cause complexity of diseases. It is mainly spread by the sand-fly. Following are some possible recommendations that can help in restriction of the occurrences of cutaneous leishmaniasis.

1. Reducing poverty and upgrading access to health care facilities in areas endemic with Cutaneous leishmaniasis.
2. Commencement of CL control campaigns in rural and backward areas to educate the residents of these areas about the prevention measurement and to make proper sewerage systems in rural areas so as to lower down breeding rates of the vector.
3. Updating laboratory equipment for advance detection of the parasite so as to cure properly.
4. Regular spraying of the rooms with Pyrethroid-containing insecticides along with the usage of bed nets soaked with Permethrin can reduce the bite of sand fly. Sand fly prefers to bite in dim light, so avoid dust and dawn outdoor activities.

Authors' contributions

Conceived and designed experiments: M Zahid & Irfan U, Data collection and experimental work: SM Jawad, S Salman & A Salam, Analyzed the data: Farman Ullah K, Manuscript prepared: SJ Hashmi & S Salman.

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