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Evaluation of the outcome of Kala-Azar Control Program in Iraq

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ABSTRACT

Visceral leishmaniasis has been recognized as an important public health problem in Iraq for the last 50 years, particularly in the southern governorates owing to its considerable impact on morbidity and its potential to spread in outbreaks and epidemics which impose a heavy burden on the national health services. This study was conducted to evaluate the effectiveness of the national control measures in reducing the number of Kala-azar cases in Al-Diwaniyah governorate (which is a known endemic focus in Iraq), for the years 2007 and 2008. The results of this study at the district level for the years 2007 and 2008 regarding the number of Kala-azar cases and application of control measures revealed that the Kala-azar incidence rates in Al-Diwaniyah governorate for the years 2007and 2008 were 1.4 and 0.8 per 1000 in children less than five years, respectively. The number of Kala-azar cases recorded for the year 2007 was 399 cases, which constituted 12.2% of the total cases in Iraq, this included 216 cases (54.1%) from areas where active control measures (spraying, rodents control campaign and euthanization of jackals and stray dogs) were not applied, and 183 cases (45.9%) from areas were such measures were applied. In the year 2007, the differences in the number of cases between areas without and areas with control measures were highly obvious in all districts. In the year 2008, the differences in the number of cases between areas without and areas with control measures were highly obvious in all districts with the exception of Al-Hamza district. Comparison of the number of cases recorded during the year 2007 in areas before active intervention with the number of cases recorded in the same areas during the year 2008, after this intervention revealed that these active control measures were 58.8 % effective in reduction of Kala-azar cases.

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INTRODUCTION

Although leishmaniasis is an important public health problem, current efforts to control this problem are insufficient. The wide diversity of both the clinical and the epidemiological forms of the disease means that each focus requires specific control principles and methods (Neouimine. 1996). Leishmaniasis occurs mostly in rural areas of warm and tropical countries where public health infrastructures are inadequate, increasing incidence of leishmaniasis is related to several reasons, the majority of them depend on human activities, such as environmental modification as the construction of dams and irrigation of channels (Bryceson, l998). In Iraq, especially in the middle and southern governorates, visceral leishmaniasis was regarded as an endemic disease since 1954 (Al-Naddawi *et al.,*2000); deterioration of health and vector control services during the previous wars and economic sanctions imposed on Iraq in 1990 with all their sequences (e.g., poverty, malnutrition, etc.) contribute to the outbreaks of leishmaniasis in the area (Alwan., 1985; AL -Rahim,

1994; Al-Majeed, 2001). The success of control measures depends on a basic understanding of the epidemiology of the disease, the cultural and social customs of the population and periodic evaluation. Such evaluation is important to determine their effect on the incidence of the disease, to assess cost-effectiveness and to adjust control strategies, if necessary (Marquorat *et al.,* 2000; Paettanayk, 2001). Only one study was done to evaluate the national Kala-azar control measures in Wasit governorate for the years 2001 and 2002 (Abdul Rahim, 2004). So, this study was conducted to evaluate the effectiveness of the national control measures in reducing the number of Kala-azar cases in Al-Diwaniyah governorate (which is a known endemic focus in Iraq), for the years 2007 and 2008.

PATIENTS AND METHODS

This is a biometry study; it was designed to evaluate the outcome of Kala-azar control program (complete control measures) by using before-after program comparison as mentioned in Gordis (1996). Data were collected from the C.D.C. centre, Baghdad, regarding the number of Kala-azar case recorded, their age, place and time and the application of complete control measures in the year previous to the year in which the cases occurred (at the end of application campaign, the area was considered have received complete control measures) at district level of the governorate for the years 2007 and 2008. The incidence rates at governorate and district levels for the years 2007 and 2008 were compared. The number of cases reported in 2007 in the areas that were not involved by complete control measures was compared with the number of cases in the same areas in 2008 after application of complete control measures to find out the percent of the reduction in the number of cases calculated using the following equation;

$$\frac{\text{No. of cases before application} - \text{No. of cases after application}}{\text{No. of cases before application}} \times 100$$

Statistical analysis

Data were analysed statistically using the following procedures: Descriptive statistics: frequencies and percentages and Inferential statistics: Chi-square test had been applied for the statistical difference at the level of significance 0.05.

RESULTS

The results presented in this study are based on the analysis of 639 Kala-azar cases reported in Al-Diwaniyah governorate for the years 2007and 2008 which constituted 11.0 % of total cases in Iraq. There were 399 cases reported in the year 2007 and 240 cases in 2008 (12.3% and 9.4 % of the total cases reported in Iraq, respectively). These results are shown in Table-1. Table-2 shows that children less than five years constituted 97.7 % of cases reported in Diwaniyah governorate in that period, while those five to ten years constituted 2.3 % of the cases; and no cases were reported above the age of 10 years. Table-3 shows the incidence rates of reported Kala-azar cases in different governorates of Iraq in children less than five years of age for the years 2007 and 2008. The incidence rates of the disease in Diwaniyah governorate were 142.4 and 83 per 100000 respectively for that period, while for overall Iraq they were 86.6 and 66 respectively for that period. Figure 1 shows that the majority of cases (81.2%) were reported from southern governorates (Wasit, Theqar, Messan, Al-Diwaniyah, Basrah, Al-Muthanna, Babil, Karbala, and AI-Najaf), while a minority of cases (5.4%) were reported from northern governorates (AI-Tameem and Nineveh), and 13.4% of cases from middle governorates (Baghdad, Diyala, Salahaldin and Al-Anbar).

Table 1: Number of Kala-azar cases reported in Al-Diwaniyah governorate and overall Iraq* for the years 2007 and 2008

The year	Kala-azar cases	
	Iraq (Number)	Al-Diwaniyah governorate (Number and percent)
2007	3236	399 (12.3 %)
2008	2548	240 (9.4 %)
Total	5784	639 (11.0 %)

* With the exception of Kurdistan territory

Table 2: Age distribution of Kala-azar cases in Diwaniyah governorate for the years 2007 and 2008

The year	Age group		Total
	< 5 years Number and percent	5 – 10 years Number and percent	
2007	391 (98.0%)	8 (2.0%)	399 (100%)
2008	233 (97.1%)	7 (2.9%)	240 (100%)
Total	624 (97.7%)	15 (2.3%)	639 (100%)

Table-4 and Figure-2 show that 550 cases (86.07%) were reported in winter and spring seasons (December-May, inclusive) of the years 2007and 2008, while only 89 cases (13.92 %) reported in the summer and autumn seasons (June-November, inclusive) of that period. These seasonal variations are highly obvious. Table 5 shows the incidence rates of Kala-azar cases per 100000 in children less than 5 years of age in different districts of Diwaniyah governorate for the years 2007 and 2008 with the percent of reduction. Regarding

Table 3: Kala-azar incidence rates per 100000 in children < 5 years in Iraqi governorates for the years 2007and 2008

Governorate	The year 2007			The year 2008		
	No. of cases	No. of children < 5 y.	Incidence rate per 100000	No. of cases	No. of children < 5 y.	Incidence rate per 100000
Diwaniyah	399	280177	142.4	240	289143	83
Wasit	514	158768	323.7	419	163848	255.7
Theqar	844	237753	355	682	245361	278
Messan	220	123476	178.2	271	127427	212.7
Babil	332	150486	220.6	188	155301	121.1
Basrah	150	287616	52.2	129	296819	43.5
Diyala	264	235929	111.9	154	243478	63.3
Al-Muthanna	61	91210	66.9	51	94128	54.2
Al-Tameem	121	115694	104.6	191	119396	160
Karbala	56	122017	45.9	46	125921	36.5
Baghdad	159	1013158	15.7	68	1045579	6.5
Al-Anbar	27	213207	12.7	4	220029	1.8
Al-Najaf	36	153659	23.4	58	158576	36.6
Salahaldin	52	181660	28.6	47	187473	25.1
Nineveh	1	409148	0.2	0	422240	0
Total (Iraq)	3236	3738412	86.6	2548	3858041	66

Table 4: Monthly distribution of Kala-azar cases in Diwaniyah governorate for the years 2007 and 2008

Month	The Year 2007		The Year 2008	
	No. of cases	Relative frequency (%)	No. of cases	Relative frequency (%)
January	22	5.5	41	17.1
February	42	10.5	30	12.5
March	100	25.1	51	21.3
April	116	29.1	0	0.0
May	59	14.8	20	8.3
June	0	0.0	14	5.8
July	3	0.8	13	5.4
August	5	1.3	5	2.1
September	7	1.8	0	0.0
October	5	1.3	12	5
November	0	0.0	25	10.4
December	40	10	29	12.1
Total	399	100	240	100

Table 5: Incidence of kala-azar cases in children < 5 years at the district level in Diwaniyah governorate for the years 2007 & 2008

	The year 2007			The year 2008			
District	No. of cases	Total no. of children < 5 y	Incidence per 100000	No. of cases	Total no. of children < 5 y	Incidence per 100000	Percent of reduction
Al- Diwaniyah	53	105575	50.2	47	108953	43.1	14.0%
Al-Shamiya	160	47354	337.9	98	48869	200.5	40.7 %
Al-Hamza	173	68712	251.8	86	70911	121.3	51.8 %
Afak	13	58536	22.2	9	60410	14.9	36.4 %
Total	399	280177	142.4	240	289143	83	41.5 %

the year 2007, the lowest incidence reported was in Afak (22.2) while the highest was in Al-Shamiya (337.9). In the year 2008, the corresponding incidences were (14.9) and (200.5) for the same two districts respectively. The percent of the reduction in the incidence of the total number of Kala-azar cases in different districts of Diwaniyah governorate was 41.5%, the highest reduction was 51.8% in Al-Hamza, while the lowest was 14.0 % in Al-Diwaniyah district. Table 6 shows that there was a reduction in the number of Kala-azar cases reported in Diwaniyah governorate for the year

2008 in districts after application of complete control measures (spraying and rodents control campaigns) in comparison with the number reported in the same districts for the year 2007 (before application of these measures). There were 85 cases recorded in 2007 and 35 cases in 2008. This indicates that the percentage of reduction was 58.8 %, calculated using the following equation;

$$\frac{\text{No. of cases before application} - \text{No. of cases after application}}{\text{No. of cases before application}} \times 100$$

The lowest reduction rate was in Al-Shamiya district (33.3%), while the highest was in Al-Hamza district (83.3%).

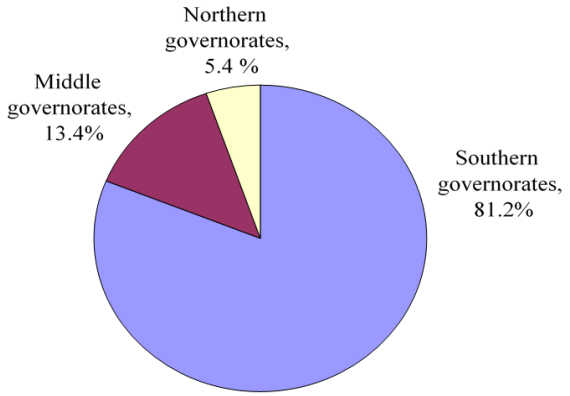

Figure 1: Geographical distribution of the percent of Kala-azar cases in Iraq for the years 2007 and 2008

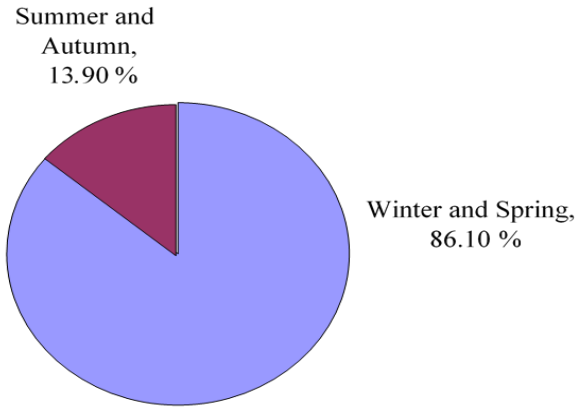

Figure 2: Seasonal distribution of the reporting kala-azar cases in Al- Diwaniyah governorate for the years 2007 and 2008

Table 6: Number of kala-azar cases in Diwaniyah governorate at the district level in certain areas before and after they were involved by active intervention

District	Cases in (2007)	Cases in (2008)	Percent of reduction (%)
Al-Diwaniyah	15	8	(46.7)
Al-Shamiya	30	20	(33.3)
Al-Hamza	36	6	(83.3)
Afak	4	1	(75.0)
Total	85	35	(58.8)

DISCUSSION

This study revealed that 97.7 % of cases reported in Al-Diwaniyah governorate during the years 2007& 2008 had occurred in children less than 5 years of age while 2.3 % cases occurred in those from 5 to 10 years of age and there was no case reported in the age above 10 years. This means that Kala-azar affects children especially those less than five years of age in Al-Diwaniyah governorate which is a known endemic focus of the disease in Iraq. The finding that the incidence rates of Kala-azar cases in children less than 5 years in Iraq were 0.9 & 0.6 for the years 2007 and 2008 ,respectively and 1.4 and 0.8 for Diwaniyah governorate for the same period, respectively, although the rates still lower than that recorded in Wasit, Theqar, Messan and Babylon governorates together with the finding that the majority of cases (94.6%) were recorded in the southern and middle governorates indicate that Kala-azar is still an important public health problem in Iraq in general and in the southern and middle parts of Iraq including Diwaniyah governorate. This result agrees with that of Al-Rahim (1994), Al-Alak (1996), Al-Naddawi (2000) and Abdul-Rahim (2004). The deterioration of both community and individual resources including health services resources as a result of the previous wars besides the economic sanctions imposed on Iraq since 1990 has been considered the most important factors in the maintenance of the Kala-azar transmission cycle, the control measures against Kala-azar (and many other endemic diseases) were interrupted or didn't receive their required attention. The availability of diagnostic facilities in highly only with irregular and interrupted supply of anti-Kala-azar drugs, which delayed patients diagnosis, follow up also contributed to the appearance of more cases. Kala-azar was reported in Iraq as an endemic disease since 1954 (AI-Naddawi *et al.,* 2000) and many studies after that time showed that the transmission cycle and the endemic nature of the disease had been continued till now especially in southern and middle governorates as revealed in this study and previous studies (AI-Rahim, 1994; Al-Alak, 1996; Mustafa, 2001; Abdul Rahim, 2004). This study showed also that the majority of cases (86.1 %) were reported in the Winter and Spring (December-May, inclusive), which may be attributed to the fact that the average incubation period of the disease is two to six months and that summer and autumn months are the period of high vector density and /or high vector-human contact. These results agree with that of Abulhab and AI-Hashimi (2001). The total percent of the reduction in the number of cases at the governorate level between the years 2007 and 2008 was 41.5 % which is a relatively low, ranging from 14.0 % in Al-Diwaniyah to 51.8

% in Al-Hamza districts. These variations in the percent of reduction at district level might be due to variations in the application of active control measures or defects in the reporting system to the health authority of the governorate.

CONCLUSION

It can be concluded from this study that Kala-azar stills a public health problem affecting children especially those less than five years of age in Iraq as a whole particularly southern governorates including Diwaniyah governorate. Most of the cases occurred in winter and spring months of the year. Most of Kala-azar cases occurred in areas with no active intervention. The current, complete national control measures against Kala-azar are effective in producing a reduction rate of 58.8 % in the number of cases in areas covered by active intervention in Diwaniyah governorate.

REFERENCES

Abdul Rahim. (2004). Evaluation of the effectiveness of Kala-azar control programme in Wasit governorate for the years 2001 and 2002.F.I.C.M.S dissertation, Iraqi Committee for Medical Specializations.

Abdul, A; Sarji, N. (2001). A comparative study of the method used for the diagnosis of Leishmania in Syria. Journal of Arab Board for Medical Specializations, 3 (4): 108 - 109.

Abulhab, J; Al- Hashimi, W K. (2001). Sand flies collected in foci of rural cutaneous leishmaniasis. Iraqi Journal of Community Medicine. 14(1): 68-69.

AI-Barazinji, R, AF-Waiz, M. (2000). Isolation and identification of microorganisms in a patient with secondary infection of Leishmania. Journal of Faculty of Medicine of Baghdad. 44 (2): 259 564.

AI-Sharqui, K E; Al-Waiz, M. (2002). Post-kala-azar dermal leishmaniasis in Iraqi children. Journal of Faculty of Medicine of Baghdad. 44 (4):786-770.

Al-Alak, A. (1996). Study on the epidemiology of visceral leishmaniasis. M.Sc. thesis, College of Medicine, Baghdad University.

Al-Alia, L. (1995). Hepatic involvement in visceral leishmaniasis and its reaction to the severity of the infection. M.Sc. thesis, College of Medicine, Al-Nahrain University.

Al-Bashir, N H. (1990). Axenic Amastegote for leishmanial parasite: cultivation and relationship to promastigote and intracellular amastigote. M.Sc. thesis, College of Medicine, Baghdad University.

Al-Jebouri, T I; Baqir, HI; Jum' an A S. (2001). Visceral Leishmaniasis: A preliminary study of the cell-mediated immune response using cytological promotion. Iraqi Journal of Medical Science. (2):119 - 125.

Al-Jebouri. TI; Baqir, HI. (2000). Diagnosis of active visceral leishmaniasis by the immunoblotting assay. Iraqi Journal of Medical Science. 2(1): P.58.

Al-Majeed, M. (2001). Visceral leishmaniasis in AI-Najaf Children. Kufa Medical Journal.4 (l): 75 76.

Al-Naddawi, MN; AI-Safar, N; Al-Ezzi J. (2000). Comparison of bone marrow examination and indirect immune fluorescent antibody test in the diagnosis of kala-azar. Journal of Faculty of Medicine of Baghdad. 42 (4): 595-599.

Al-Rahim, Q. (1994). Kala-azar (visceral leishmaniasis) in children. Journal of Faculty of Medicine of Baghdad. 36 (1): 212-21.

Alwan, S J. (1985). The present status of visceral leishmaniasis in Baghdad city. M.Sc. thesis, College of Medicine, Baghdad University.

Bacigalupo, D. A. (1998). Animal agents and vectors of human disease. 6th edition. London, Lear Febiger. PP. 356-357.

Ballarat, M. (2000). Visceral Leishmaniasis control. Belgium Journal of Tropical Medicine: 45 (5): 465-471

Berman, D. J., Badro, R.; Thakur, C. P. (1998). Efficacy and safety of liposomal amphotericin B (AM- Biosome) for visceral leishmaniasis in endemic developing countries. Bulletin of the World Health Organization. 76 (1): 25-32.

Bryceson, A. D. M. (1998). Leishmaniasis. In: Cook GC. (Editor). Manson's Tropical Diseases, 20th edition, London, WB Saunders. PP. 1213-1238

Campbell, AGM; Intosh, NM. (1998). Textbook of Pediatrics, 5th edition, New York, Churchill Living stone. PP. 1461-1462.

Chin, J. (2000). Control of Communicable Disease Manual, 17th edition.Washington DC., American Public Health Association.

Daniel, W. W. (1999). Biostatistics: A Foundation for Analysis in the Health Sciences. Seventh edition. New York, John Wiley & Sons Inc.

Gordis, L. (1996). Epidemiology Textbook. New York, W.B. Saunders.

Griffin, GE; Sisson, JGP; Chiodini, PL; Mitchell, DM. (1999). Diseases due to infection in Haslett; Chilvers, ER; Hunter, JAA; Boon, NIA (editors), Davidson's Principles and Practices of Medicine, 18th edition, New York, Churchill Livingstone. PP. 57-190.

Grögl, M; Daugirda, JL; Hoover, DL; et al. (1993). Survivability and infectivity of viscerotropic *Leishmania tropica* from Operation Desert Storm participants in human blood products maintained under blood bank conditions. American Journal of Tropical Medicine and Hygiene. 49:308-15.

Guthmann. JP: Calmet, J Rusell, E. Cruz, M.; Chang, J. (1997). Patient's Association and the Control of Leishmaniasis in Peru. Bulletin of the World Health Organization. 75(1): 39-44.

Herwaldt, B. L. (2001). Leishmaniasis. In: Braunwald, E.; Fauci, A.S.; Kasper, D. L.; Hauser, S. L.; Longo, D. L.; Jameson, J. L. (editors). Harrison's Principles of Internal Medicine. 15th edition. New York, McGraw-Hill.PP.1213-1217

Hoffmeister, H; Mensink, G B. (1997). Community-based intervention trials. In: Detels, R.; Holland, W.W.; McEwen, J.; Omenn, G.S. (editors). Oxford Textbook of Public Health. 3rd edition. London, Oxford University Press. PP. 571-584.

Kadivar, M R; Kajbaf, T Z; Karimi, A. (2000). Childhood visceral leishmaniasis complicated by bacterial infections. Eastern Mediterranean Health Journal, World Health Organization, 6 (516): 874-883.

Kamhawi, S; Arbagi; A; Adwan, S. (1999). Environmental manipulation in the control of Leishmaniasis. Journal of Archives de I' Institute de Tunis. 70 (4): 383-390.

Kerosi, S: Kishore, K; Palit, A. (2000). An entomological field evaluation of sand flies in Kala-azar focuses in Bihar- Indian. Journal of Communicable Diseases: 32 (4): 284-288.

Marquart, W C; Demoree, RS; Grieve, R B. (2000). Parasitology and Vector Biology. 2nd edition, Philadelphia, Harcourt: PP. 57-65.

Mustafa, A K. (2001). Kala-azar complications in Messan governorate. Iraqi Journal of Community Medicine :(l4) (2): 142-145

Neouimine, N.I. (1996). Leishmaniasis in the Eastern Mediterranean region. Eastern Mediterranean Health Journal. 2 (1): 94-101.

Paettanyk, K S. (2001). Kala-azar potentially predictable disease as a public health problem. Indian Journal of Public Health. 45 (2): 41-42.

Pearson, R.D.; Sousa, A.; Jeronimo, S. (2000). Leishmaniasis. In: Mandell, G.L.; Bennett, J E; Raphael, D. (editors), Principles and Practices of Infectious Diseases. 5th edition. New York, Churchill Living stone: PP. 2831-2841.

White, A.C. (1998). Leishmaniasis. In: Kelley, W.N.; Dupont, H. L.; Glick, J.H. et al. (editors). Textbook of Internal Medicine, 3rd edition. New York, Lippincott-Raven: PP. 1799-1802.

Wilson, M. E. (1998). Leishmaniasis. In: Wallace, RB. (editor). Maxcy-Rosenau-last, Public Health & Preventive Medicine, 14th edition. New York, Simon & Schuster PP. 334-337.

Wyler, D J; Davidson, H. (1996). Infections disease-leishmaniasis. In: Behrman, R.E.; Kliegman, R.M.; Arvin, A.M. (editors). Nelson Textbook of Pediatrics. I5th edition, New York, W.B. Saunders Company: PP. 972-974.

Yadova, D K. (1999). People's participation in the control of Kala-azar. Indian Journal of Community Medicine. 42 (4): 509-10.