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

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ABSTRACT

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 Leishmaniasis 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 the state but from the country by 2020 by bringing down the Kala-azar prevalence <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, Phlebotomus 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 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. 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 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 and now to 2020, 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...
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 Kushinagar are 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](https://example.com/figure1.png)
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 |
|--------|---------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1.     | Deoria        | 1    | 0    | 3    | 0    | 2    | 0    | 4    | 0    | 3    | 2    | 1    | 1    |
| 2.     | Kushinagar    |      |      |      |      |      |      |      |      |      |      |      | 61   |
|        |               | 7    | 55   | 5    | 40   | 0    | 21   | 3    | 30   | 1    | 19   | 0    | 1    |
| 3.     | Ballia        | 8    | 1    | 1    | 1    | 6    | 0    | 2    | 0    | 2    | 0    | 14   | 0    | 21   |
| 4.     | Mau           |      |      |      |      |      |      |      |      |      |      |      | 1    |
| 5.     | Varanasi      | 45   | 0    | 2    | 0    |      |      |      |      |      |      |      | 3    |
| 6.     | Ghazipur      | 1    | 0    |      |      |      |      |      |      | 1    | 2    | 0    | 6    |
| 7.     | Jaunpur       | 1    | 0    |      |      |      |      |      |      |      |      |      | 1    |
| 8.     | Chandauli     |      |      |      |      |      |      |      |      |      |      |      | 1    |
| 9.     | Bhadohi#      |      |      |      |      |      |      |      |      |      |      |      | 13   |
| 10.    | Mirzapur      | 1    | 0    |      |      |      |      |      |      |      |      |      | 1    |
| 11.    | Gorakhpur     |      |      |      |      |      |      |      |      |      |      |      | 1    |
| 12.    | Ayodhya***    |      |      |      |      |      |      |      |      |      |      |      | 13   |
| 13.    | Sultanpur     |      |      |      |      |      |      |      |      |      |      |      | 1    |
| 14.    | Gonda         | 2    | 0    |      |      |      |      |      |      | 11   | 1    | 15   | 1    |
| 15.    | Bahraich      |      |      |      |      |      |      |      |      |      |      |      | 1    |
| 16.    | Rampur        |      |      |      |      |      |      |      |      |      |      |      | 1    |
| Total  |              | 59   | 1    | 15   | 0    | 1    | 1    | 1    | 1    | 61   | 7    | 64   | 5    |
|        | 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.
| S. No. | District/Year | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|--------|---------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1.     | Deoria        | 3    | 0    | 2    | 0    | 3    | 0    | 1    | 0    | 1    | 0    | 1    | 0    | 2    | 0    | 2    |
| 2.     | Kushinagar    | 48   | 0    | 18   | 0    | 9    | 0    | 5    | 0    | 6    | 0    | 2    | 0    | 7    | 1    | 11   | 0    |
| 3.     | Ballia        | 16   | 0    | 15   | 0    | 16   | 0    | 6    | 1    | 3    | 0    | 2    | 1    | 15   | 0    | 13   | 0    |
| 4.     | Mau           |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | 1    |
| 5.     | Varanasi      | 3    | 0    | 22   | 1    | 3    | 0    | 5    | 0    | 4    | 0    | 2    | 0    |      |      |      | 1    |
| 6.     | Ghazipur      | 9    | 0    |      |      |      |      | 3    | 0    | 3    | 0    | 2    | 0    | 2    | 0    | 3    | 0    |
| 7.     | Jaunpur       | 3    | 0    |      |      |      |      |      |      |      |      |      |      |      |      |      | 1    |
| 8.     | Chandauli     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 9.     | Bhadohi       | 7    | 0    |      |      |      |      |      |      |      |      |      |      |      |      |      | 1    |
| 10.    | Mirzapur      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 11.    | Gorakhpur     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 12.    | Ayodhya       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 13.    | Sultanpur     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 14.    | Gonda         | 3    | 0    | 3    | 0    |      |      |      |      |      |      |      |      |      |      |      |      |
| 15.    | Bahraich      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 16.    | Rampur        |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Total  |              | 83   | 0    | 69   | 1    | 44   | 0    | 17   | 1    | 14   | 0    | 11   | 1    | 5    | 0    |      |      |
|        | No. of Districts reported KA case | 7    | 6    | 7    | 4    | 4    | 6    | 2    | 3    | 1    | 5    | 7    | 5    | 7    | 7    | 7    |
| S. No. | District       | Year      | Population | Block/CHC          | Town ward/village | No. of kala-azar cases | Prevalence index of ka/10000 population at | No. of pkdl cases reported |
|-------|----------------|-----------|------------|--------------------|-------------------|------------------------|---------------------------------------------|------------------------------|
|       |                |           |            | Name               | Name              |                       | DistRICT Block/CHC Town ward/village | DistRICT Block/CHC Town ward/village |
| 1.    | Ballia         | 2016 (06/17) | 3308751   | Bariya/Kotwa 182263 | Reoti 194520 Reoti 40000 | 13 5 3 0.04 0.15 0.75 0 | 0.04 0.27 0.00 0 | - - - - - - |
|       | 2017 (08/17)  | 3592107   |           | Bariya/ Kotwa 182263 | Sukhpura 40000   | 26 4 2 0.07 0.22 17.17 1 | 0.07 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 | 0.10 0.46 33.29 0 | - - - - - - |
|       | 2019 (11/17)  | 3717869   |           | Bariya/Kotwa 182263 | Bind kaTola 1485 | 34 11 6 0.09 0.60 40.40 2 | 0.09 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 | 0.20 0.75 0.00 0 | - - - - - - |
|       | 2017 (08/15)  | 4092081   |           | Tamkuhi 294515    | Nahar Chhapra 7140 | 22 22 0.28 4.20 0 | 0.28 0.41 >1 0 | - - - - - - |
|       |                |           |            | Padrauna/ Kubernath 387092 | 11 3 | 12 2 | 0.41 >1 0 | - - - - - - |
|       |                |           |            | Dudi 289416 Guruliya | 27 0 | 41 - | - 1 | - - - - - - |
|       |                |           |            | Taryasujan 303236 Basdila Bujurg | 14 7 | 3 0 | - - - | - 0 | - - - - - - |

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| Year   | District | ID     | Village | Latitude  | Longitude | District | ID     | Village | Latitude  | Longitude |
|--------|----------|--------|---------|-----------|-----------|----------|--------|---------|-----------|-----------|
| 2018   | Deoria   | 4187302Taryasujan | 303236 | Basdila Bujurg | 3975 | 46 | 26 | 3 | 0.11 | 0.86 | 7.55 | 10 |
|        |          | Tamkuhi | 294515  | 7 | - | 0.24 | - | 9 | 0.16 | 4.04 | 5 |
|        |          | Padrauna/Kubernath | 387092 | Nahar Chhapra | 7423 | 6 | 3 | 0.21 | - | 4 |
|        |          | Dudhi | 289416 | Guruliya | 6 | 2 | 0.21 | - | 4 |
| 2019   | Deoria   | 4284738Taryasujan | 303236 | Basdila Bujurg | 4055 | 30 | *21 | 0 | 0.07 | 0.69 | 0.00 | 8 |
|        |          | Padrauna/Kubernath | 387092 | Nahar Chhapra | 7566 | 3 | 0 | 0.10 | 0.00 | 2 |
|        |          | Dudhi | 289416 | Guruliya | 3 | 0 | 0.09 | - | 3 |
|        |          | Kasiya | 212852 | 2 | - | 0.08 | 2.64 | 1 |
|        |          | Padrauna/Kubernath | 387092 | Nahar Chhapra | 7566 | 3 | 0 | 0.10 | 0.00 | 2 |
|        |          | Dudhi | 289416 | Guruliya | 3 | 0 | 0.09 | - | 3 |
|        |          | Kasiya | 212852 | 2 | - | 0.08 | 2.64 | 1 |
| 2016   | Deoria   | 3328274Bankata | 235749 | Kartarwa B | 2071 | 8 | 5 | 0 | 0.024 | 0.21 | 0.00 | 0 |
|        |          | Jagdishpur | 2730 | 0 | 0.00 | 0.00 | 0.00 |
|        |          | Mishrauli | 6034 | 0 | 0.00 | 0.00 | 0.00 |
|        |          | Pather Deva | 288876 | Pathardeva Bazar | 7669 | 1 | 1 | 0.03 | 1.30 | 0 |
|        |          | Hetimpur | 7392 | 1 | 1 | 0.05 | 1.35 | 0 |
| 2017   | Deoria   | 3375701Bankata | 235749 | Kartarwa B | 2071 | 24 | 19 | 1 | 0.071 | 0.81 | 4.83 | 5 |
|        |          | Jagdishpur | 2730 | 2 | 0.73 | 0.30 | 0.00 |
|        |          | Mishrauli | 6034 | 6 | 9.94 | 9.94 | 9.94 |
|        |          | Bhatni | 168552 | Pipra Bithali | 1987 | 2 | 1 | 0.12 | 5.03 | 0 |
|        |          | Kowl Chhapra | 2071 | 2 | 2 | 0.11 | 9.66 | 0 |
| 2018   | Deoria   | 3423804Bankata | 235749 | Kartarwa B | 2071 | 28 | 25 | 8 | 0.082 | 1.06 | 38.63 | 10 |
|        |          | Jagdishpur | 2730 | 7 | 25.64 | 25.64 | 25.64 |
|        |          | Mishrauli | 6034 | 1 | 1.66 | 1.66 | 1.66 |
|        |          | Bhatparrani | 182990 | Bhatpar Kuea | 1746 | 2 | 1 | 0.11 | >1 | 1 |
|        |          | Bhaluani | 138489 | 1 | 1 | 0.07 | 5.73 | 0 |
| 2019   | Deoria   | 3472593Bankata | 235749 | Kartarwa B | 2071 | 29 | 22 | 6 | 0.084 | 0.93 | 28.97 | 8 |
|        |          | Jagdishpur | 2730 | 5 | 18.32 | 18.32 | 18.32 |
|        |          | Mishrauli | 6034 | 3 | 4.97 | 4.97 | 4.97 |
| Block     | Year  | Population | Kala-azar Cases | Total | Male | Female | New Cases | Mortality | Death Rate |
|-----------|-------|------------|----------------|-------|------|--------|-----------|-----------|------------|
| Bhatparrani | 2016  | 182990     | 2               | 0.11  | 0.03 | 0.002  | 0.002     | 0.042     | 4.67       |
| Aktahi Bazar | 2016  | 2856       | 1               | 3.50  | 7.15 | 2       | 2         | 1         |
| Pather Deva  | 2016  | 288876     | 1               | 0.00  | 0.00 | 0.000  | 0.000     | 0.00      | 0          |

4. Varanasi

| Year  | Population | Kala-azar Cases | Total | Male | Female | New Cases | Mortality | Death Rate |
|-------|------------|----------------|-------|------|--------|-----------|-----------|------------|
| 2016  | 4003061    | NIL            |       |      |        |           |           |            |
| 2017  | 407100     | NIL            |       |      |        |           |           |            |
| 2018  | 4141515    | Sewapuri       | 240184| 1    | 1      | 0.002     | 0.002     | 0.042     | 4.67       |
|       |            | Arjunpur       | 2140  | 1    | 1      |           |           |           |            |
| 2019  | 4212527    | K.V.Pith       | 238793| 3    | 2      | 0.007     | 0.007     | 0.08      | 2.59       |
|       |            | Harpalpur      | 7710  | 1    | 1      |           |           |           |            |

5. Ghazipur

| Year  | Population | Kala-azar Cases | Total | Male | Female | New Cases | Mortality | Death Rate |
|-------|------------|----------------|-------|------|--------|-----------|-----------|------------|
| 2016  | 3981076    | Moham-madabad  | 221471| 2    | 1      | 0.005     | 0.005     | 0.045     | 6.67       |
|       |            | Faizullapur    | 1500  | 1    | 1      |           |           |           |            |
|       |            | Manihari       | 217280|      | 1      | 1        | 1         |           |            |
| 2017  | 4057445    | Moham-madabad  | 221471| 3    | 2      | 0.007     | 0.007     | 0.09      | 13.33      |
|       |            | Faizullapur    | 1500  | 3    | 2      |           |           |           |            |
|       |            | Gournour       | 188989|      | 1      | 1        | 1         |           |            |
|       |            | Raghuvarganj   | 2750  |      | 2      |           |           |           | 7.27       |
|       |            | Barachawar     | 204173|      | 1      | 1        | 1         |           |            |
| 2018  | 4135277    | Moham-madabad  | 221471| 5    | 3      | 0.012     | 0.012     | 0.13      | 6.67       |
|       |            | Faizullapur    | 1500  | 5    | 3      |           |           |           |            |
|       |            | Raghuvarganj   | 2750  |      | 2      |           |           |           |            |
|       |            | Gournour       | 188989|      | 1      | 1        | 1         |           |            |
|       |            | Barachawar     | 204173|      | 1      | 1        | 1         |           |            |
| 2019  | 4214602    | Moham-madabad  | 221471| 2    | 1      | 0.016     | 0.016     | 0.135     | 6.67       |
|       |            | Faizullapur    | 1500  | 2    | 1      |           |           |           |            |
|       |            | Raghuvarganj   | 2750  |      | 2      |           |           |           | 7.27       |
|       |            | Gournour       | 188989|      | 1      | 1        | 1         |           |            |
|       |            | Mardah         | 186435|      | 2      | 1        | 1         |           |            |

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.
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 Bisis (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 (Table 2). Moreover, Post Kala-Azar Dermal Leishmaniasis (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 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.

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 Phlebotomus argentipes 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 Leishmaniasis (PKDL) cases in Uttar Pradesh

| S. No. | Year | No. of PKDL Cases | Deaths | No. of reporting PKDL Districts | Population of PKDL | PKDL/10000 population |
|--------|------|------------------|--------|---------------------------------|-------------------|-----------------------|
| 1.     | 2017 | 12               | 0      | 3                               | 11265553          | 0.0929                |
| 2.     | 2018 | 70               | 0      | 7                               | 25535801          | 0.1471                |
| 3.     | 2019 | 52               | 1      | 6                               | 24285819          | 0.0979                |
| S. No. | District       | IRS Done | I\(^{st}\) Round IRS Coverage (%) | II\(^{nd}\) Round IRS Coverage (%) |
|--------|----------------|----------|-----------------------------------|-----------------------------------|
|        |                |          | Houses               | Rooms               | Houses               | Rooms               |
|        |                | 2017     | 2018     | 2019     | 2017     | 2018     | 2019     | 2017     | 2018     | 2019     | 2017     | 2018     | 2019     |
|        |                | I\(^{st}\) Round | I\(^{nd}\) Round | I\(^{st}\) Round | I\(^{nd}\) Round | 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.     | Kushinagar     | 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       | 140.88 |
| 4.     | Ghazipur       | June-Jul. | Oct.-Nov. | April-May | ND       | March-April | Oct.-Oct. | 97.87 | 49.67 | 116.53 | 88.52 | 42.33 | 102.57 | 97.47 | ND       | 51.09 | 81.64 | ND       | 45.36 |
| 5.     | Gorakhpur      | July      | November | ND       | ND       | ND       | November | 100.00 | 100.00 | 0.00 | 100.00 | 0.00 | 100.00 | 98.49 | 100.00 | ND       | 98.54 |
| 6.     | Jaunpur        | March-Jun. | September | April | ND       | ND       | November | 100.00 | 97.63 | 0.00 | 100.00 | 60.68 | 0.00 | 95.86 | 100.00 | 77.88 | ND       | 92.72 |
| 7.     | Varanasi       | NA       | NA       | ND       | ND       | ND       | Jul.-Aug. | Sept.-Oct. | NA | NA | 70.90 | NA | 46.51 | NA | ND | 100.00 | NA | ND | 88.51 |
| 8.     | Sultanpur      | March     | Aug.-Sept. | ND       | ND       | ND       | December | 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       | November | NA | NA | 0.00 | NA | NA | 0.00 | NA | ND | 92.92 | NA | ND | 83.21 |
| 10.    | Mau            | NA       | NA       | ND       | ND       | ND       | October | NA | NA | 0.00 | NA | NA | 0.00 | NA | ND | 93.57 | NA | ND | 91.95 |
| Total  | Mar.-Sept.     | Aug.-Dec. | Mar.-May | ND       | ND       | Mar.-Aug. | Sept.-Jan.\(^{20}\) | 99.81 | 86.71 | ND | 100.40 | ND | 95.07 |

ND = Not done and NA = Not applicable.
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 llnd 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 llnd 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 Phlebotomus 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 these, 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.

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