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Evaluation of the national Kala-Azar control program in Daiyla Governorate for the years 2002 and 2003

Dr. Hayder Hameed Waheeb
Iraq. Daiyla. Baquba. Daiyla Health Directorate.

Abstract

Visceral leishmaniasis has been recognized as an important public health problem in Iraq for the last 50 years, particularly in middle and southern governorates. This study was conducted to evaluate the national control program in reducing the number of Kala-azar cases in Diyala governorate (which is a
known endemic focus in Iraq), for the years 2002 and 2003. Data were collected from the communicable diseases control unit in Diyala governorate, where all cases of leishmaniasis are recorded on monthly bases. Analysis of data at district level for the years 2002 and 2002 regarding the
number of Kala-azar cases and application of active control measures was carried out. The results of this study revealed that Kala-azar incidence rates in Diyala governorate for the years2002 and 2003 were 111.9 and 63.3 per 100000 in children less than five years, respectively .The number of Kala-azar cases recorded for the year 2003 was 154 cases ,which constitute 6.04% of the total cases in Iraq; this included 51 cases (33.1%)from areas where active control measures (spraying and rodents control campaign)were applied previously ,and 103 cases (66.9%)from areas where no such control measures were applied. The ratio of reported cases from areas without to areas with active control programs was higher than 1:1 in Diyala governorate at the districts level.
Comparison of the number of cases recorded for the year 2003 in areas after active intervention with the number of cases recorded in the same areas for the year 2002, before this intervention revealed that this active control measures were 62.2% effective in reduction of Kala-azar cases. It can be concluded from this study that national active control measures against Kala-azar in Diyala governorate were, relatively effective in reducing the number of cases and spreading of the disease in areas where these control measures were applied, but still, more effective control measures are needed for better interruption of the local transmission cycle and more reduction in the number of Kala-azar cases.

Keywords: kala-azar, control program, Dyiala

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 [(1)].

Visceral Leishmaniasis occurs mostly in rural areas of warm and tropical countries where public health infrastructures are inadequate, increasing incidence of visceral leishmaniasis is related to several reasons, and the majority of them depend on human activities, such as environmental modification as construction of dams and irrigation of channels [(2, 3)]. Visceral leishmaniasis is normally a zoonosis of wild animals, usually rodents, canines that include domestic dogs. Man is usually an accidental host but important for maintaining life cycle in few areas e.g., in India where

human are the only known reservoir .Unknown hosts in many areas till recently are present (2,4 , 5).

Visceral leishmaniasis is endemic in the tropical and sub-tropical region of Africa, Asia, Mediterranean, Southern Europe, South and Central America .The distribution of visceral leishmaniasis in this area is not uniform, it is patchy and often associated with areas of drought, and famine populated villages with little or no sanitation. In endemic areas children below the age of 15 years are commonly affected (6- 11).

In many affected endemic areas, the diseases occur commonly as scattered cases among infants, children and adolescent, but occasionally in epidemic form, Children, one to four year, especially are affected in Mediterranean regions (including Iraq), South West Asia, China, Latin America. In East Africa and India the peak age is five to nine years but the disease occur also among teenagers. Males are usually affected twice as often as females (2,12,13). All forms of leishmaniasis are initiated by the bite of female sand flies of genus Phlebotomus in the Old World (e.g. Phlebotomus Papatasi and Phlebotomus Sergenti are the most important) while in the New World, it belongs to the genus Lutzomyia (2, 14). In Iraq, the responsible sand flies vector is Phlebotomus Papatasi (15).

The breeding sites of sandfly depend on temperature in cool climates and rain fall in hot climates, thus transmission of Leishmania is often seasonal. Sandfly breed in soil that is rich in organic detritus and which must be damp, also sandfly breed in cracks in the walls of dwellings. Sandfly are weak flies and tend to remain close to ground near their breeding sites(2,4).They feed mostly on plant juices contain sugar, gravid female sandflies need at least two blood meals for maturation of eggs, so only female sandflies transmit the disease(16). As the flies attempt to feed, they regurgitate the parasites flagellated promastigote stage into the skin of mammalian hosts. Promastigotes attach to receptor on macrophages phagocytized and transformed within phagolysosome into the amastigote stage. After rupture of infected macrophages, amastigotes are phagocytized by other macrophages. If ingested by feeding sandflies, amastigotes transform back into promastigotes, which require at least 7 days for becoming infective and repeating the cycle (2, 4).
Transmission from person to person by blood transfusion and sexual intercourse has been reported but it is rare (17). The World Health Organization has estimated that 350 million people are at risk of leishmaniasis. Visceral leishmaniasis occurs in >80 countries in Asia and Africa (Leishmania donovani), southern Europe (L.infantum), and South America (L.chagasi).However, Leishmania donovani is the principal pathogen and 90% of the estimated 500000 new symptomatic cases per year arise in just five countries India, Sudan, Bangladesh, Nepal, and Brazil. India a lone may contribute to as many as 40 to 50% of the world's cases (16, 18).

Up to 30% patients of Kala-azar develop Post Kala-azar dermal leishmaniasis (PKDL) (19). Since PKDL allow parasites to survive in cutaneous locations, it may be important in allowing humans to serve as reservoir of visceral leishmaniasis (14, 20). Kala-azar was first reported in Iraq in 1916, when nine cases from Baghdad city were reported, all these cases were diagnosed by spleen puncture (21).Other workers in the twenties of the past century brought the attention to the presence of the diseases in Nasriyeh area in the south of Iraq and suggested that the cases were imported from a focus of the disease outside Iraq (22).

In 1954 the visceral leishmaniasis was reported as an endemic disease in northern Iraq (23, 24), and in the outskirts of Baghdad and nearly rural villages (25).

Following that several reports where published on the presence of the disease in rural area outside towns and cities in the central part of Iraq (26-28). The number of reported Kala-azar cases increase year by year, partly due to increased familiarity of physicians with the diagnosis and partly due to a real increase in its incidence due to limited control measures insufficient understanding of the epidemiology of this disease in Iraq. As insecticides spraying for malaria eradication from the country, was withdrawn, more cases of Kala-azar were reported (29, 30). Now a day, visceral leishmaniasis is regarded as an endemic disease in the middle and southern governorates (31).

The success of control measures depends on a basic understanding of the epidemiology of the disease, to assess cost effectiveness and to adjust control strategies, if necessary (4, 32). Deterioration of health and vector control services during previous gulf wars and economic sanctions imposed on Iraq since 1990 with all their sequences (e.g. poverty, malnutrition …) have contributed to the occurrence of outbreaks of leishmaniasis in the area (12, 33 , 34).

Only two studies were done to evaluate the national Kala-azar control program in Wasit governorates for the years 2001 and 2002 ,and in Babil governorate for years 2002 and 2003 (35,36).

Aims of the study

This study was carried out to:-

1. Evaluate national control measures against Kala-azar (spraying and rodents control campaigns) in Diayla governorate at districts level for years 2002 and 2003.
2. Find-out the incidence rates, age distribution, seasonal and monthly variations of Kala-azar cases in Diayla governorate for the same period.

Materials and Methods

This is a retrospective study designed to evaluate Kala-azar control program (active interventions) by using program-no program and before after program comparison as recommended by Gordis [36]. Data were collected from the Communicable Disease Unit in Diyala, about the number of Kala-azar cases, their age ,place and time distribution and application of complete control measures(at the end of active intervention campaign, the area was considered received complete control measures) at districts level of Diyala governorate for the years 2002 and 2003. The numbers of cases reported in the year 2003 in areas with control program (intervention-by applying complete control measures) were compared with number of cases reported in areas without intervention of the same year and also compared with the number of cases reported in the same areas before program (intervention) for the year 2002.

Results

Table 1 shows the distribution of Kala-azar in Diyala governorate for district for the years 2002 and 2003. Ba'qubah, AL-Khalis, ALMiqdadiyah, BaladRuz, and Khanaqin are the districts of Diyala governorate. This table shows the incidence rates of Kala-azar cases per 100000 in children less than 5 years of age in different districts of Diyala governorate for the years 2002 and 2003 with percent of reduction. Regarding the year 2002, the lowest incidence reported was in Khanaqin (53.05) while the highest was in BaladRuz (216.31) .In the year 2003, the corresponding incidences were (0.0) and (168.72) for the same two districts respectively .

Table 1: No. & Incidence of Kala-azar cases in children <5 years at the district level in Diyala governorates for the years 2002 and 2003.

	2002			2003		
District of Diyala	NO. of cases	Total no. of children <5y	Incidence per 100000	NO. of cases	Total no. of children <5y	Incidence per 100000
Ba'qubah	67	92631	72.33	51	95733	53.27
AL-Khalis	61	44794	136.18	30	46281	64.82
AL-Miqdadiyah	39	40143	97.15	24	41356	58.03
Khanaqin	16	30161	53.05	0	31065	0.0
Balad Ruz	61	28200	216.31	49	29043	168.72
Total	264	235929	111.89	154	243478	63.25

Table 2 show that 326 (78%) were reported in winter & spring seasons (December - May inclusive) of the year2002 and 2003, while only 92 cases (22%) reported in summer and autumn seasons (June - November inclusive). This seasonal variation is obviously significant. Table 3 show that there were 154 Kala-azar cases reported in Diyala governorate for the year 2003.there were 51 cases (33.12%) reported in areas covered by complete control measures (where active interventions by spraying and rodents control campaigns were applied), while there were 103cases(66.9%)reported in areas where no active control measures were applied for the year 2003.There was a significant difference in the number of cases in each district regarding the application of active control measures except in Khanaqin. Table 4 show that there was a reduction in the number of Kala-azar cases reported in Diyala governorate for the 2003 in districts after application of control measures (after active intervention by spraying and rodents control campaigns) in comparison with that number reported in the same districts for the year 2002 (before active intervention), from 135 cases recorded in 2002 to 51 cases recorded in 2003 . This indicate that the percent of reduction was 62.2% calculated using the following equation :(NO. of cases before intervention –NO. of cases after intervention / NO. of cases before intervention) x100.The highest reduction rate was in Khanaqin distract while it was the lowest in Ba'qubah distract.

Table 2: Monthly distribution of Kala-azar cases in Diyala governorate for the years 2002 and 2003.

Month	2002		2003	
	No. of cases	Relative frequency (%)	No. of cases	Relative frequency (%)
January	51	19.31	66	42.85
February	48	18.18	24	15.90
March	38	14.39	12	7.80
April	21	7.95	4	2.60
May	14	5.30	4	2.60
June	6	2.27	6	3.90
July	4	1.51	7	4.54
August	2	0.75	6	3.90
September	4	1.51	7	4.54
October	11	4.16	5	3.25
November	23	8.71	11	7.14
December	42	15.90	2	1.30
Total	264	100	154	100

Table 3- distribution of Kala-azar cases in Diyala governorate for year 2003at district level regarding previous application of control measures.

District	Areas with control measures No. (%)	Areas without control measures No. (%)	Total No.	Without to with ratio	P-Value*
Ba'qubah	13(25.5)	38(74.5)	51	2.9:1	<0.001
AL-Khalis	11(36.7)	19(63.3)	30	1.7:1	0.14
AL-Miqdadiyah	8(33.3)	16(66.7)	24	2:1	0.10
Balad Ruz	19(38.8)	30(61.2)	49	1.6:1	0.12
Khanaqin	0(0)	0(0)	0	---	---
Total	51(33.1)	103(66.9)	154	2:1	<0.001

**P- Value for chi-square "goodness of fit" is testing for each area the statistical significance of departure of reported frequencies for areas with & without control program from the 50:50 frequency distribution theory.*

Table 4- Number of Kala-azar cases in Diyala governorate for year 2002 at district level before intervention (application of control measures) and the year 2003 after intervention.

	No. of Kala-azar cases		
District	Before intervention	After intervention	Percent of reduction
Ba'qubah	28	13	53.6
AL-Khalis	35	11	68.6
AL-Miqdadiyah	22	8	63.6
Balad Ruz	43	19	55.8
Khanaqin	7	0	100.0
Total	135	51	62.2

Discussion

The incidence rates reported for Diyala governorate for the years 2002 and 2003 indicates that Diyala governorate was an endemic area.

The rates still lower than that recorded in Wasit, Theqar, Messan, Al- Qadissiya and Babil governorates. The finding that the majority of cases (94.6%) were recorded in the southern and middle governorates, this indicate that the major impact of the disease is on the southern and middle governorates .This results agree with the previous studies carried out in Iraq (31,34- 36, 39).

This study showed, also, that the majority of cases were reported in the winter and spring (December-May inclusive), and as it is well known that the average incubation period of the disease is two to four months, it can be concluded that the summer months are the period of high vector density and /or high vector-human contact .This result agree with that of a previous study carried out in Iraq (15).

Variations in the incidence rate of reported Kala-azar cases were noticed at district level .This may be related to geographical site of the district e.g. Khanaqin district is a northern area, reported a low incidence rate compared to other districts e.g. BaladRuz and Ba'qubah are at the northern border of Wasit governorate which reported a high incidence rate.

Most of Kala-azar cases recorded in Diyala governorate for the year 2003(66.9%) were in areas without previous control measures (spraying and rodents control measures) in comparison with areas with previous control measures(33.1%).This difference in the number of cases is statistically highly significant in Ba'qubah district regarding the application of active control measures, but in AL-Khalis, AL-Miqdadiyah and BaladRuz are not significant due to variations in the application of control measures, as it was not possible to cover all areas with spraying and rodents control campaigns.

The ratio of reported cases from areas without to areas with active control program in Diyala governorate was higher than 1:1 ranging between 1.6:1 in BaladRuz to 2.9:1 in Ba'qubah. The excess of reporting from areas without to areas with active control program over the 50:50 chances which is the 1_{st} evidence to the effectiveness of the program implemented.

Comparison of the number of cases recorded at district level for the year 2003 after active intervention (after application of spraying and rodent control measures), with the number of cases recorded in the same areas before active intervention, for the year 2002, revealed that there were a reduction in the number of cases at district level, which is the 2_{nd} evidence.

The percent of reduction in the governorate as a whole was (62.2%), ranging from (100%) at Khanaqin district to (53.6%) at Ba'qubah district**.** The relatively, low percent of total reduction in the most distract of governorate could be due to improper use of insecticides, sandfly resistance, lack of public role in control program. The reduction rate showed obvious variations between districts ,which may be attributed to variations in quality of active program implementation ,skill of working team, amount of area coverage , cooperation of the local community and resistance of sandfly to insecticides.

The deterioration of health services resources in the last two decades which affect the possibility of early diagnosis and treatment of cases and the application of other control measures besides the insufficient evaluation of these control measures affect the strategies of these measures and led to increase in the Kala-azar cases in different governorates of the country. Vector control through residual insecticides house – spraying campaigns are without doubt the most effective measure in the reduction of Kalaazar transmission, especially in endophilic species (1). In Iraq this intervention is considered the back bone of the completeness of the Kalaazar control measure and usually done in campaigns in specific time according to the number of cases recorded in that area and usually associated with rodents control measures. The above factors with many others factors need further comprehensive studies and multidisciplinary approach for better planning and implementation of disease control program. The cooperation and the education of local population are considered the cornerstone of any preventive program. In Peru, which is one of the endemic foci of leishmaniasis, a major achievement in reduction in reduction of number of cases was occurred after the 1990, the community has played a major role in bringing this achievement, first by forming its own patients associations and by coordinating their activities through a committee on which different sectors of society, including health authorities are represented (41). In China, before the foundation of the People's Republic of China in 1949, Kala-azar was one of the major parasitic disease of the country .From the areas north of the Yangtze River,

about 5300000 cases were reported in 1951.In 1950-1958 a nationwide control campaign (mass treatment of patients, killing of infected dogs, use insecticides) was launched and the disease was largely brought under control in the plains region (42). In India, Bihar the epidemic was controlled through a combination of active case detection and treatment in the community combined with residual spraying in the household (43, 44).

In Iraq, until the living conditions can be improved to make human habitant unsuitable for the sandfly breeding together with early disease recognition and treatment, the cycle of Kala-azar transmission is likely to be maintained which need further application of more effective control measures in all endemic foci on country in order to overcome this problem. Periodic and scientific evaluation of these control measures is the cornerstone of successful and effective implementation.

Conclusion

It can be concluded from this study that:-

1. Kala-azar is an important public health problem affecting children less than five years of age in Diayla governorate and in Iraq as whole especially southern and middle governorates.
2. Most of Kala-azar cases occurred in Winter and Spring months of the year.
3. Most of Kala-azar cases were reported in areas without active intervention.
4. The current complete national control measures against Kala-azar are effective in producing a reduction rate of 62.22% in number of cases in areas covered by active intervention in comparison with the number of cases reported in the same areas, but before this intervention, although further reduction is required.
5. Deterioration of health services during the last few years, together with irregular use of insecticides and ignorance of public education and participation in control program may be an important factor in disease transmission even in areas with intervention.

Recommendation

The lift of economic sanctions imposed on Iraq after the 2003 war should be a step forwards for mobilization of enough resources to health sector for effective planning and implementation of comprehensive control strategy, leading to:-

1. Regular application of proper insecticides and other control measures recommended by international authorities.
2. Periodic and scientific evaluation of these control measures including evaluation of the susceptibility of sandfly to insecticide used.
3. Expanding the role of public health education and participation in disease control.
4. Availability of diagnostic facilities, low cost drugs, together with surveillance mechanisms at primary health care centers.
5. A comprehensive long term studies should be initiated concerning the most effective means of reducing disease incidence including post spraying follow up study to determine the duration of insecticide residual activity.
6. Collaboration of C.D.C center in Baghdad with other international health organization especially WHO authorities for scientific and economic cooperation.

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