



Historical background and factors related to the dispersal of Leishmaniasis in Afghanistan.

Monib Ullah^{1*}, Khyber¹, Hikmat ullah khan²

¹Institute of microbiology, University of Agriculture Faisalabad, Pakistan

²Centre of Biotechnology and Microbiology, University of Peshawar, KPK, Pakistan

*Email: monebullah91@gmail.com

ABSTRACT

Leishmaniasis is an epidemic problem in Afghanistan specifically in Kabul city and areas associated with the boundaries. L. tropica (write in full) is the major cause of cutaneous leishmaniasis in the country which is transmitted by Phlebotomines and fly. First time in 1962, leishmania were analyzed which were very little while after that, that is increased continuously. With the end of Soviet Union war of Russia this disease boosted up. The incidence of leishmaniasis in Kabul city is 29/1000 people in a year. A total number of 22% people have active lesions and scars. Investigation of leishmaniasis in Afghanistan carried out in different regions including Hiraat, Kandahar, Kabul, Badakhshaan and Balkh province. The dissemination of disease in the country is mostly associated with the human activities like traveling and business. The incidence of the cases is high in Kabul regions which require further investigation and research to tackle the problem. Many factors are associated with the dissemination of the disease in the country like humidity, temperature, rainfall, travel, and ecological factors. The aim of this study is to establish research investigations for the students in graduate and post graduate degrees in the country and out of the country. It can also render a support in future planning for the control, treatment and eradication of leishmania disease from the country.

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INTRODUCTION

Leishmaniasis is a medical condition caused by sand-fly known as Phlebotomus which is 2mm to 3mm in diameter. There are 20 different species of leishmania parasites [23]. Phlebotomus sandflies are very small and nocturnally active, fragile with weak abilities of direct flying and feeding on drastic hosts. Phlebotomus inhabits old world while the sand-fly Lutzomyia genus inhabits new world. Phlebotomines are only the vectors of leishmania but can transfer virus as well as bacteria [21, 44]. There are 800 evident species of Phlebotomine family in which only 92 covers to genera phlebotomus and lutzomyia [33]. According to global level prevalence of species presence, there are total 989 species of Phlebotomine has been discovered all over the world in which 531 species has identified in America and 277 found in Brazil. Phlebotominae family not only supports leishmania distribution but also it harbors Phlebovirus and bortonellosis and other bacterial species [11]. Phlebovirus cause a medical diseased condition called sand-fly fever, or three days fever, it is a neuro-invasive disease [4]. There are 80 countries in the world which are endemic in case of leishmaniasis forms of cutaneous or in severity visceral form [13]. Cutaneous leishmania is the common one, while mucocutaneous is the leishmaniasis which is native to Afghanistan called leishmaniatropica transmitted anthroponotically by the sand-fly Phlebotomus-sergenti. The condition in anthroponotical leishmania are cutaneous lesions mostly appear on face [44]. Cutaneous leishmaniasis initially show papules on the skin which then lead to the scab formation and ulcers, which leave permanent scars which may more than 200 on a particular area of the skin [34]. This condition in CL is greater than 90% in countries like Afghanistan, Brazil, Syria, Iran, and Algeria [27]. The predicament of cutaneous leishmaniasis has hopefully wiped out in 1960s and 1970s by the use of DDT spraying on the sand-fly population [44]. Leishmania is 3rd important vector borne disease in world with a high incidence [21]. 88 countries are under the threat of CL in four continents including Asia, America, Africa and Europe

[11]. The leishmania specie has a broad range of hosts to be infected as we can say 2.5million dogs are infected with leishmania in Mediterranean basin only [45]. The leishmania is absent in New-Zealand and South Pacific Ocean. Afghanistan, Algeria, Colombia, Brazil, Iran, Syria, Ethiopia, North Sudan, Costa Rica, and Peru together account for 70% to 75% of the global estimated CL incidence [27]. Cutaneous leishmaniasis has high cost and no fatality so it is considered as least priority by international donor agencies. Due to the progressive devastation of infrastructures and health care managements in civil wars led to the increase in cases according to WHO estimations [42]. During the civil war, the afghan refugees migration to Pakistan northern sites has alarmed the local villagers which then required an epidemiological study on the same problem [7]. Current studies should be focused on the national infection of leishmania parasite in their vector will be beneficial to notice the ways and strengths of parasite transmission between hosts. Life cycle phases, and location of the parasite in the gut of the vector can provide a fruitful understanding regarding vector ability to host diverse species of parasite and epidemiology [28].

SAND-FLY

Most of the sand flies or vectors of leishmania parasites are native to the amazon region covering much of northwestern Brazil and extending into Colombia, Peru and other South American countries, is the world's largest tropical rainforest, famed for its biodiversity. Out of 20 to 30 sandflies, only 15 are presumed to be efficient vectors and infecting humans there. *Nyssomyia antunesi* is the most abundant specie of sand-fly found during a study carried out by [16]. In columbia the average elavation rate of CL spread is 8926 cases which are transferred by only six recognized species[30]. ENSO, El Nino southern oscillation causing up and down in the climate is a significant way of increasing the number of cases because it can affect the population of sand flies reported by [8]. Wet soils water drainage, animals houses, agricultural wastes and animal droppings are preferable areas for the sandflies to mate [11]. Vegetation, humidity, average rainfall, moist soil and temperature are factors of choice for the distribution and dispersal of sandflies [39]. When the female sandflies acquire the blood meal to have the consumption, they usually search for the site where there is resting shelter for them to be engaged with the blood meal consumption there [40]. The caves mostly the limestone regions, the internal temperature not largely changes but remain constant as compared to the external temperature of the year so they are tend to host sandflies population in case of relative humidity 90 to 100%. It is a convenient environment for the breeding of leishmania specie as like form Brazil, nearly 600 specie have been identified to be present in caves [12].

The leishmania vectors are not only dependent upon climate but also have a close association with agricultural activities like in Mexico, the people who elapse more time in close proximity to coffee plants are highly infected as compared to those who are distant [33]. One of *Lutzomyia* specie has been isolated from an association of bats, reptiles and sand-fly in a hole from a tree referenced to a study carried out in February 2015 by [31]. In 2010 study by Shimabukuro and Galati, identified 989 species globally in which 277 from Brazil and 531 were from only America, the resting were from other world [51]. The leishmania sand-fly species have a drastic adaptation to reliable environment in Brazil was due to rapid urbanization [28]. *N. Whitmani* specie is one of evident species which causes leishmaniasis in Brazil [15].

Leishmania parasite detects their host through a proper smell from the host which is indicated by Americans as a controlling the colonies of mosquitoes in the vicinity. The mosquitoes were exposed to the 1-octen-3-ol and lactic-acid. *Nyssomyia neivai* was found to be the most active host attracting compound but lactate rendered a little bit slow response to mosquitoes [35]. A prolong investigation has carried out in south America for the detection of leishmania species, their distribution in ecology and influence of environmental factors upon them. The study conducted in April 2012 up to 2013 March. They captured 7370 specimens in *Lutzomyia cruzi* specie was dominant in number. This study has indicated that vegetation declination due to urbanization in different areas have caused a drop in population density of the *Lutzomyia cruzi* vector [9].

A 7 months another mosquito trapping study has been conducted in Ethiopia based on light trapping duration in four phases of moon light. The highest result was in full moon where there was a high number of mosquitoes has attracted to the light capture net. 13553 specimens they had collected which were comprised of eight *Phlebotomus* genera. 97.78% of the entire collected figure were *Phlebotomus orientalis* [17].

A dashing study from France has been conducted for detection of different environmental factors on the leishmania vectors from year 2011 to 2013. They collected four genera of the vectors in *Phlebotomus* and *Sergentomyia* were dominant in density. This investigation has clearly demonstrated that there was a fruitful effect of the temperature and altitude on the *Phlebotomus* and *Sergentomyia* species while humidity remained non effective. In the whole year, there was an elevated activity of the sand flies in July

and August stated by these researchers. The same study had conducted in 1977, so there was no apparent change in the results of the previous investigation and the current one [37]. Topography has a drastic role in the dispersal of leishmania, in India a study carried out which indicates that the number of cases declines with the escalation of altitude beyond 300m [38]. [6] States that the areas with high altitudes actually harbor the vectors refuge where there are no or less common cases. Relative humidity of 70-80% and temperature ranges 25-28 degree C is suitable for the vectors while low temperature and humidity is cannot support the vectors to distribute across an area [20, 49]. The Phlebotominae species are active all the year but they increase their population especially in high temperature condition and high humidity in same year [46], they are nocturnally active and slow in direct flight abilities [13]. According the status given above, [46] investigated the effect on temperature on *Lutzomyia longipalpis*, examined the behavior of the specie in controlled laboratory conditions and indicated that this specie is more active at night times at elevated temperature ranges, under LD 16:08, sandflies showed the initial values of maximum peak and offset times, opposing to other management system.

The areas where the cases of leishmania is non-endemic must be investigated for the fauna of sand-fly to acquire the knowledge of their dispersal, diversity and dominance in that area Camapuã, a region 409 meter above sea level in Mato Brazil 19°31'53"S and 54°02'38"W, with a tropical climate and temperature variation between 20 and 24 degree usually. The season of this region is dry from April to September and moist means rainy from October to March. Sandflies has collected from regions of animal's shelters, organic matter presence. Totally 2005 specimens have collected comprised of 9 species and 5 main genera. *Brumptomyia*, *Evandromyia*, *Nyssomyia*, *Psathyromyia*, *Lutzomyia*, are the five genera in which *Nyssomyia* was 55.3% and *Lutzomyia* 41.3% [15]. Same study has been conducted by [28], in Corumba region of Brazil 19°00'33"S 57°39'12"W; 118 meter above the sea level, a study from 2012 to 2014. 9,759 specimens were collected comprised of 13 species. Out of 9759 only 1481 were females in which there was no specie of *Phlebotomus* but out 1481, 1038 were infected with the leishmania parasite. *Lutzomyia* was 89.01% among all the 13 species composed of 9759. The increase of leishmania cases in Brazil is dependent upon the urbanization of humans which have adapted the pathogenic strains of leishmania sandflies to the urban environments [28].

Lutzomyia has been reported to be dominant in rainy days in Camapuã region of Brazil with precipitation rates 50 mm³ upto 250 mm³ in all months of the same year but no dominance *Nyssomyia* has been reported in same precipitation of the same year [15]. Comparative study for investigation of leishmania species in Eastern Thrace region in Turkey and northern Cyprus has conducted for the characterization of leishmania infections in vector sandflies. 2690 is the entire figure of specimens collected in which 15.4% were from Turkey eastern Thrace and 84.6% from northern Cyprus. 780 specimens from Cyprus were examined in which 95.2% were *Phlebotomus*, *Laroussius* sp. 1.6%, and *Sergentomyia* were totally 3%. The remaining 1910 species were investigated for either the presence of pathogenic parasite or absence from 195 pools. *Phlebotomus* sandflies indicated *Leishmania infantum* DNA [13]. Another study conducted in Palastine using Giemsa staining technique for leishmania identification, there results showed sensitivity of 87% with positive predictive value of 100% and a specificity of 100% with negative predictive value of 85% respectfully [3].

Ghats India has also investigated for the detection of different species of leishmania sand flies. The Ghats India is ever green, vegetative area where the common temperature reaches to 33 degree in March. 1279 sandflies have captured from 28 different locations. Nearly 8 different genera of the sandflies detected there in which *Phlebotomus* accounted for approximately 30.2%. this study also investigated for the presence of Visceral leishmania there, the result indicated that out 28 different settlements there, 21 regions were affected by Kala-azar disease [38]. A prolong research article investigation has conducted for the purpose of geographical distribution of *Phlebotomus* sandflies and the effect of environmental factors upon them. This study has large citations of articles from 1962 to 2014. The study has focused on seasonal variations like the average temperature of the region is tropical summer rain from October to March while dry from April to September. This investigation given a result that there were totally 17 genera of *Phlebotomine* has identified which belong to 127 different species groups. They have concluded that the temperature influences accounts more for the distribution of vectors but the species adapt according to the temperature conditions, each and every climate in Brazil can adapt at least one specie of the leishmania parasite means vector [5].

Another study from Brazil has carried out in 2008 to detect different species of sandflies present in the caves. This investigation has captured 638 sandflies in which 56% were male flies and *Lutzomyia* accounted for nearly 62% of all the flies which were from 11 species [12]. The introduction of leishmania species and their vector to Europe has documented by [41], They have given three possible ways through which the leishmania specie might have transferred from the endemic regions of world to the Europe as following.

- 1) The introduction of exotic *Leishmania* species or strains into Europe via the increasing worldwide travelling of humans and domestic dogs.
- 2) The natural spread of visceral and cutaneous leishmaniasis caused by *L. infantum* and *L. tropica* from the Mediterranean region of Europe, where these species are endemic to neighboring temperate areas where there are vectors without disease.
- 3) The re-emergence of disease in the Mediterranean region of Europe caused by an increase in the number of immunosuppressed people.

The most significant prevalent cause of cutaneous and visceral leishmania in humans in Europe is *leishmania infantum*. This species has been isolated from black rats and domestic dogs in Europe [41].

HISTORICAL BACKGROUND OF LEISHMANIASIS ORIGINATION

The Palearctic hypothesis indicates the origination of leishmania in Palearctic region in the Paleocene, 1971 by Lysenko. The new tropical hypothesis indicates leishmania origination in new tropical region, 1987 by Lainsons and Shaw. The Supercontinent hypothesis shows its origination during the disintegration of supercontinent Gondwana in Mesozoic, 2000 by Momen and Cupolilli [52]. The evolution of leishmaniasis is dependent on selective pressure through millions of years due to natural ecological changes, they could be rapid such as volcanic eruptions which have caused vector and host association disturbance, flooding, hurricanes or could be slowly emerging like climate changes [50].

THE COUNTRY AFGHANISTAN

Afghanistan is located in central Asia with latitude of about 33 degree north and 65 degree longitude. The country borders many other geographic important countries like China, Turkmenistan, Uzbekistan, Tajikistan, India, Iran and Pakistan especially shares the longest border known as Durand line. 70% of the country is extreme mountainous highlands while 30% are plane areas [56]. Climate of Afghanistan is cooler as compared to India and Pakistan because of highlands which decreases the temperature, the extreme summer temperature is 38 degree while in regions with cold winter the temperature fall to -25 degree Celsius. The total land area of Afghanistan is 652,500 square kilometers in which pastures covers 46%, arable land covers 12%, forests covers 3% and remaining other, the term given by [56].

THE STUDY OF LEISHMANIASIS IN AFGHANISTAN

The CL ailment is defined by Al-Razi (850-923 AD) in Balkh of Afghanistan and Baghdad as an endemic ailment [3]. Avicenna was the first who described the sore of leishmania tropica in Balkh of Afghanistan, 980-1037 [10].

The 1824/25 outbreak of kala-azar was the first in a village known as Mahomedpore in lower Bengal India, then spread to west Bengal Burdwan 1860 and became an epidemic when disseminate to north of Bengal and Assam in next year with mortality rate of 30% [18]. Eliseev and Kelina 1962, epidemiological study showed zoonotic cutaneous leishmaniasis in Herat and Kandahar but no cases in Jalalabad, Sarobi, Kabul and Ghazni [26].

1964-1967, the number of cases had elevated in Kabul (334 in 1967), although there were no or extremely low number of cases between 1947 and 1963 [29]. They also stated that majority cases dating back to before 1965 and people were infected in other provinces of Afghanistan. Outbreaks reported in diverse localities of Kabul in March 1972, the cases were prevalent in khair-khana city of Kabul Afghanistan [29]. There were 218 acute cases and 1734 clinically registered with the project [26]. In 1970, 44 species of sandflies were detected in which half were *Phlebotomus* and half were *Sergentomyia* genus [24, 48]. Diagnosis of leishmaniasis is under process since 1995 by the aid of non-governmental organization like health-net TPO in Afghanistan [43].

A study conducted in five of the 14 districts of Kabul, the capital of Afghanistan, showed that many erroneous beliefs exist about CL, e.g., that "the disease can be transmitted by person-to-person physical contact and sharing meals and household goods [22].

The Mirjaveh town of Sistanva Baluchestan province of south east Iran suffered with CL outbreak in 1996 which slowly affected 400 people up to 2005. The area is a few kilometer to Afghanistan where there is a continuous travelling of people between Iran and Afghanistan. But the study report depicted that no one patient had a previous record of traveling to any endemic territory [14].

In 2001, a house to house survey was conducted in Kabul city to collect data during July and September. There are 14 districts in Kabul city which divided in 90 subdivisions and randomly investigated 30 households from each division. 26892 persons were investigated in this entire survey, there were 726 (2.7%) and 5900 (21.9%) had active leishmaniasis lesions and scars. During the year 2003, the number

of cutaneous leishmaniasis in Kabul city was estimated 67500 cases [44]. According to the health ministry of Afghanistan and health-net TPO, 16390 cases of CL sick persons have cured in the same year [43].

But in June 2003, the Faizabad city of Badakhshan, Afghanistan was surveyed by health-net international to investigate for cutaneous leishmaniasis. There were 10 districts checked for 20 household. They investigated 1832 people from 200 households, the result was 16.1% which indicates that 114 people had cutaneous leishmaniasis in which 56% were women and 44% were men [42].

In September 2003, an entire sample of 1000 households was investigated for CL in Kabul city. There were only 872 households surveyed including 10596 people in which only 1645 individuals had ACL with either scar or lesion and 11 entities had both scars and lesions [45].

In 2002 to march 2003, a study was conducted on Afghan refugee's camps in Baluchistan. 48 refugee's camps along with 19 neighboring villages were investigated to reveal the prevalence of disease in the territory that either the disease has transferred from Afghan refugees or it is endogenous to that area. 21046 people were investigated from refugee camps and 7305 from neighboring villages, 650 people had lesions, 1236 had scars, and 38 persons had both the scars and lesions [7]. Subsequently in 2005 Dutch army personals had contracted cutaneous leishmaniasis in northern Afghanistan, 172 troops were infected out of 938 deployed personals [54].

According to WHO organized regional meeting on worldwide epidemiological basis for leishmaniasis, there were 22620 cases/year in Afghanistan from year 2003 to 2007 with an incidence rate of 113100 to 226200 people(WHO worldwide epidemiological study on leishmaniasis: 2007-2010). The average infection rate of leishmaniasis on world basis is 1.2 million people each year [2].

The aggregated study from 20 provinces of Afghanistan by the aid of national malaria and leishmania control program (NMLCP),2003-2009 described an entire number of 148945 cases across the Afghanistan [2].

A total number of 4189 suspected cases in Herat province of Afghanistan were tested in between 2012 and 2013, there were only 3861 (92.2%) had active cutaneous leishmaniasis lesions [32]. And subsequent study was undertaken upon the Canadian soldiers deployed in Kandahar province of Afghanistan where only 4 had acute cutaneous leishmaniasis, returned from Afghanistan January 2012 [36]. Same was the case with 172 Dutch army soldiers who had deployed in Mazar-sharif in 2005 had developed cutaneous leishmaniasis which was initially confirmed as streptococcal ulcers [53]. From May 2010 to September 2010, a study was conducted in Pakistan western sphere region of NWFP and Fata where 125 patients were reported with cutaneous leishmaniasis [23]. These areas are closely juxtaposes the eastern provinces of Afghanistan which have extremely low incidence of CL except the Kabul city, though the southern eastern provinces has high incidence. Several cases of leishmaniasis has been reporting from Afghanistan neighboring countries like Pakistan, Iran, Uzbekistan and Turkmenistan, since 1980 there were solely 23 cases reported in Afghanistan [24].

A 2010 study conducted from India based on the correlation of leishmania vector with the topographic condition including temperature, altitude, humidity, rain fall and vegetation. In 2005 the prevalence of the infection was high with an altitude of 150 up to 300m on sea level. The regions where the temperature was in between 25-29 maximum were highly affected and minimum 16-20 degree. 1154 and 1834 mm was the measure of the rainfall over there [6].

North West region of Pakistan in NWFP known is Timergarah where a study carried out in 1997 for the detection of leishmania in the people migrated from Afghanistan in a refugee camp. 9200 inhabitants were studied in which 38% had active lesions while 13% had previous scars. A *Phlebotomus* sand-fly has also detected. As the Kabul city of Afghanistan faces a susceptible epidemic of leishmania, this investigation concluded that the outbreak in Timergarah might be due to immigrants from Kabul during migration [47].

Cutaneous leishmaniasis sand-flies have been diagnosed in Sherdarwaza mountain foot and Asamai mountain foot in 1967 and 1968 respectively. Twenty sandflies were detected which all were belonging to *Phlebotomus sergenti*. 100 dogs has also search for either presence or absence of the vectors as well as the infection, but none to the dog was infected with specie [29]. Nadim and Rustami in 1974 have clearly investigated the cutaneous leishmaniasis in Kabul. They stated that there is no roll of rodents in spread of the vector between individuals and regions [26].



Figure1. Mapping of the country regions where the cases of leishmaniasis are found in high prevalence. Kabul, the capital indicated by Brown Square where the disease is endemic.

Table1. Summary of the cases and studies carried out in different regions of the country in different years.

Year	Location	Total cases	Active cases
1962	Hiraat, Kandahar	Very few cases	Few or no
1964-1967	Kabul	1 lac	334 in all population
1996-2005	Sistanvalochistan, Iran	Unknown	Cases reach from 0 to 400
1997	Timergara, Pakistan	9200	38% active lesions
2001	Kabul	26892	6500
2002	Afghan refugee camp balochistan, Pakistan	21046	1886
2003	Faizabad, Badakhshan	1832	144
2005	Balkh	938 Dutch troops	172
2012	Hiraat	4189	3862
2013	Kandahar	Unknown	4 Canadian army troops

IMMUNITY

Leishmania life cycle has two stages, promastigotes and amastigotes. The promastigotes takes place in the sand-fly while the amastigotes in human [44]. The leishmania parasite usually vulnerable to human complement cascades as little 1/120 concentration of human serum is effective to lyse the parasite through the formation of membrane attack complex especially the alternative pathway [21]. It has seemed to be affected by different pathways in human body which is preferred by the parasite byself, the Classical pathway seems to be specific for Leishmania promastigotes [57], while the Alternative pathway kills the Leishmania amastigotes [58]. Leishmania parasite contains two antigens which are crucial for its spread and immune evasion, liphosphoglycan and metalloprotease leishmanolysin GP63 [14]. When the parasite is deficient for any one of these two antigens, so it is prone to the immune system attack especially complement system [21].

Leishmania infection fruitfully induces protective immune response to the current infection as well as immunity to reinfection. CD4+ T-cells play a vital role in the secondary infection as the memory cells. This investigation carried out on the effector CD4 t cells. These cells initiate delayed hypersensitivity in case of reinfection [55]. Another study suggests that CD4 T-cells have a reliable role in the protection of leishmania. They also stated that if CD4 is eliminated through specific monoclonal antibodies, it releases CD8 T-cells which carry out protection of leishmania parasite in the primary lesions [19]. A study carried out for the vaccine production in case of leishmania in 1995. They isolated gp63 gene of leishmania specie which was recombined with the BCG vaccine. The recombinant vaccine has showed delightful result in BALBs mice against zoonotic cutaneous leshmaniasis. The BCG were composed of two genera of mycobacterium namely *Paratuberculosis* and *Fortuitum* specie [1]. Immunity against leishmania is also supported by the production of interleukin-II. A research investigation has concluded that interleukin-II

deficient mice are vulnerable to the infection with the leishmania parasite in a very low dose, the patient can develop lesions. This study was also conducted on BALB mice [25].

CONCLUSION

The entire historical background of leishmaniasis in Afghanistan mostly dependent upon the activities carried out by humans. After the end of Soviet Union War in Afghanistan, the economy and trade gradually increased in Kabul which serves a central hub for business and trade. Most of the people settled in Kabul for the aim of business, livelihood and peace. People from Iran, Turkmenistan, Tajikistan and Pakistan made expeditions to Kabul for the purpose of trade. Kabul city is a very congested location in Afghanistan which provides residence up to 4.3 million people. First cases of cutaneous leishmaniasis patient diagnosed in Kandahar and Herat in 1962 when there were no cases or very few number in Jalalabad, Kabul and Ghazni [26]. The dispersal of leishmania in central Afghanistan is imported from the peripheries [29]. High humidity, higher altitude, moist and wet soils, high temperature are preferable factors for the reproduction and mating of sand-fly species. In 1970, 50% of the sandflies detected in Kabul by [24, 48], were *Phlebotomus* species. Before 1965, the infected cases of leishmaniasis in Kabul were mostly acquired infection in the peripheral boundaries of the country, Afghanistan [29]. Domesticated dogs and animals serve as the crucial reservoirs for the dissemination of leishmaniasis in the country. Increase of leishmaniasis in Afghanistan dating back to year 2000 when the country again acquired solidarity in terms of politics. Most of peripheral people intentionally went Kabul to engage with the constructions, business, trade and other livelihoods. If we consider the boundary shared countries as the disseminating factors for the leishmaniasis in Kabul so it will be prolific factor because since 1980 there were solely 23 cases reported in Afghanistan [24], but due to the migration, the people from Afghanistan suffered hugely in refugee's camps in after 1980s up to the year 2000 in Pakistan. War, ecological disasters, internally displaced people, cross boundary journey, travel, trade, business, high altitudes, high humidity, temperature, moist agricultural areas and rainfall accounts for the dissemination of the leishmania in Afghanistan as well the growth of sand-flies population.. Tajikistan, Turkmenistan, Uzbekistan, Pakistan, Iran and India are effective regions which preferentially imported leishmaniasis in Afghanistan because the average increase in cases occurred after the end of Soviet Union War in the country. This article clearly indicates that the southern and eastern regions of Afghanistan has high incidence of cases due to boundary share except the Kabul which serves a hub for different activities. The information in this article is very little to clearly define the actual emergence of leishmania in Afghanistan so many studies are still to be discovered for this purpose. The article is for the purpose of research and study in many disciplines like epidemiology, public health management, protozoology, microbiology and disease control inside the country and abroad.

FUTURE PERSPECTIVE

This review article can provide sufficient data regarding the incidence and prevalence of leishmaniasis in Afghanistan. It can provide basic information about the geographic distribution of the leishmania disease in the country. The article data is relevant and authentic with approximately sixty references, all discussing leishmaniasis in Afghanistan. Different government and non-governmental organisations can acquire advantage of this study in terms of epidemiology, control and treatment of this endemic disease in all the territories embraced by the heinous attack of leishmaniasis. Research investigation and studies by different universities can get benefit of this article especially the post graduated students who wish to engage in scientific researches.

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