

# The Efficiency of Insecticides Against Sandflies with Epidemiology of Leishmaniasis in Basrah, Iraq

Mufeed A. Habeeb

Basrah university, college of science, Biology Department

## Abstract

The study was carried out with determined the status of insecticides against animal agent vector of *Leishmania* parasite causing leishmaniasis and epidemiology of this disease in Basrah. The impact of indoor spray with four insecticides against sandflies in selected farmland finding that mortality percent 55.6% , 13.8% after 30 minute and 100% after 24 hour and 79.1% after 72 hour for Lambda-cyhalothrin and Diazinon respectively, so the status of neurotoxic Lambda-cyhalothrin most efficiency than other insecticides tested. The status of VL was investigated from 2008 through 2009 to provide an epidemiologic characterization of the disease in Basrah show a rural community in the north part with a higher level 88.28% especially in Qurna town with 44.43% than other arts, the disease appear in total individual in first to second seasons more than the last ones, the age percent of VL analysis for a total parts finding that 1-4 years most positive with 53.6% than >5 years with 8.24% and in term of the male were more frequently affected than female.

## Introduction

Phlebotominae sandflies are blood sucking insect of temperate and tropical regions showing significant difference in ecological adaptation, endemism, reticulation and species richness (Dujardin *et al*, 1999). Sandfly vectors that transmit *Leishmania* spp parasites by biting in many countries in the world are all members of the genus *Phlebotomus* and include more than a dozen species that vary with regions and habitat (Alptekin *et al.*, 1999). More than twenty species of these anthropophilic blood sucking insects recorded in Iraq (Abul-hab, 1980 ; Abul-hab and Ahmed, 1984 ; Atia *et al*, 1993), recently ; Habeeb, 2007 recorded some of these insects in Basrah province including gravid females of *Ph. papatasi* and *ph. sergenti* which incriminated as a vector of *Leishmania* spp. parasites causing leishmaniasis which are endemic in Iraq and often take as cutaneous and visceral leishmaniasis. The complete epidemiological cycle of these disease has not been elucidated yet as a prerequisite for effective disease control ; today, an estimated more than million individuals have leishmaniasis world wide, an addition many hundreds millions are at risk of developing the disease. On other hand , applying insecticides some times in conjunction with environmental management, has commonly controlled sandflies, the emphasis has been residual insecticidal applications in predomestic environments especially in houses and in animal shelters to control anthroponotic leishmaniasis, in many cases sandfly control was collateral benefit of insecticides spraying to control animal agent disease vectors (Eldridge and Edman, 2000).

## Material and Methods

The study was carried out dairy farm two hectares contain four animal shelters (4x4x3) meters dimension construction from clay with rodents burrow in the period March-August, 2008/2009, specimens sandflies collecting using Axel *et al* (2002), method to count mean

density of sandfly insects using light trap three at time sequence and then the insects set free, mean density count for (0.5, 2, 24, 72) hour after each trial, the experiment put back after 2-3 days between each trial and an a other. Insect control was mean count also and then set free and spraying with water ((watering)), and the mean count all these practical experiment doing at room temperature. Sample of sandfly systematically according to Habeeb, 2007. To estimated the efficiency percentage employ Axel *et al*, 2002 and Shaban and Al-Mula, 1993 and statistical analysis due to Gomes and Gomes, 1984.

#### **Four insecticide using in this study:**

- 1-Lambdacyhalothrin 10% wp ; 2.5gm/L water (RS)-alpha-cyano-3-phenoxybenzyl 3-C2-chloro-3,3,3-trifluoropropenyl)-2, 2-dimethyl cyclo panecarboxylete (12).
- 2- Diazinon 60% ; Icc/IL water 0,0-Diethyl-0-(2-isopropyl-4-methyl-6-pyrimidinyl) phosphorothioate.
- 3-Malathion 57%; 150 mm/100L water 0,0-Dimethyl phosphothioate of diethyl mercapto succinate.
- 4-carbaryl 10% 1-Naphthyl methyl carbamate.

The information statistics data for epidemiological study obtain from Basrah hospitals, healthful centers and statistical and Lineation of directorate-general health center.

#### **Result and Discussion**

A total of 722 specimens of anthropophilic sandflies were captured or counted in animal shelters during the study , systematically they comprise *Ph. papatasi* 81% , *Ph. sergenti* 8% , *Ph. alexandri* 7.5% and *Sergentomyia squampleri* 3.5% , the *Ph. papatasi* was obviously the predominate in the farm in Basrah and it is known as vector of visceral Leishmaniasis and then *Ph. sergent* is a known as vector of cutaneous leishmaniasis (Christensen *et al*, 1983), these insects are a wide distribution in Basrah (Habeeb, 2007) and have no insecticide use for control them , and the insecticides can be helpful in reducing sandfly numbers, pyrethroid and thiocyanate acresol provid effective control indoor when applied at night or in the early moring (Reithinger *et al.*, 2002 ; David *et al.*, 2002), organochloride, organophosphate, carbamate and pyrethroide insecticides are effective for residual control of adult sandfly , insecticide should be applied to inside wall and ceiling wall handing impregnated with pyrethroids have been used for sandfly control in homes in many countries, that area treatment should be directed toward potential breeding and resting sites (Mullen and Durden, 2002).Insecticides used in this study appear different toxicity among these anthropophilic insects but appear different reduction in their number according to the insect control table (1) , these different toxicity depended on the efficiency each insecticide, Malathion and Diazinon organophosphate insecticides are widely used in agriculture and for structural pest control and also used on avarity of food crop more than blood feeding insects (Mullen, 1997), these two organophosphate chemical family chemical reduction that inhibit an important control nervous system enzymes acetylcholinestrse (AChE) and this enzyme involved with the transmission of nerves impulse and when this enzyme is inhibited , the transmission system resulting in restlessness, hyper excitability convulsions, paralysis and death (Robert and Perich, 1995).

In table (1), show rate and percent mortality after thirty minute 5.3 ; 13.8% and survival rate 33.0 Diazinon and 23.6 ; 55.6% and survival rate 18.0 Lambdacyholothrin and two other insecticides malathion and carbaryl 17.3 ; 34.3%; 26.7 and 8.3 ; 22.4% ; 28.7 respectively. Lambdacyhalothrin is a pyrethroide insecticide high active against wide range of species of insects families, it is also has some miticidal activities and it has same spectrum of insecticidal as cyhalothrin but is more active that the compound is a stomach and contact insecticide (Basimik and Mutinga, 1995 ; Axel *et al*, 2002). and through the period of time and especially after 24 hour appear very clear that statistical analytic  $4 > 2 > 3 = 1$  ,  $P < 0.01$  show difference between these insecticides that Lambdacyholothrin reach 100% percent mortality and zero survival rate, and these three other insecticides their percent mortality 79.1% , 83.1%, 81.9% and survival rate 8.0, 7.4, 6.7 respectively , therefore these insecticides to put into service as against insects in Iraq before more than forty years ago as pesticides and antimalarial against mosquitoes insects persistence and biomagnifications in the environmental and development of resistance in may species of blood sucking insects (FAO/WHO, 1969 ; Brien, 1970), and Rienting *et al*. (2002) compared the suscepility of sandfly vector to four tropical insecticides treatment where significantly reduce by permethrin and more active by Lambdacyhalothrin but Diazinon had low effective and reduce the incidence of leishmaniasis . The number of sandflies were collected after four months spraying was significantly lower in the treated shelters than in the untreated ones so the anthropophilic species where not present in large number, so our conclude that to make use of Lambdacyhalothrin curtains may provide good method for endophilic and endophagic sandfly vector of leishmaniasis.

Table (1): Rate number of spraying and unspraying sandfly insects along period test.

Insecticides	Unspraying rate no.	No. spraying specimens	Time of test, hour				
			0.5	2	12	24	72
Diazinon	38.33	Mor. Rate	5.3	10.3	17.0	25.0	30.3
		%	13.8	26.9	44.3	62.2	79.1
		Sur. Rate	33.0	18.0	21.3	13.3	8.0
Malathion	44.0	Mor. Rate	17.33	22.3	28.0	32.6	36.6
		%	39.3	50.8	63.6	74.0	83.1
		Sur. Rate	26.7	21.7	16.0	11.4	7.4
Carbaryl	37.0	Mor. Rate	8.3	13.6	18.6	25.3	30.3
		%	22.4	36.7	50.2	68.3	81.9
		Sur. Rate	28.7	23.4	18.4	11.7	6.7
Lambdacyhalothrin	42.3	Mor. Rate	23.6	35.0	41.0	42.3	42.3
		%	55.6	59.1	69.1	100	100
		Sur. Rate	18.7	7.3	1.3	0	0

The insecticides carried out in this study appear different toxicity among these insects but appear reduction in their numbers according to insects control, almost toxicity in the first time slight, but there are some different between them ; that Diazinon show 32% and

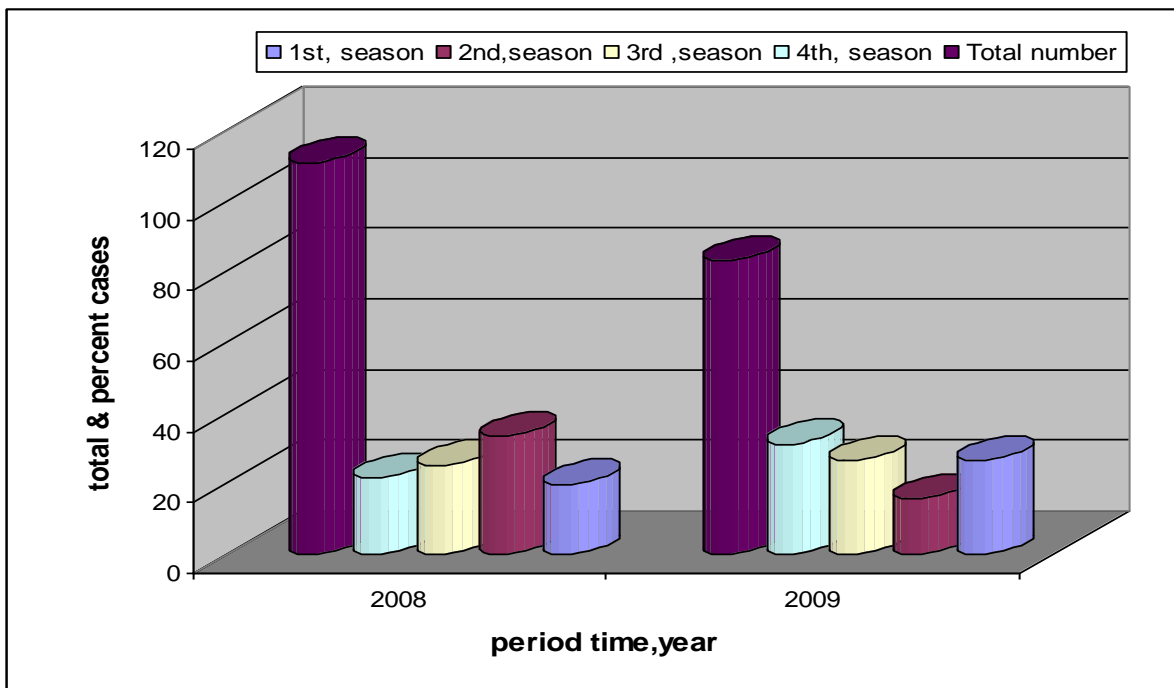
Lambelacyhothrin 65% after thirty minute and through the period of time these results clear after two hours that 41% and 87% toxicity for Diazinon and Lambdacyhalothrin respectively and after 24 hours Lambdacyhalothrin reach 100% toxicity and mortality percentage and after 72 hours Diazinon reach 84% toxicity and mortality percentage and the other two insecticides their toxicity to sink between them table (2), and these different of toxicity depended on the efficiency of each insecticides after spraying throughout time employ in this trial.

**Table (2): Efficiency percent of insecticides along period time L.S.D.= 10.8**

Insecticides	Rate no. sandfly unsp	Efficiency insecticides, time ; hours %				
		0.5	2	12	24	72
Diazinon	38.33	32	41	56	73	84
Malathion	44.0	52	61	71	80	87
Carbaryl	37.0	38	50	61	75	86
Lambdacyhalothrin	42.0	65	87	98	100	100
Control	42	0	0	0	0	0

**Epidemiology:**

Table (3) show our epidemiological study was carried out on 194 VL cases in 2008 and 2009, a preliminary survey show high prevalence cases in three periods of time through the year, these period Feb.-April, May-July and Aug.-Nov., and low prevalence in March-April and July-Aug. in the two years fig. (1).



**Fig (1): Total and percent VL cases in 2008 and 2009 Basrah**

and , according to Habeeb, 2007 the phlebotominae vector have two period time with high density once in Fieb.-May and the second Sept.-Nov. after these period the density of sandfly decrease in number Jun.-Aug. and disappear in Dec.-Jun. (Corradott, 1967) so there is sig. difference between the seasons ( $t=1.52$ ) of two years but ( $x^2$  test) show no sig. difference between male and female human numbers.

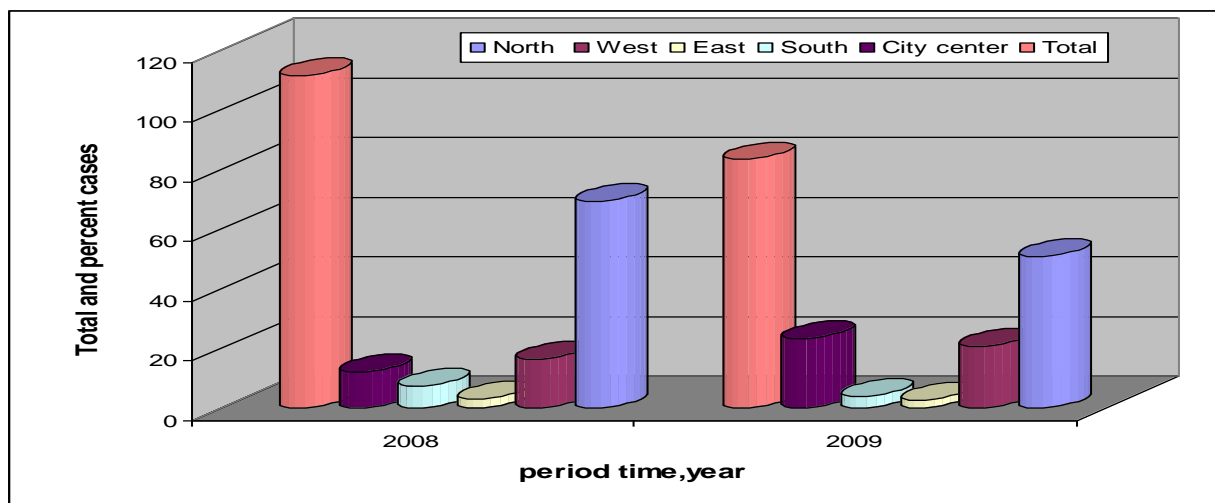
Table (3): Seasonal variation of total number and percent of VL in 2008 and 2009.

Year	Sex	Fieb.-May		Sept.-Nov.		Jun.-Aug.		Dec.-Jun.	
		T	%	T	%	T	%	T	%
2008	F.	12	54.50	18	48.64	13	46.42	07	29.16
	M.	10	45.50	19	51.35	15	53.57	17	70.83
	T.	22	19.81	37	33.33	28	25.22	24	21.62
2009	F.	11	50.0	7	53.84	8	36.36	11	42.30
	M.	11	50.0	6	64.15	14	63.63	15	57.69
	T.	22	26.50	13	15.66	22	26.50	26	31.32

The total number of the cases in Basrah stats show in table (4); that all the rural farmlands except Basrah center were 98 case (111), 88.28% in 2008 and 64 case (83), 77.10% in 2009 and 13 case (111), 11.71% in 2008 and 19 case (83); 22.89 in 2009 in Basrah center, these results appear sig. difference ( $x=20.64$ ) between Basrah stats especially Qurna and shatt -Al-Arab stats, and as in table (5), there is sig. difference between rural and urban regions  $x^2 = 20.64$  as in fig. (2).

Table (4): The distribution of VL cases in Basrah stats in 2008 and 2009.

Stats of Basrah Gov.	Cases VL			
	2008		2009	
	T	%	T	%
<b>North :</b>				
Qurna	49	44.43	22	26.50
Madina	14	12.61	13	15.66
Hartha	06	5.40	07	8.43
<b>West:</b> Zubair	18	16.21	17	20.48
<b>East:</b> shatt Al-Arab	03	2.70	02	2.40
<b>South:</b> Abu-Al-Kassib	08	7.20	03	3.61
City center Basrah	13	11.71	19	22.89
Total	111	100%	83	100%



**Fig (2): Total and percent VL cases in 2008 and 2009 Basrah stats**

Table (5): rural and urban density and percent in Basrah in 2008 and 2009.

Disivion, Basrah stats	VL cases, 2008		VL cases, 2009	
	T	%	T	%
Rural	98/111	88.28	64/83	77.10
Urban	13/111	11.71	19.83	22.89

Human are important reservoir for *Leishmania* parasite because during the early stage of the disease infected people can continue their normal activities and contact between human and sandflies often is most intense at the end of prolonged wet spells, so that the prevalence of infection with leishmaniasis slight difference between two sex that in male ; 54.95% (61) and 45.04% (50) in 2008 and in female 55.42% (46) and 44.57(37) in 2009 of a total of 194 cases and the ratio male : female 1.22 of two years. In the locality of Basrah were slight difference in gender that dwelling these gender difference associated with VL response were statistically signification ( $x^2 < 0.1$ ) of working activities which take place in men a condition of a higher exposure to sandflies bites due to agriculture nature of their work (Robert and Perich, 1995 ; Alptekin *et al.*, 1999). Patients with VL were identified according to age group in 2008 and 2009 appear that the cases straitened between younger people (Uzan *et al* , 2004), the age people 0-1 year with 74 ; 38.14% ; 1- 4 year with 104, 53.6% and 5-14 year old with 16, 8.24% of a total cases 194 at  $x^2 = 14.22$  in both two year as in table (6).

**Table (6): Number and percent of VL in 2008 and 2009 in Basrah**

Year	Age , year		
	01	14	5-14
2008	47	49	15
2009	27	55	1
Total	74	104	16
Percent	38.14	53.60	8.24

The frequency of VL positively increased in aged 1-4 year and in general the younger people > 5 years had percent of response more than other aged (Alptekin *et al.*, 1999) so the people most affected in these age group for VL and that patients predominated slightly at 53.60%.

## References

- Abul-Hab, J. (1980). A list of arthropods of medical and veterinary importance recorded in Iraq. Bull. Bio. Res. Cent. Vo. 121: 9-39.
- Abul-Hab, J. and Ahmed, S.A. (1984). Revision of the family phlebotomidae (Diptera) in Iraq. J. Bio. Sci. Res. 1-64. Pub. No.7.
- Alptekin, D.; Kasap, M.; Luleyap, U.; Kasp, H. ; Aksony, S. and Wilson, M.L. (1999). Sandflies (Diptera: Psychodidae) associated with epidemic cutaneous Leishmaniosis in sanliurfa, Turkey. J. Med. Ent. 36(3): 277-281.
- Atia, A.A.; Rassam, M.B.; Kasal, S.M.; Al-Diwany, L.J. and AI-Bashir, N.M. (1993). *Phlebotomies papotasi*, the major sandfly in natural foci of Leishmaniasis in Iraq. Electrophoretic isoenzyme study, Labortory infection with *Leishmania major* and disease transmission. Iraqi of micro. Vo.(2):108-120.
- Axel, K.; Avila, E.V. and Morison, L. (2002). Insecticides impregnant curtains to control domestic transmission of cutaneous Leishmoniasis in Venezuela ; cluster randomized trial. BMJ. Oct. 12, 325(7368): 810-3.
- Basimike, M. and Mutinga, M.J. (1995). Effect of permethrin treated screens on phlebotominae J. Vet. Med. Ent. 33(2): 221-229.
- Brien, O. (1970). Biochemical toxicology of insecticide. Academic press London.
- Christensen, H.A.; Fairchild, G.B. and Herrer, A. (1983). The ecology of cutaneous Leishmoniasis in the republic of panomaa. J. Med. Ent. 20(5): 463-468.
- Corrodetti, A. (1967). Information of Leishmoniasis collected in Lebanon, Syric, Iraq, Iran and Turkey during sept, and oct. 1965. WHO, Leish. 167-6. Derm. 14: 417-423.
- Davies, C.R. ; Llanos, E.A.; Campos, P. ; Leon, F. and Canal, J. (2000). Spraying houses in the Peruvian andes with Lambdocyhalothrin protect resident against leishmaniasis. Trans. R. Soc. Trop. Med. Hyg. 94(6): 631-636.
- Davies, C.R. ; Stamm, L.M. ; Bezerra, H.S. and Lima, J.W. (2002). Deltamethrin-impregnated dog collars have a potent anti-feeding and insecticidal effect on *Lutzomyia longipalps*. Mem. Inst. Osw. Cruz. 96(6): 839-847.
- Dujardin, J. ; Le-Pont, F. and Martinez, E. (1999). Quantative phentics and taxonomy of some phlebotominae taxa. Mem. Inst. Osw. Cruz. 94(6): 735-741.
- Eldridge, B.F. and Edman, J.D. (2000). Medical Entomology, klvwer Academic publ. 101 philip drive, no well, MAO, 2061, USA.

- FAO/WHO, (1969). Pesticide residues in food, report of the (1968). Joint meeting of the FAO working party of expert on pesticide residues. FAO. Agriculture studies No. 78. World Health org. Tech.
- Gomes, K.A. and Gomes, A.A. (1984). Statistical procedure for agricultural research. John welly and Sons. 2<sup>nd</sup>. ed. USA.
- Habeeb, M.A. (2007). Systematic, Ecology on the sandflies Diptera: Psychodidae; phlebotominae ) in Basrah Governorote. Iraq. PH.D. thesis. Basrah Uni. Iraq.
- Kessari, S. ; Kishore, K. ; Palet, A. ; Kumar, V. ; Roy, M.S. ; Sivakumar, S. and Kat, S.K. (2002). An entomological field evolution of the larval biology of sandfly in kala-Azar endemic focus of bihar exploration of larval control tool. J. com. Dis. 32(4): 284-288.
- Mullens, C.R. and Durden, L.A. (2002). Medical and veterinary Entomology , Elsevier Science Pre. USA. Mullens, B.A. ; Lubing, K.A. and Breidenbangh, M.S. (1997). Experiment host studies with phlebotominae. J. Am. Mosq. Con. 13(4): 398-401.
- Read, P.D. (2002). Systematic of Spanish sandfly vector of leishmaniasis and their role of the Gibrattar in their evolution. J. Para. 4: 3-11.
- Reithinger, R.; Teodorote, H. and Davies, C.R. (2002). Tropical insecticides treatment from sandfly vector of leishmaniasis. Emerg. Infect. Dis.7(5):872-876.
- Robert, L.L. and Perich, MJ. (1995). Phlebotominae sandfly (Diptera: Psychodidae) control using a residual pyrethroid insecticide J. Am. Mos. Cont. Assoc. 11(2): 195-199.
- Shaban, A. and Al-Malah, N.M. (1993). Insecticides. Mosual Univ. Press. Mosual. (in Arabic).
- Uzan, S. ; Murate, D. ; Gulnaz, C. ; Adil, M. and Hamdi, R.M. (2004). Clinical features, epidemiology and efficiency and safty of intralossion antimony treatment of cutaneous leishmaniasis ; recent experience in Turkey. J. Para. 90(4): 853-559.

### كفاءة المبيدات لحشرات ذباب الرمل الفاصد مع وبانيات مرض الليشمانيا

في البصرة – العراق

جامعة البصرة-كلية العلوم-قسم علوم الحياة

مفيد عبد اللطيف حبيب

### الخلاصة

أجريت الدراسة لاختبار أربعة مبيدات ضد الناقل الحيوي لطيفلي الليشمانيا المسبب لمرض الليشمانيات، تم الرش داخل أربعة بيوت طينية تحوي جحور الجرذان في الحقل ولفترات زمنية متتالية، إذ بلغ نسبة الوفيات 55.6%، 31.6% بعد ثلاثين دقيقة بعدها بلغت 100% بعد أربعة وعشرين ساعة و 79.1% بعد اثنان وسبعون ساعة لكل من المبيدين Lambdacyhalothin و Diazinon على التوالي، اظهر المبيد Lambdacyhalothin ذات الأثر العصبي السمي أكثر كفاءة من بقية المبيدات. أظهرت الدراسة الوبائية أن المجتمعات الريفية وخاصة في شمال البصرة ذات مستوى عالي للإصابة خاصة في منطقة القرنة 44.43% أكثر من بقية المناطق. ينتشر المرض في الأفراد المصابين للفصلين الأول والثاني من السنة أكثر من الفصل الأخير كما أن أعمار الأفراد 1-4 سنة ذات إصابة 53.6% أكثر تعرض للإصابة من الأعمار التي تزيد عن 5 سنة 8.24% وان الذكور أكثر تأثير من الإناث للإصابة بالمرض.



