Journal of Communicable Diseases
Volume 53, Issue 1 - 2021, Pg. No. 45-57
Peer Reviewed & Open Access Journal

Research Article

Present Status and Progress towards Kala-Azar Elimination Programme in Uttar Pradesh, India

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DOI: https://doi.org/10.24321/0019.5138.202108

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How to cite this article:
Chandra R, Kamal S, Singh SM, Kumar A, Mittra KK, Roy N. Present Status and Progress towards Kala-Azar Elimination Programme in Uttar Pradesh, India. *J Commun Dis* 2021; 53(1): 45-57.

Date of Submission: 2021-02-18
Date of Acceptance: 2021-03-25

A B S T R A C T

Kala-azar (KA) and Lymphatic Filariasis (LF), two out of the six vector borne diseases slated for elimination from the country by Government of India. Kala-azar or Visceral Leishmaniasisis prevalent in the eastern part of Uttar Pradesh mainly in the districts bordering to Bihar, the state known for high endemicity of the disease. This disease has been targeted for elimination not only from thestate butfrom the country by 2020 by bringing down the Kala-azar prevalenceto <1 per 10000 population at sub district/block level. The two important interventions in Kala-azar control Programme includes Indoor residual spray (IRS) and Active Case Searches (ACS) in the endemic districts. The disease has been existed since long back in the state and the efforts made towards elimination are inadequate and deviated from the guidelines laid down by Directorate of National Vector Borne Disease Control Programme (NVBDCP).If the population of the sub district/ block is considered basic unit for calculating the prevalence of Kala-azar case<1 per 10000 population, then the state has achieved the same and as no activity pertaining to Kala-azar intervention measure is needed but in order to achieve the real target, it is suggested to consider the population of Health Sub-Center (HSC) for calculating the parameter of Kala-azar case <1 per 10000 population, for which a long way is required by undertaking measures like (a) active cases search drive for at least up to three years sweeping the whole population of the district, (b) complete treatment of the KA cases (both VL & PKDL), (c) complete coverage of population with IRS following the time line and quality of IRS as per NVBDCP guidelines, and (d) intervention activities needs to be synchronized with neighboring states or country subjecting their areas for KA elimination. Present study revealed the current status and progress towards elimination of the disease.

Keywords: Kala-azar Outbreak, Surveillance, Intervention Measures, Leishmania donovani, Phlebotamus Argentipes, Activecase Case Search

Introduction

Uttar Pradesh is the largest state of India comprised of 75 revenue districts and area of 243,286 sq.km, reflects population density of 828 persons per sq.km. The population of Uttar Pradesh is highest 230 million population (199.81 million as per 2011 census). It has vast length and width. About two third population resides in rural areas and mainly depend upon agricultural practices as the Indo-Gangetic plain is contributing a lot in the fertile agricultural region for the development of not only the state but India as a whole. Since this area is traversed be a number of big and small rivers, provide good opportunity & facility for irrigation of the crops, horticulture fields and industry too. The state had public health problems as every third person suffered due to malaria with high mortality & morbidity prior to the independence. Though Malaria was the major problem, yet Kala-azar and plague also posed a threat. The launch of National Malaria Control Programme (NMCP) in 1953 with organized control efforts by performing DDT 50% wdp Indoor Insecticidal Spray (IRS) inside the human dwellings, resulted drastic decline in malaria cases, as only 0.10 million cases of malaria in India and 3365 cases left in Uttar Pradesh in 1965, thereby eradicating the dreadful disease from almost major part of the country. The Indian sub-continent, which experienced several epidemics of Kala-azar in eastern part 1 of India at an interval of ten years and lasted in 10 years duration, ceased to occur automatically. The epidemics of plague, a zoonotic disease, were also prevented, as no death due to plague was reported after 1967[2] though the activity of the bacillus responsible for plague continued in rodent host population till 1980, as the isolation of the bacillus was reported from rodent of Himachal Pradesh, thereafter no isolation of bacillus reported, only serological positivity was reported in Tatarica indica. The possible cause of check on epidemics of Kala-azar and prevention of plague epidemics may be attributed to the pressure exerted on the vectors of the two diseases by insecticidal use against malaria in public health and in agriculture, without any additional effort/ input against Kala-azar and plague vectors. The limitation of conducting IRS operations, was experienced on technical ground due to reduction in malaria cases. The handing over of malaria free areas to the basic health services in the states for maintaining the malaria free status in their area and restricted use of insecticides in public health, resulted in resurgence of the many of the vector borne diseases, among which included kala-azar too. The local and focal outbreaks of malaria with high morbidity & mortality, occurred in different states, thereby increased the toll of malaria cases to 6.47 million in 1977 in the country. The reporting of kala-azar started by seventies and as such Bihar & West Bengal became worst affected among all.[1] The introduction of Japanese Encephalitis (JE) in north-eastern Uttar Pradesh, during 1978, swept over the affected population with IRS again, prevented the population from kala-azar but the IRS was withdrawn in midth of nineties, due to the exophilic and exophagic behavior of the JE vector. The other districts of Uttar Pradesh, not covered under IRS, reported sporadic occurrence of kala-azar cases 1 but outbreak occurred in 1987-88 in District Bhadohi (erstwhile part of district Varanasi), a place known for carpet weaving, for which looms are installed in the houses. The labour deployed in the looms, was used to come from Bihar, a highly kala-azar affected state.

Concerned with the increasing problem of Kala-azar in the country, the Government of India (GOI) launched a centrally sponsored Kala-azar Control Programme in the endemic states in 1990-91. The GoI provided drugs, insecticides and technical support and state governments provided costs involved in implementation. The program was implemented through State/ District Malaria Control Offices and the primary health care system with the existing set up of malaria programme without any additional manpower. Prior to this, the disease kala-azar was looked through general health services in the country. The programme brought a significant decline in Kala-azar morbidity, but could not sustain the pace of decline for longer period.

The National Health Policy-2002 set the goal of Kala-azar elimination in India by the year 2010[4] in order to improve the health status of vulnerable groups and at-risk population living in Kala-azar endemic areas by the elimination of Kala-azar, so that it no longer remains a public health problem. The target of elimination was revised to 2015[7-9] and now to 2020[10] but the target has not been achieved so far, which envisage reduction in the annual incidence of Kala-azar to <1 case per 10,000 population at the sub-district (block PHCs) level in Bangladesh and India and at the district level in Nepal.

The National Vector Borne Disease Control Programme (NVBDCP)is an umbrella programme for prevention and control of vector borne diseases and is subsumed under National Health Mission (NHM).Presently all programmatic activities pertaining to vector borne diseases in the country are being implemented through NVBDCP with the objectives of reducing Kala-azar in the vulnerable, poor and unreached populations in endemic areas; reducing case-fatality rates from Kala-azar to negligible level; reducing cases of PKDL to interrupt transmission of Kala-azar; and preventing the emergence of Kala-azar and HIV/ TB co-infections in endemic areas. The present paper deals with the status and efforts & progress of the state towards the elimination of the Kala-azar disease.

Methodology

A multipronged approach was planned and implemented

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202108

as the national strategy for elimination of Kala-azar which included: Early diagnosis & complete case management; Integrated Vector Management and Vector Surveillance; Supervision, monitoring, surveillance and evaluation; Strengthening capacity of human resource in health; Advocacy, communication and social mobilization for behavioral impact and inter-sectoral convergence and Programme management. In order to ensure action on different approaches of the disease elimination, the Kala-azar endemic and affected district Kushinagar, Deoria, Ballia, Ghazipur, Varanasi, Jaunpur and Sultanpur were visited during 2018 & 2019. The activities related to different approaches were observed in the districts. The observation made so in the districts were analyzed and interpreted.

Result and Discussion

Since, there was no identified programme for prevention and control of the Kala-azar disease, the number of Kala-Azar (KA) cases reported by the state form various treatment hospitals in 1977, the time of implementation of modified plan of operation for malaria and when the National Vector Borne Disease Control Programme (erstwhile National Malaria Eradication Programme) started collection of information on Kala-azar (KA) cases, has been furnished through graphic presentation in the document (Figure 1).[1-6] The disease is not reported from all 75 districts of the state but the maximum number of KA reporting districts in the eastern half of the state remained only 16 during last twenty five years. It is evident from the (Table 1) that only five districts namely Ballia, Ghazipur, Varanasi, Deoria and Kushinagar have been reporting Kala- azar cases regularly. In addition to this, District Sant Ravidas Nagar (Bhadohi), (which was earlier a part of district Varanasi), also experienced KA outbreak in 1987-88, resulting considerable morbidity & mortality.[1] As per the National guidelines, the state is implementing various intervention activities, which are briefly documented in this communication.

Surveillance of Kala-azar (KA) Cases

The district Ballia, Ghazipur, Varanasi, Deoria and Kushinagarare highly KA endemic districts reporting cases on regular interval, had conducted special search drive for abouta fortnight twice in a year. The hospital based surveillance has also been included in these cases. On analyzing the month wise data of KA cases of last four years, it was revealed that the reporting of KA cases remained throughout the year with increased number in the last quarter of the year and a slight rise in post spring months (Figure 2). The surveillance data in absence of the regular surveillance staff, is not sufficient to conclude the seasonality of the disease but of the disease pattern, it can be assumed that the transmission of the disease in the state is post spring and post monsoon season and the intervention activities pertaining to the elimination of the disease are being instituted by the state, keeping in view the disease transmission period.

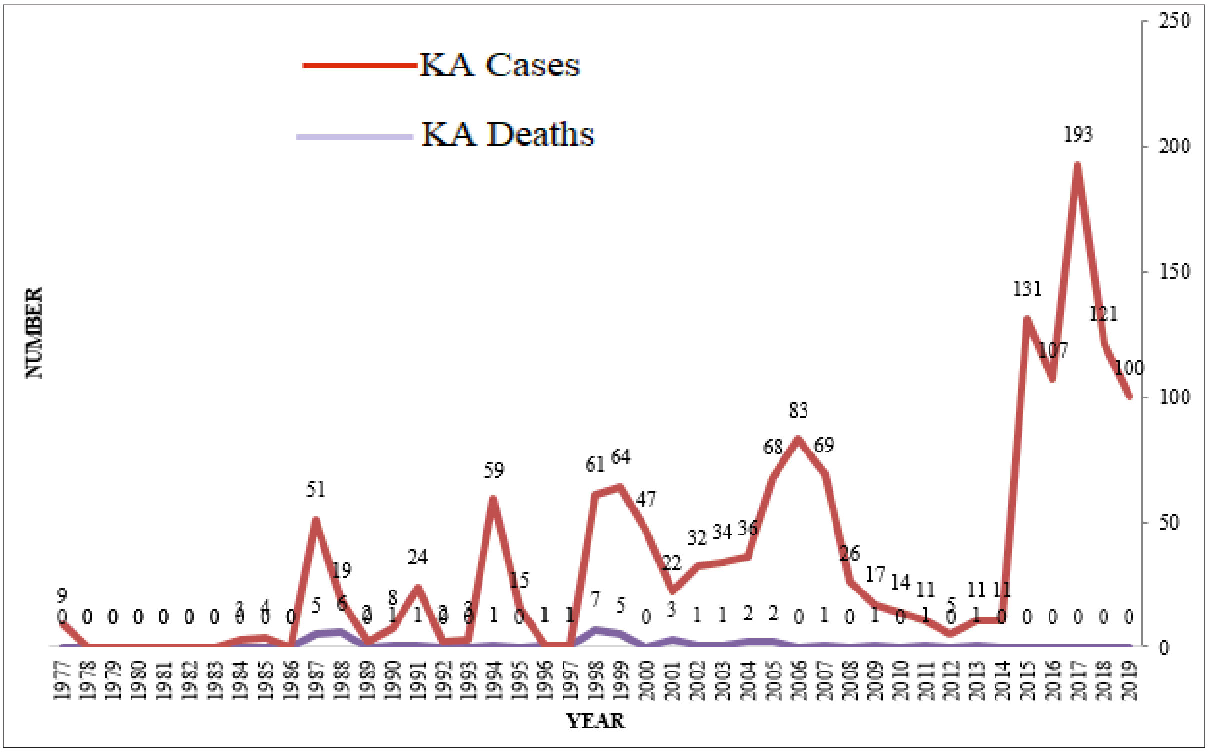

Figure 1.Number of Kala-azar Cases and Deaths reported in Uttar Pradesh from 1977 to 2019

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202108

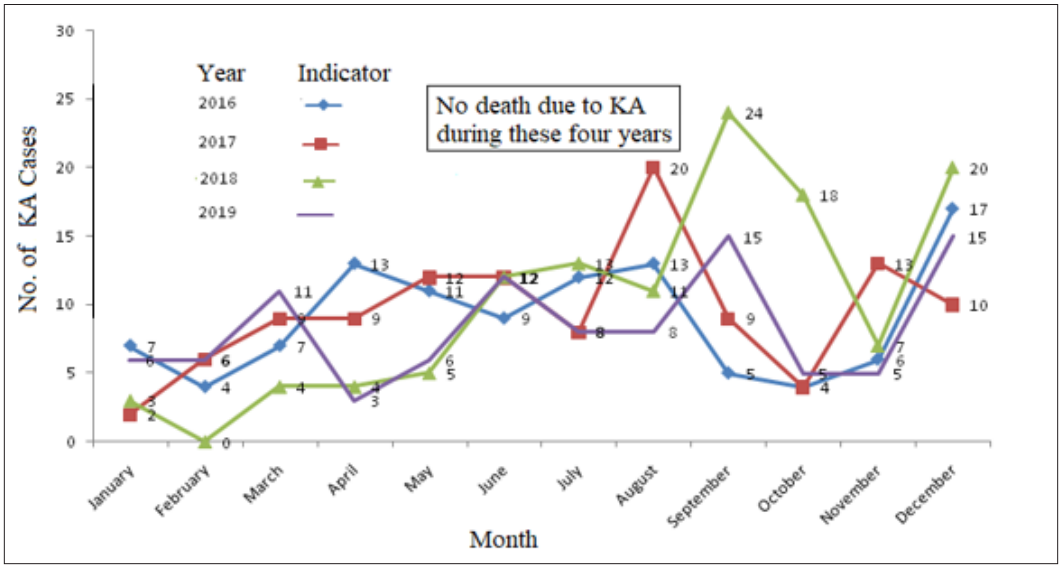

Figure 2.Seasonality of Kala-azar Cases in Uttar Pradesh from 2016-2019

Table 1.District wise Status of Kala-azar Cases in Uttar Pradesh

S. No.	District/ Year	1994		1995		1996		1997		1998		1999		2000		2001		2002		2003		2004		2005	
		*C	**D	*C	**D	*C	**D	*C	**D	*C	**D	*C	**D	*C	**D	*C	**D	*C	**D	*C	**D	*C	**D	*C	**D
1.	Deoria	1	0									3	0	2	0	4	0								
2.	Kushi-nagar									61	7	55	5	40	0	21	3	30	1	19	0	1	0	27	0
3.	Ballia	8	1			1	1					6	0	2	0			2	0	14	0	21	1	20	1
4.	Mau							1	1																
5.	Varanasi	45	0	2	0																	3	0	6	0
6.	Ghazipur	1	0											2	0										
7.	Jaunpur	1	0																						
8.	Chan-dauli																								
9.	Bhadohi#																								
10.	Mirzapur	1	0																						
11.	Gora-khpur													1	0										
12.	Ayodhya***			13	0																				
13.	Sultanpur																								
14.	Gonda	2	0																			11	1	15	1
15.	Bahraich																								
16.	Rampur																			1	1				
	Total	59	1	15	0	1	1	1	1	61	7	64	5	47	0	25	3	32	1	34	1	36	2	68	2
	No. of Districts reported KA case	7		2		1		1		1		3		5		2		2		3		4		4	

*C = Cases, **D= Deaths # = erstwhile part of district Varanasi, *** = erstwhile known as Faizabad.

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202108

S. No.	District/ Year	2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019	
		C*	D**	C*	D**	C*	D**	C*	D**	C*	D**	C*	D**	C*	D**	C*	D**	C*	D**	C*	D**	C*	D**	C*	D**	C*	D**	C*	D**
1.	Deoria	3	0	2	0	3	0	1	0	1	0	1	0	2	0	2	0			5	0	8	0	74	0	28	0	29	0
2.	Kushinagar	48	0	18	0	9	0	5	0	6	0	2	0			7	1	11	0	108	0	79	0	89	0	46	0	30	0
3.	Ballia	16	0	15	0	16	0	6	1	3	0	2	1							15	0	13	0	26	0	38	0	34	0
4.	Mau																							1	0				
5.	Varanasi	3	0	22	1	3	0	5	0	4	0	2	0													1	0	3	0
6.	Ghazipur			9	0							3	0	3	0	2	0			2	0	2	0	3	0	5	0	2	0
7.	Jaunpur	3	0			3	0															1	0			1	0		
8.	Chandauli																												
9.	Bhadohi#	7	0			7	0					1	0															1	0
10.	Mirzapur																												
11.	Gorakhpur																					1	0						
12.	Ayodhya***																												
13.	Sultanpur																			1	0	3	0			2	0		
14.	Gonda	3	0	3	0	3	0																						
15.	Bahraich																											1	0
16.	Rampur																												
	Total	83	0	69	1	44	0	17	1	14	0	11	1	5	0	11	1	11	0	131	0	107	0	193	0	121	0	100	0
	No. of Districts reported KA case	7		6		7		4		4		6		2		3		1		5		7		5		7		7	

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202108

Table 2.District wise & Blockwise prevalence of Kala-azar Cases in Uttar Pradesh

S. No.	District	Year	Popu-lation	Block/CHC		Town ward/ village		No. of kala-azar cases			Prevalence index of ka/10000 population at			No. of pkdl cases repo-rted
				Name	Popul -ation	Name	Popul-ation	Dis-trict	Block/ CHC	Town ward/ village	Dis-trict	Block/ CHC	Town ward /village	
1.	Ballia	2016 (06/17)	3308751	Bariya/Kotwa	182263			13	5		0.04	0.27	0.00	0
				Reoti	194520	Reoti	40000		3			0.15	0.75	0
				-	-	-	-		-	-		-	-	-
		2017 (08/17)	3592107	Bariya/ Kotwa	182263	Sukhpura	1165	26	4	2	0.07	0.22	17.17	1
				Reoti	194520	Reoti	40000		9	8		0.46	2.00	1
				M.Chhapra	152943	Thekaha	1502		2	1		0.13	6.66	1
		2018 (08/17)	3654447	Bariya/Kotwa	182263	Bind kaTola	1485	38	10	0	0.10	0.55	0.00	4
				M.Chhapra	152943	Thekaha	1502		7	5		0.46	33.29	0
				Reoti	194520	Reoti	40000		6	5		0.31	1.25	10
		2019 (11/17)	3717869	Bariya/Kotwa	182263	Bind kaTola	1485	34	11	6	0.09	0.60	40.40	2
				Murlichapra	152943	Thekaha	1502		7	7		0.46	46.60	1
				Reoti	194520	Reoti	40000		5	5		0.26	1.25	3
2	Kushi Nagar	2016 (07/15)	3999025	Taryasujan	303236	Basdila Bujurg	3826	79	29	0	0.20	0.96	0.00	0
				Tamkuhi	294515				22	-		0.75	-	0
				Padrauna/ Kubernath	387092	Nahar Chhapra	7140		11	3		0.28	4.20	0
				Dudhi	289416	Guruliya			12	2		0.41	>1	0
		2017 (08/15)	4092081	Taryasujan	303236	Basdila Bujurg	3900	89	27	0	0.22	0.89	0.00	0
				Tamkuhi	294515				41	-		1.39	-	0
				Padrauna/ Kubernath	387092	N.Chhapra	7280		14	7		0.36	9.62	4
				Dudhi	289416	Guruliya			3	0		0.10	0.00	0

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		2018 (05/15)	4187302	Taryasujan	303236	Basdila Bujurg	3975	46	26	3	0.11	0.86	7.55	10
				Tamkuhi	294515				7	-		0.24	-	9
				Padrauna/ Kubernath	387092	Nahar Chhapra	7423		6	3		0.16	4.04	5
				Dudhi	289416	Guruliya			6	2		0.21	-	4
		2019 (05/15)	4284738	Taryasujan	303236	Basdila Bujurg	4055	30	*21	0	0.07	0.69	0.00	8
				Padrauna/ Kubernath	387092	Nahar Chhapra	7566		3	2		0.08	2.64	1
				Dudhi	289416	Guruliya			3	0		0.10	0.00	2
				Kasiya	212852				2	-		0.09	-	3
3.	Deoria	2016 (04/16)	3328274	Bankata	235749	Kartarwa B	2071	8	5	0	0.024	0.21	0.00	0
						Jagdishpur	2730			0			0.00	
						Mishrauli	6034			0			0.00	
				Pather Deva	288876	Pathardeva Bazar	7669		1	1		0.03	1.30	0
				DeshiDeoria	188954	Hetimpur	7392		1	1		0.05	1.35	0
		2017 (03/16)	3375701	Bankata	235749	Kartarwa B	2071	24	19	1	0.071	0.81	4.83	5
						Jagdishpur	2730			2			7.33	
						Mishrauli	6034			6			9.94	
				Bhatni	168552	Pipra Bithali	1987		2	1		0.12	5.03	0
				DeshiDeoria	188954	Kowla Chhapra	2071		2	2		0.11	9.66	0
		2018 (06/16)	3423804	Bankata	235749	Kartarwa B	2071	28	25	8	0.082	1.06	38.63	10
						Jagdishpur	2730			7			25.64	
						Mishrauli	6034			1			1.66	
				Bhatparrani	182990	Bhatpar Kuea	1746		2	1		0.11	>1	1
				Bhaluani	138489				1	1		0.07	5.73	0
		2019 (06/16)	3472593	Bankata	235749	Kartarwa B	2071	29	22	6	0.084	0.93	28.97	8
						Jagdishpur	2730			5			18.32	
						Mishrauli	6034			3			4.97	

ISSN: 0019-5138
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				Bhatparrani	182990	Aktahi Bazar	2856		2	1		0.11	3.50	0
				Pather Deva	288876	Laxmipur	1398		1	1		0.03	7.15	2
4	Varanasi	2016 (00/10)	4003061	NIL										
		2017 (00/10)	4071700	NIL										
		2018 (01/10)	4141515	Sewapuri	240184	Arjunpur	2140	1	1	1	0.002	0.042	4.67	0
		2019 (01/10)	4212527	K.V.Pith	238793	Harpalpur	7710	3	2	2	0.007	0.08	2.59	2
5.	Ghaz-ipur	2016 (02/16)	3981078	Moham-madabad	221471	Faizullapur	1500	2	1	1	0.005	0.045	6.67	0
				Manihari	217280				1	1		0.046	>1	0
		2017 (02/16)	4057445	Moham-madabad	221471	Faizullapur	1500	3	2	2	0.007	0.09	13.33	0
				Gournour	188989				1	1		0.05	>1	0
		2018 (03/16)	4135277	Moham-madabad	221471	Faizullapur	1500	5	3	1	0.012	0.13	6.67	1
						Raghuvarganj	2750			2			7.27	
				Gournour	188989				1	1		0.05	>1	0
				Barachawar	204173				1	1		0.05	>1	0
		2019 (02/16)	4214602	Moham-madabad	221471	Faizullapur	1500	2+5 (PKDL)	3	1	0.016	0.135	6.67	2
						Raghuvarganj	2750			2			7.27	
				Gournour	188989				1	1		0.05	>1	1
				Mardah	186435				2	1		0.11	>1	2

Asterisk marked (*) figure originally belong to block CHC/PHC- Sewarahi (Kushinagar); Figures in parenthesis of Year's column represent the total number of block level CHC/PHC reporting Kala-azar cases.

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202108

The state is much serious about the elimination of the disease to achieve the goal by 2020. The KA cases are being searched regularly in special drives in endemic districts, along with districts reporting sporadic districts. The KA cases are being treated completely with Am Bisome (Liposomal Amphotericin B) injection in single dose according to body weight (10 mg/ kg) but it is not sure, whether whole district or the KA affected area has been searched thoroughly or not, because many new areas of the affected districts have been reported in consecutive drives leaving behind the already affected area (Table2). Moreover, Post Kala-Azar Dermal Leishmaniasisis (PKDL) cases are also being reported in adequate number in these search drives during last few years (Table 2 & 3), which are being treated too but the matter of much concern is, that these PKDL cases may act as reservoir of infection of the disease, if left unsearched and untreated. Such areas may be supplemented with the KA cases, which were left for survey having no report of KA cases, as is being practiced not to conduct survey in the complete district, together with recent infection having long intrinsic incubation period, even for more than a year[51] and those reported in the hospitals, when the patients approached for their treatment. The remaining districts with sporadic occurrence of KA cases, the active case search drives are restricted to only limited areas, which cannot be assumed to be a right step, when the disease is subjected for elimination and vector has been reported from many parts of India.[11-50]

It is pertinent to mention here that the disease elimination goal has been targeted as < one KA case/ 10000 population of health unit at block level. If, we consider the whole block population as denominator to total KA cases as numerator to find out it at 10000 fraction, then the resultant outcome is <1/10000 during last four years except block/CHC/ PHC-Tamkuhi of District Kushinagar and block/CHC/PHC-Bankata of District Deoria, which reflected KA prevalence 1.39/10000 & 1.06/10000, respectively. But at district level, the KA prevalence becomes much below <1/10000. Thus, there is no need to conduct any intervention activity towards the elimination of the disease on considering the block as a unit but the same are being carried out with active involvement/ participation of the Non-Government Organizations NGOs).The basic health unit for implementing various health programmes at peripheral level, Health Sub-Centre (HSC), with a population of 5000 in plain & 3000 in hilly or hard to reach areas (erstwhile the health worker area with population of 10000 under National Malaria Eradication Programme), HSC has been subjected as basic health unit for identifying the high risk malaria area and other purposes. If existing health unit (HSC) is considered for elimination of the disease, with HSC not more than two in number, will make a population of 10000, the fraction of the population at which elimination of the disease may be ensured but at present majority of the HSCs have population >10000 and single HSC may be sufficient to be considered for elimination. If, health sub-center (HSC), is considered as basis unit with population of 10000, many more health sub-centers, may reflect KA cases >1 per 10000 population or even combining two health sub centers' 5000 population, at which HSCs were established/ created as is evident from Table 2, wherein the village/ town or health sub-centers of five districts, Deoria, Kushinagar, Ballia, Ghazipur and Varanasi reporting regularly KA cases, reflect >1 KA case/ 10000 population (up to 46.60 KA cases/ 10000 population) and need special attention of the state/ district health programme officers for undertaking intensified intervention measures for: (a) active cases search drive for at least three years sweeping the whole population of the district and (b) complete treatment of the KA cases (both VL & PKDL).

Indoor Residual Spray (IRS)

IRS is recommended in the programme against vector Phlebotomusargentipes with alphacypermethr in 5% wp since 2017, prior to this DDT 50% wdp was sprayed in the programme. The IRS is effected inside the human dwellings & cattle sheds in accordance with the prescribed time schedule and good quality, leaving no sign of partial & patchy coverage of the spray. The dose of the insecticide is to be monitored along with the discharge rate and under dose of the insecticide should not be practiced.

Table 3.Post Kala-azar dermal Leishmaniasisis (PKDL) cases in Uttar Pradesh

S. No.	Year	No. of PKDL		No. of reporting PKDL		Population of PKDL		PKDL/10000 population
		Cases	Deaths	Districts	Cases PHC	Districts	PHCs	
1.	2017	12	0	3	5	11265553	1291718	0.0929
2.	2018	70	0	7	23	25535801	4691995	0.1471
3.	2019	52	1	6	24	24285819	5211171	0.0979

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202108

Table 4.Indoor Residual Spray (IRS) activities conductedin Uttar Pradesh during last three years

S. No.	District	IRS Done						Ist Round IRS Coverage (%)						IInd Round IRS Coverage (%)					
		2017		2018				Houses			Rooms			Houses			Rooms		
		Ist Round	IInd Round	Ist Round	IInd Round	Ist Round	IInd Round	2017	2018	2019	2017	2018	2019	2017	2018	2019	2017	2018	2019
1.	Deoria	June-Jul.	Oct.-Dec.	ND	ND	March-May	Sept.-Nov.	34.84	32.67	67.57	28.76	ND	62.15	90.61	ND	96.77	92.86	ND	96.55
2.	Kushi-nagar	June-Sept.	Sept.-Nov.	March-May	ND	March-July	Sept.-Nov.	97.00	70.00	94.23	98.00	75.00	99.30	89.36	ND	66.75	84.06	ND	72.13
3.	Ballia	Jul.-Sept.	ND	ND	ND	March-July	Oct.-Jan.[20]	99.00	100.00	149.24	99.00		99.38	ND	ND	183.34	ND	ND	140.88
4.	Ghazi-pur	June-Jul.	Oct.-Nov.	April-May	ND	March-April	Octo-ber	97.87	49.67	116.53	88.52	42.33	102.57	97.47	ND	51.09	81.64	ND	45.36
5.	Gorakh-pur	July	Nov-ember	ND	ND	ND	Nov-ember	100.00	100.00	0.00	100.00		0.00	100.00	ND	98.49	100.00	ND	98.54
6.	Jaunpur	Mar-Jun.	Sep-tember	April	ND	ND	Nov-ember	100.00	97.63	0.00	100.00	60.68	0.00	95.86	ND	100.00	77.88	ND	92.72
7.	Varanasi	NA	NA	ND	ND	Jul.-Aug.	Sept.-Oct.	NA	NA	70.90	NA		46.51	NA	ND	100.00	NA	ND	88.51
8.	Sultan-pur	March	Aug.-Sept.	ND	ND	ND	Dece-mber	65.06	100.00	0.00	55.48		0.00	85.78	ND	99.34	97.63	ND	90.22
9.	Bhadohi	NA	NA	ND	ND	ND	Nov-ember	NA	NA	0.00	NA	NA	0.00	NA	ND	92.92	NA	ND	83.21
10.	Mau	NA	NA	ND	ND	ND	Octo-ber	NA	NA	0.00	NA	NA	0.00	NA	ND	93.57	NA	ND	91.95
	Total	Mar.-Sept.	Aug.-Dec.	Mar.-May	ND	Mar.-Aug.	Sept.-Jan.[20]			99.81			86.71			100.40		ND	95.07

ND = Not done and NA=Not applicable.

ISSN: 0019-5138
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The monitoring of the IRS activities revealed (Table 4) that time schedule was not followed in the districts as the 1st round of IRS was performed from March to September during 2017, 2018 & 2019 instead of scheduled time of February/ March. The IInd round of IRS was performed from September to January of the ensuing year during these years instead of scheduled time of June/ July but the IInd round of IRS was not performed in 2018. The reported room coverage varied from 28.76% to 183.34%, reflecting extreme variation. The low coverage of rooms below 90% may not have the desired impact against the vector and similarly the over coverage reported by district Ballia may not provide the desired dose of the insecticide as, house & room coverage reported by District Ballia in 2019 remained 149.24% & 99.38% in 1st round and 183.34% & 140.88% in 2nd round, whereas house and room coverage reported by District Ghazipur in 2019 remained 116.53% &102.57% in 1st round. It is worth mentioning when the exact quantity of the insecticide has been provided as per proposed IRS plan, for covering the fixed population, the over coverage will ultimately give under dose of the insecticide to kill the vector, making it a futile exercise of IRS and undue expenditure incurred on it is nothing but merely wastage. Moreover, partial exposure to the insecticide sprayed and the sub-lethal doses of the insecticide applied against the vector, may force to develop resistance against the insecticide in due course as has been reported in *Phlebotamus argentipes* and *Phlebotomus papatassi* in Bihar Gujarat and Uttar Pradesh.[52-54] Hence, to achieve the goal of elimination of the disease, the state health authorities need to ensure: (a) complete coverage of population with IRS following the time line and quality of IRS as per NVBDCP guidelines, and (b) The intervention activities need to be synchronized with neighboring states or country subjecting their areas for KA elimination.

Conclusion

On the basis of foregoing observations and discussion, it can be inferred that the programme of elimination of the KA disease is being implemented in the state but the guidelines framed and issued by Government of India (NVBDCP) are not being followed strictly. The target of elimination of KA disease could have been achieved, if the sub-district or block area is considered as an unit and need not to undertake further intervention measures but the target achievement is beyond reach, if village/ sub-centers are considered as basic elimination unit and the programme activities in these districts are to be implemented seriously & monitored closely. The absence of dedication towards programme will not only deprive from achieving the goal of elimination of KA but will pose a threat of spread of KA disease together with cutaneous leishmaniasis, reported from south Indian states. The presence of vector has been reported from many parts of India and likely may increase the problem of these disease. In addition to theses, an aggressive strategy in form of Jan Andolan by Social mobilization is also required for elimination of the disease. Further in endemic districts, an enhanced Active Case Search (ACS) and quality indoor residual spray (IRS) asper the time schedule of NVBDCP apart from massive IEC activities are needed to eliminate this disease from India.

Acknowledgement

The authors are thankful to State Vector Borne Disease Programme Officer, Directorate General of Medical & Health Services, Lucknow (UP) and District Malaria/ VBD Officers/ Health authorities of Kala-azar endemic districts of the State for their inputs and support rendered for completing the present task.

Conflict of Interest: None

References

1. Lal S, Saxena NBL, Dhillon GPS. Manual on Visceral Leishmaniasisis (Kala-Azar) in India. *National Malaria Eradication Programme* 1996; 1-182.
2. Sehgal S, Bhatia R. Plague, National Institute of Communicable Diseases. Directorate General of Health Services, Delhi. 1994; 1-64.
3. Banerjee KB. Kala-azar in India with particular reference to Bihar. Proc. on Vector Borne Diseases and Control (2-11 November, 1987), NICD, Delhi, DGHS, Government of India. 1989; 20-22.
4. National Plan for Regional Kala-azar Elimination Programme, India.Directorate of National Vector Borne Disease Control Programme, DGHS, Ministry of Health & Family Welfare, 2005; 39.
5. National Consultative workshop on National Vector Borne Disease Control Programme, Government of India, DGHS, Ministry of Health &Family Welfare, 2005; 24.
6. Jung RK. Epidemiological situation and control of Malaria and Kala-azar in intercountry bordering areas of Bangladesh, Bhutan, India and Nepal. WHO/SEARO, 1998; 1-109.
7. Operational guidelines on Kala-azar (Visceral Leishmaniasisis) elimination in India. World Health Organization, Geneva. 2015.
8. Operational Guidelines on Kala-azar (Visceral Leishmaniasisis) Elimination in India.National Malaria Eradication Programme, 2015; 1-99.
9. Guidelines on Vector Control in Kala-azar Elimination. National Malaria Eradication Programme. 2015; 21.
10. Accelerated Plan for Kala-azar Elimination. National Malaria Eradication Programme. 2017; 80.
11. Adler S, Theodor O. Transmission of disease agent by Phlebotamine sandflies. *Ann Rev Ent* 1957; 2: 203-226.
12. Bhattacharya PK. Distribution of Kala-azar in India. *Trans*

Roy Soc Trop Med & Hyg 1981; 75: 333-334.
13. Smith ROA, Lal C, Mukerjee S et al. Bionomics of Phlebotamusargentipes. Part I: Duration of life in nature. *Indian J Med Res* 1936; 24: 295-300.
14. Chowdhury AB. Recent resurgence of Kala-azar in West Bengal. Proc. of Indo-UK Workshop on Leishmaniasisis held at Patna. Indian Council of Medical Research, New Delhi. 1983; 10-19.
15. Dhanda V, Gill GS. Double blood meals by Phlebotamusargentipes and Phlebotamuspapatasi in two villages of Maharashtra. *Indian J Med Res* 1982; 76: 840-2.
16. Dhanda V, Modi GBC. Studies on the sandflies collected indoors from Aurangabad district, Maharashtra State (Diptera: Psychodidae). *Indian J Med Res* 1971; 59: 1565-71.
17. Dhanda V, Shetty PS, Dhiman RC. Studies on Phlebotamine sandflies as vectors of Kala-azar in Bihar Proc. of Indo-UK Workshop on Leishmaniasisis held at Patna. Indian Council of Medical Research, New Delhi.1983; 128-137.
18. Hati AK. Current status of Leishmaniasisis vector biology.Proc. of Indo-UK Workshop on Leishmaniasisis held at Patna. Indian Council of Medical Research, New Delhi. 1983; 84-91.
19. Killick-Kendrick R.Investigation of Phlebotaminae sandflies-vectors of Leishmaniasisis.Proc. of Indo-UK Workshop on Leishmaniasisis held at Patna. Indian Council of Medical Research, New Delhi. 1983; 72-83.
20. Pandya AP. Laboratory breeding of the sandflies, Phlebotamus argentipesAnnandale & Brunetti and Phlebotamuspapatasi. *Indian J Med Res* 1980; 72: 64-5.
21. Kumar K, Rahman SJ, Singh K et al. Biology of Phlebotamusand Sergentomyiagroup of sand flies under laboratory conditions. *J Comm Dis* 1986; 18: 45-50.
22. Kalra NL, Kumar K, Rahman SJ. Sandflies of bird tunnel in Eastern mounds from district Rohtak (Haryana). *J Comm Dis* 1986; 18: 136-138.
23. Kumar K, Rahman SJ, Rajagopal R. Phlebotamid sandflies (Diptera: Phlebotaminae) in Delhi and Environs. *J Comm Dis* 1988; 20: 44-51.
24. Srinivasan R. Studies on the biology, ecology and population dynamics of Phlebotamuspapatasi (Diptera: Phlebotamidae) in Pondicherry. Ph.D. thesis submitted to Pondicherry University, 1990; 164.
25. Srinivasan R, Viswam K, Panicker, KN. An improvised method of laboratory colonization of Phlebotamuspapatasi, the vector of cutaneous Leishmaniasisis. *J Expt Biol* 1992; 30: 925-927.
26. Kamal S, Srinivasan R. Investigations on the Biology of Phlebotamusargentipes, Annandale & Brunetti, 1908 (Diptera: Phlebotamidae), the vector of Indian Kala-azar. *J Comm Dis* 1993; 25(3): 96-100.
27. Kaul SM. Phlebotamine sandflies (Diptera: Psychodidae) from Western Ghats in Kerala and Tamil Nadu States, India, Part I. Description of four new species. *J Comm Dis* 1993; 25(2): 75-82.
28. Kaul SM, Das RK, Shiv R et al. Entomological monitoring of Kala-azar control in Bihar State, India: Observations in Vaishali and Patna districts. *J Comm Dis* 1993; 25(3): 101-106.
29. Kaul SM. Phlebotamine sandflies (Diptera: Psychodidae) from Western Ghats in Kerala and Tamil Nadu States, India, Part II. Taxonomic and biological notes on the species recorded. *J Comm Dis* 1993; 25(3): 116-125.
30. Kaul SM, Prabha PGS. Phlebotamine sandflies (Diptera: Psychodidae) from Western Ghats in Kerala and Tamil Nadu States, India, Part III. Description of Sergentomyiaarboris Sinton and new species related to it. *J Comm Dis* 1993; 25(4): 199-206.
31. Swaminath CS, Shortt HE, Andersan LAP. Transmission of Indian Kala-azar to man by the bites of P. argentipes (Ann. &Brun.). *Indian J Med Res* 1942; 30: 473-477.
32. Sinton JA. Records of geographical distribution and seasonal prevalence of known Indian and Cingrales of the genus Phlebotamus. *Indian J Med Res* 1924; 11: 55-74.
33. Rathnaswamy GK, Ramkrishnan NR. Report on the sand fly survey of Madras city. *Indian J Ent* 1954; 16: 29-36.
34. Shetty PS, Kulkarni SM. Records of Phlebotamussandflies ofBastar district, Madhya Pradesh (India). *Indian J Parasit* 1983; 7: 87-88.
35. Rahman SJ, Menon PKM, Rajagopal R et al. Behaviour of Phlebotamusargentipesin the foothills of Nilgiris, Tamilnadu. *J Comm Dis* 1986; 18: 35-44.
36. Modi GB, Soman, RS. A note on the Phlebotamine sandflies of Krishna and Godavari districts of Andhra Pradesh. *Indian J Parasit* 1978; 2: 159-161.
37. Modi GB, Shetty PS, Mahadev PVM et al. Distribution and adult habitats of Phlebotamine sandflies from Maharashtra (India). *J Bombay Nat His Soc* 1972; 66: 845-847.
38. Modi GB, Soman RS, Mishra AC et al. A report on the Phlebotaminesandflies (Diptera: Phlebotamine) from Bankura district (West Bengal). *Indian J Med Res* 1977; 66: 373-378.
39. Modi GB, Dhanda V, Goverdhan RS. Studies on Phlebotamine sandflies ofPoona (Maharashtra), India. *Indian J Med Res* 1978; 67: 48-56.
40. Napier LE, Smith ROA. A study of the bionomics of P. argentipeswith special reference to conditions in Calcutta. *Indian Med Res Memoirs* 1926: 4: 161-172.
41. Nasiruddin M. Phlebotamusargentipesfound in Shimoga district, Mysore state (Karnataka), India. *Indian Med Gaz* 1951; 36: 142-145.

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202108

42. Pandya AP, Mandal MM, Niyogi AK. Blood meal of Phlebotamus species in Gujarat. *J Comm Dis* 1972; 4: 132-135.
43. Pandya AP, Mehta NR, Trivedi DH. Studies on the sandflies collected indoors in Surat city and nearby two villages of Surat, Gujarat. Phlebotamus species in Gujarat. *Indian J Med Res* 1972; 31: 133-136.
44. Pandya AP. Geographical distribution and density of Phlebotamine sandflies in Surat district (Gujarat). Phlebotamus species in Gujarat. *Indian J Med Res* 1983; 77: 817-23.
45. Raman TK. Kala-azar in Madras. *Madras Medical College Magazine* 1927; 4: 273-294.
46. Shanmugam CAK, Roy RG, Ganesan AV. Kala-azar in Tamil Nadu during 1945-1975. A retrospective and prospective study. *Indian J Med Res* 1977; 65: 786-806.
47. Saini P, Kumar NP, Ajithlal PM et al. Visceral Leishmaniasisis caused by Leishmaniadonovani Zymodeme MON-37, Western Ghats, India. *Research Letter Emerging Infectious Diseases* 2020; 26(8): 1956-1958.
48. Kesavan A, Parvathy VK, Thomas S et al. Indigenous visceral Leishmaniasisis: two cases from Kerala. *Indian Pediatr* 2003: 40-373.
49. Kumar NP, Srinivasan R, Anish TS et al. Cutaneous Leishmaniasisis caused by Leishmaniadonovaniin the tribal population of the Agasthyamala Biosphere Reserve forest, Western Ghats, Kerala, India. *J Med Microbiol* 2015; 64: 157-163.
50. Srinivasan R, Kumar NP, Jambulingam P. Detection of natural infection of Leishmania donovani(Kinetoplastida: Trypanosomatidae)in Phlebotamusargentipes(Diptera: Psychodidae)from a forest ecosystem in the Western Ghats, India, endemic for cutaneous Leishmaniasisis. *Acta Trop* 2016; 156: 95-99.
51. Rahman SJ, Kumar K, Sharma SK. Intrinsic incubation period of kala-azar in man through entomological and epidemiological parameters-A retrospective study. *Adv Med Entomol & Human Welfare* 1998; 119-123.
52. Joshi GC, Kaul SM, Wattal BL. Susceptibility of sandflies to organochlorine insecticides in Bihar (India)-Further reports. *J Comm Dis* 1979; 11: 213-218.
53. Thapar BR, Joshi, RD, Rao JS et al. Susceptibility status of PhlebotamuspapatasiScopoli (Diptera: Psychodidae) to chlorinated hydrocarbons in Panchamahal District of Gujarat State (India). *J Comm Dis* 1993; 25(4): 212-213.
54. Joshi RD, Rai RN. Impact of DDT spraying on populations of P. argentipes and P.papatasi in Varanasi District, Uttar Pradesh. *J Comm Dis* 1994; 26(1): 56-58.

ISSN: 0019-5138
DOI: https://doi.org/10.24321/0019.5138.202108