

Evaluation the Effectiveness of Impregnated Net in Reducing Leishmaniasis Incidence: Diala-Iraq

Dr. Haifa I. Tawfeeq Ph.D., Dr. Yousif Abdul-Raheem MBCHB, FICMS /CM Dr. Zuhair Najeeb Rasheed MSc., Buthaina Ateyah Rashid M.Sc.

Abstract

Background: Leishmaniasis is important public health problem owing to its impact on morbidity and mortality and difficulties in application of effective control measures.

Objective: The aim of the study is to evaluate the using of impregnate bed nets in the control of leishmaniasis.

Methods: The study was conducted throughout the years 2004 and 2005, in Diala Governorate (about 60km north-east Baghdad). This is the first study in Iraq for evaluation of the impregnated bed net in control of leishmaniasis. Two villages were selected to achieve this aim. The nets were distributed for the first village to be used by their

population. The second village was served as control.

Results: The results revealed that there was a significant decline in the incidence of cutaneous leishmaniasis from 19.23 per 1000 (before net distribution) to 3.34 per 1000 (after net distribution). On other hand, there was no significant difference in the incidence in the second village (control) as it was 13.42 to 12.46 per 1000.

Conclusions: Impregnated bed net is effective in the reduction of leishmaniasis incidence when used properly as a control measures.

Key wards: Leishmaniasis, impregnated bed nets, control measures

Al - Kindy Col Med J 2010 ; Vol .6 . No. (1)p:

Introduction

Although leishmaniasis is an important public health problem, current efforts to control this problem are insufficient. ⁽¹⁾

The wide diversity of both the clinical form of the disease and the epidemiological situations mean that each focus requires specific control principles and methods. ⁽²⁾ The WHO has estimated that 350 million people are at risk of leishmaniasis, 1.5 million new cases of cutaneous leishmaniasis (CL), and 500,000 cases of the systemic, or visceral type (VL) occurs each year around the world. In all, about 59,000 people die from it annually. ⁽³⁾ Leishmaniasis often represents a zoonotic infection with a vector-borne transmission, rodents and canines are common reservoirs, and human is usually an incidental host. It occurs mostly in rural area of worm 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 construction of dams, irrigation channels and settlement of non-immune population as military activities, traveling and urbanization. ^(4,5) In Iraq, especially

inmiddle and southern governorates, visceral leishmaniasis was regarded as an endemic disease since 1954. ⁽⁶⁾ The causative agent of visceral leishmaniasis is *Leishmania donovani* while cutaneous leishmaniasis is *Leishmania tropica* and *Leishmania major* ⁽⁷⁾. The responsible vector is *Phlebotomus Papatasi Scopoil* (Diptera, Phlebotomidae), which is spread and abundant in central and southern Iraq. ⁽⁸⁾ Population movement and deterioration of health and vector control services during the previous wars and economic sanction imposed on Iraq in 1990 with all their sequences (e.g. poverty, malnutrition ...etc.) had contributed to the outbreak of leishmaniasis in the area ^(6,9) 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. ⁽¹⁰⁾ A combination of approaches is usually used to control leishmaniasis, but vectors elimination through residual insecticide spraying

plays a significant role in the reduction of transmission. However, the high cost of modern insecticides and increasing concern about their

**Health and Medical Technology College Community Medicine DepartmentAL- Kindy College of Medicine-*

***Community medicine Communicable Diseases Control Center-Baghdad.*

****Community Health Technology Health and Medical Technology College*

Correspondence Address to :Dr. Yousif Abdul-Raheem _ E- mail: yousifkindi@yahoo.com

impact on the environment have resulted in a significant reduction in the use of insecticides by national programmes. ⁽¹¹⁾ Bed nets have been in use since very early times to protect people against blood sucking insects at night, but insecticide-treated nets are new technology started to be used in mid-1980s, in May endemic countries. Trials on the use of insecticide-impregnated bed nets in foci of cutaneous and visceral leishmaniasis are going on in the Islamic Republic of Iran, Sudan and the Syrian Arab Republic. The trials are supported by the EMRO/CTD/TDR Small Grants project. The preliminary results from these trials are very encouraging. ⁽¹²⁾ Sandfly that land on an impregnated net and attempt to feed through it on part of the body in contact with

the net are likely to be killed. ⁽¹³⁾ The behavior of a sandfly that survives contact with the insecticide is so disturbed that it is unlikely to attack again. People without a net and sleeping near someone with a treated net may receive some protection from bites. These factors make the widespread use of treated bed nets particularly important in the control of leishmaniasis. ^(14, 15) In 2004, the use of impregnated bed net was done for the first time in Iraq, and this study is the first evaluation of such intervention. The aim of the study is to evaluate the use of impregnated bed net in reduction of CL in Diala governorate (area of high leishmaniasis transmission intensity) at village level.

Methods

Study area and population: The study was carried out from the 1st of January 2004 throughout the 31st of December 12/2005 in Diala Governorate, located 60 km north-east Baghdad. It is one of the leishmaniasis-endemic areas in Iraq, with 1,393,788 populations (according to the census of

1997); most of them live in rural areas. Two villages (Harbetela and Al-Hasauia) were selected for the comparison of the bed net control effect. The data regarding the demographic criteria of these two villages are shown in the table below:

Table A: Demographic and administrative characteristics of the studied villages.

| Character | Harbetela | Al-Hasauia |
|--|-----------------------|------------------------|
| Distance from district | 10 Km | 10 Km |
| No. of population | 1196 | 3130 |
| No. of houses | 134 | 516 |
| No. of bed rooms | 514 | 2170 |
| No. of animal houses | 175 | 223 |
| No. of others rooms | 249 | 1034 |
| Expected area for insecticide spraying | 53.400 m ² | 171.800 m ² |
| Cats and dogs | Present | Present |
| Occupation of most population | Agriculture | Agriculture |
| No. of schools | One (Primary) | One (Primary) |
| Primary health care services | None | None |

Study design and data collection:

The work in this interventional study is divided into three parts:

Part I: Cooperation with The Department of Infectious Diseases in Diala was performed regarding the implementation of the national leishmaniasis control measures, which were

implemented by The Communicable Diseases Control Center (Baghdad) in these two villages. The following measures were applied for both villages:

a- Insecticide spraying: this is done by application of insecticides with residual action (usually Malathion or Pyrethroids) to control of sandflies vector.

b- Rodents control measures; by rodents borrow destruction and poisoning.

c- Night fogging: Spraying of Icon mixed with oil during dusk. Implementation of night fogging usually occurs in high vector density period from May to October, but it can change according to weather condition and insect activity.

Part II: Selection of Harbetela village to distribute the bed nets and evaluate their effectiveness. The following steps were done:

a- Explanation the purpose of the study to the population in the village, and a verbal consent was obtained from each family. Health education messages regarding the importance and the proper uses of bed net were giving through house to house visits, besides, explanation the impact of disease, method of transmission, methods of prevention and the proper handling of the net.

b- Health education lectures and instructions were also given in the primary school with the aid of teachers as well as in the mosques of the village.

Part III: Follow up of the two villages:

A specially designed interviewing questionnaire was used to obtain data from the studied subjects. Data collected including the number of CL cases which were recorded through monthly visits for each village during the whole 2005 year. During these visits, checking was done for the nets, health messages were giving in attempt to maintain the efficacy and compliance of proper use of the bed net by the Harbetela population. At end of the study period (2005), a comparison of the number of CL cases in each village (after the application of control measures) were calculate and compared with that recorded before the application of control measure (in 2004).

Statistical analysis:

Field data forms were checked manually for completeness then were analyzed statistically by using the following procedures:

a- Descriptive statistics; frequencies and percentage.

b- Inferential statistics; Chi-Square test was used to find out the significance of the difference between the numbers of cases.

P values<0.05 were considered to be statistically significant

Results

The total number of leishmaniasis reported in whole Diala Governorate for the years 2004 and 2005 were 3124; CL (Baghdad Boil) constituted 95.26% (2976 cases) of them, while VL (Kala-azar) cases constituted only 4.74% (148 cases). (Table 1)

Table 1: Distribution of leishmaniasis in Diala governorate 2004 and 2005.

| Year | Visceral Leishmaniasis (Kala azar) | | Cutaneous Leishmaniasis (Baghdad Boil) | | Total |
|------|------------------------------------|------|--|-------|-------|
| | No | % | No | % | |
| 2004 | 89 | 4.69 | 1807 | 95.31 | 1896 |
| 2005 | 59 | 4.80 | 1169 | 95.20 | 1228 |

The results revealed that there was a significant decline in the incidence of CL in Harbetela village from 19.23 per 1000 (before net

distribution) to 3.34 per 1000 (after net distribution). On other hand, there was no significant difference in the incidence in the second village (control) as it was 13.42 and became 12.46 per 1000. The bed nets were

effective in reduction of CL cases in Harbetela village in 82.63%, while the percent of reduction was only 7.15% in Al-Hasauia village where the

net were not used. (Table 2). The monthly distribution of CL cases, for both villages in 2004 and 2005, is illustrated in figures 1 and 2.

Table 2: The distribution of CL cases in the two villages during 2004 and 2005

| Village | 2004 | | 2005 | | Percent Reduction | P Value |
|---------------------------------------|------|---------------|------|---------------|-------------------|---------|
| | No | Rate per 1000 | No | Rate per 1000 | | |
| Harbetela (with net) N=1196 | 23 | 19.23 | 4 | 3.34 | 82.63 | 0.002 |
| Al-Hasauia (without net) N=3130 | 42 | 13.42 | 39 | 12.46 | 7.15 | |

Fig 1: Monthly distribution of CL cases in both villages, 2004.

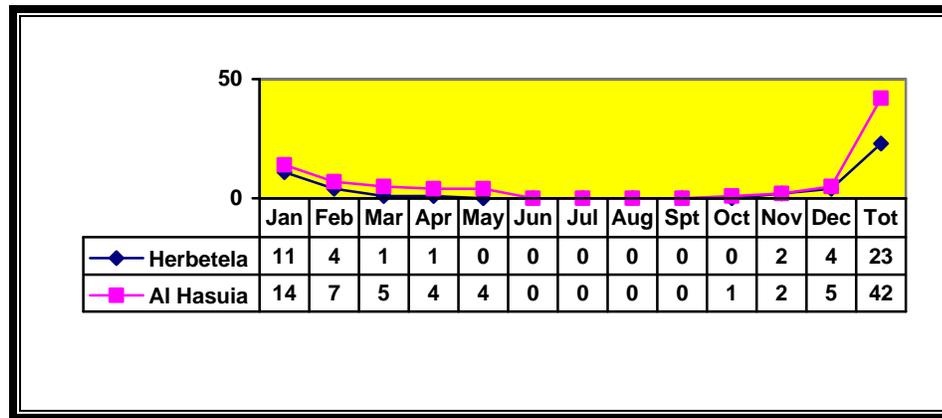
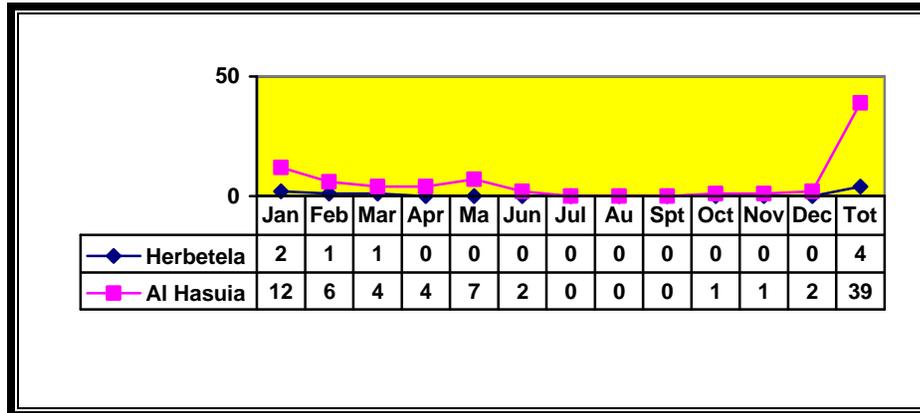


Fig 2: Monthly distribution of CL cases in both villages, 2005.



Discussion

The difficulties in gaining perfect control for leishmaniasis are large, which need further attention and work by health authority. ⁽¹⁶⁾ Vector (sandfly) control remain the corner stone in prevention of vector borne diseases (e.g. leishmaniasis, malaria...etc), but this control should be selective, cost-effective, sustainable, environmentally friendly and applied in one integrated fashion utilizing local technologies and resources. As far as possible community participation should be facilitated, health education should be emphasized and inter-sectoral approaches should be utilized. ^(17, 18) Before the development of insecticide-treated nets (ITNs) as a new technology in the mid-1980s, people in many endemic countries were already using nets, mainly to protect them self's against biting insects and for cultural reason. It was only recently appreciated that a net treated with insecticide offers much greater protection against vector born diseases (e.g. malaria, leishmania); not only does the net act as a barrier to prevent vector (mosquito, sandfly) biting, but also the insecticide repels inhibits or kills any vector attracted to feed. Thus ITNs provide protection both to individuals sleeping under them and other community members. ^(19, 20)

Many studies all over the world showed a significant effect of ITNs in malaria control and recently many studies conducted to evaluate the ITNs effect in leishmaniasis endemic area. ^(21,22,23,24) This study was conducted for such evaluation in Iraq. This study sought to evaluate ITNs prevention effect on CL in two Iraqi rural communities. The study relied on CL cases in determination the nets effectiveness for many reasons, firstly CL constituted of 95.26% of leishmania cases, secondly it affects all ages evenly in contrast to VL which affect only those below 5 years, and thirdly it is easier in diagnosis. Although considering that interventions were not applied ideally in all the families in the Harbetela village, strong reduction in the incidence rate was observed regarding the number of CL pre and post intervention . There was a reduction in the incidence rate for the cases from 19.23 in 2004 to 3.34 per 1000 during 2005, while in Al-Hsuaia (without net) village the rates were approximately almost equal at the same period. This significant reduction was in agreement with the results reported in Iran, Sudan, Syria and China. ^(24,25) The most important difficulties of this study were the bad security situation during the study period

and the difficulty in transportation from area to area as the main roads were blocked in the governorate. Despite that, monthly visits were maintained to supervise the implementation of control measures in both villages and guarantee the proper use and handle of the nets in Harbetela village. In conclusion, our findings showed that ITNs may be the ultimate answer to the problem of

leishmaniasis in remote, rural areas provided a suitable and optimal health education service delivery; importance of ITNs and more importantly their prompt handle. Further studies on larger area and population are needed for better assessment and understanding the impact of different insecticide impregnated bed nets on disease control.

References

- 1- David L. Heymann, MD. Leishmaniasis. In: Control communicable diseases manual, 18th Edition Washington DC., American Public Health Association, 2004; pp.295-301.
- 2- Marquorat, WC; Demoree, RS; Grieve, RB. Leishmania and Leishmaniasis. In: Parasitological and vector biology. 2nd edition. Harcourt: 2000; pp, 57-65.
- 3- Neouimine, NI. Leishmaniasis in Eastern Mediterranean region. *Eastern Mediterranean health Journal*. 1996; 2(1):94-101.
- 4- Bryceson, A.D.M. Leishmaniasis. In : Cool G.C. (Editor). Manson's tropical diseases. 20th edition London, WB Saunders Company Ltd, London: 1998; pp, 1213-1237.
- 5- Al-Alak, A. Study on epidemiology of visceral leishmaniasis. M.Sc. thesis, College of Medicine, Baghdad University. 1996; p: 3.
- 6- AL- Nadawi, M.N.; Al-Safar, N.; Al-Ezzi, J. Comparison of bone marrow examination and indirect immune fluorescent antibody test in diagnosis of kala-azar. *Journal of Faculty of Medicine of Baghdad*. 2000; 42(4):595-599.
- 7- Communicable Diseases Control Centre. Leishmaniasis in: Report on Leishmaniasis in Iraq 1st quarter. Ministry of Health-Baghdad, C.D.C. center. 2005; pp: 1-2.
- 8- Abul-hab J. and Al-hashimi W. Study on Night man-biting activities of Phlebotomus papatasi Scopioil (Diptera, Phlebotomidae) in Suwaira, Iraq. *Regional Training Center for Malaria and Vector Biology Control*. Baghdad: 2005; p: 1.
- 9- Niazi A.D. and Al-Kubaisi W.A. The humanitarian and health impact of war and embargo on the Iraqis: *Iraqi Med. J*. 1998; 47:1-12.
- 10- Abdul Raheem Y. Evaluation of the effectiveness of kala-azar control program in Wasit governorate for the years 2001 and 2002. F.I.C.M.S. Dissertation. *Scientific Council of Family and Community Medicine*. 2004; pp: 1-5.
- 11- Yadova, DK. People participation in control of kala-azar. *India Journal of Community Medicine*. 1999; 42(4):509-510.
- 12- WHO Report. Leishmaniasis Control measures. Available at http://www.who.int/docstore/water_saitation_health/vectcontrol/ch08.htm. 2004; pp: 3-38.
- 13- Rozendaal JA, and Curtis CF. Recent research on impregnated mosquito nets. *Journal of the American Mosquito Control Association*, 1989; 5: 500 - 507.
- 14- Lines JD, Myamba J, Curtis CF. Experimental hut trials of permethrin – impregnated mosquito nets and eave curtains against malaria vectors in Tanzania. *Medical and veterinary entomology*, 1987; 1: 37 - 51.
- 15- Lindsay SW. Permethrin-impregnated bed nets reduce nuisance arthropods in

- Gambian houses. *Medical and veterinary entomology*, 1989; 3: 377 - 383.
- 16-** Braunwald E, Fauci AS, Hauser SL, et al. Leishmaniasis. In: Harrison's Manual of Medicine. 15th ed. McGraw-Hill .2001; p: 214-25.
- 17-** Jamjoom GA and Omar MS. Portable mosquito net support devices for indoor and outdoor use. *Journal of the American Mosquito Control Association*, 1990; 6: 544- 546.
- 18-** Schreck CF. Evaluation of personal protection methods against phlebotomine sandflies including vectors of leishmaniasis in Panama. *American journal of tropical medicine and hygiene*, 1992; 31: 1046 - 1053.
- 19-** Curtis CF. Natural and synthetic repellents. In: Curtis CF, 12th ed. *Control of disease vectors in the community*. London, Wolfe, 1991; 75 - 92.
- 20-** Jamjoom GA and Omar MS. Portable mosquito net support devices for indoor and outdoor use. *Journal of the American Mosquito Control Association*, 1990; 6: 544-546.
- 21-** Rozendaal JA. Impregnated mosquito nets and curtains for self-protection and vector control. *Tropical diseases bulletin*, 1989; 7: R1 - R41.
- 22-** Rozendaal JA, and Curtis CF. Recent research on impregnated mosquito nets . *Journal of the American Mosquito Control Association*, 1989; 5: 500 - 507.
- 23-** Hossain MI, Curtis CF. Permethrin-impregnated bednets: behavioural and killing effects on mosquitoes. *Medical and veterinary entomology*,1989; 3: 367 - 376.
- 24-** World Health Organization. Evaluation of pyrethroid impregnated bed nets for control of anthroponotic cutaneous leishmaniasis in Syria, WHO/LEISH/79.41, Geneva. 1998; pp: 15-19.
- 25-** World Health Organization. Information on the epidemiology and control of the leishmaniasis by country or territory by Desjeux, P. World Health Organization, Geneva. 1995.