



Eradicating Yaws from India: A Summary

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Abstract

Yaws disease was first reported in India during early 1900s. Subsequently, the disease was reported from several other parts of the country. 1950s world-wide anti- yaws campaign reduced its incidence to a negligible level in India. But, it resurged. National Yaws Eradication Programme was launched in 1996. It achieved elimination goal in 2006. Since 2003, no new yaws case has been reported. Extensive sero- survey proved cessation of its transmission in the community, thereby implying that, India has eradicated yaws disease from its soil. This communication describes the efforts taken by the country to achieve yaws eradication.

Keywords: Yaws, Eradication, NCDC.

Introduction

In the early 1950s, one of the diseases singled out for special attack by WHO's membership was Yaws.¹ Later on in 1976, D. R. Hopkins said "After smallpox eradication: Yaws" to be the next candidate for eradication.² The 33rd World Health Assembly in 1980 and subsequent expert group meeting at Fogarty International Centre culminated in the decision that measles, poliomyelitis and yaws were clearly suitable for at least regional eradication. But, even in 2010, yaws (along with leprosy, lymphatic filariasis and visceral leishmaniasis) continue to represent a major public health problem in the 11 countries comprising the South-East Asia Region of the World Health Organization.^{3,4}

Yaws disease

Yaws is a chronic bacterial infection caused by *Treponema pallidum* subspecies *pertunue* which mainly affects the skin and bones and is a disfiguring, debilitating non- venereal infection. Willem Piso⁵ and Thomas Sydenham⁶ as early as seventeenth century gave the earliest recorded clinical description of ulcer resembling yaws. In 1905, Castellani discovered spirochaetes in the ulcers of patients with yaws in Ceylon.⁷

It can cause disabilities and visible deformities that can lead those affected to be

stigmatized, discriminated against and marginalized and thus kept away from participating in normal family or community life or from earning their livelihoods in settings that are already poor in resources.

Materials & Methods

An attempt is made to review the yaws disease situation and its control activities in the country. Methodologies adopted are review of related literatures and information collected from different sources. The literature search was performed on PubMed. Cross- referenced articles were also used. Comprehensive data were collected from Nodal department and YEP cell of state health directorates.

Early history of Yaws in India

Yaws was first noticed in India during 1887 when the cases were first reported among tea plantation workers in Cachar district of Assam.^{8,9} During 1940s, yaws was endemic in several parts of the country in geographically contiguous areas of central India which included Surguja, Bastar and Bilaspur districts of Chhattisgarh state, as well as Mirzapur of Uttar Pradesh, Palamu of Bihar (Now part of Jharkhand state).^{10,11}

The discovery of long acting penicillin in the late 1940s and its proven effectiveness in the treatment

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of yaws led to anti- yaws campaigns in the 1950s.^{12, 13} A yaws control programme was started in the region in 1952 with assistance from WHO and UNICEF. After remarkable initial success, complacency set in. Yaws control efforts were gradually abandoned in most countries, including India. Even after that, researchers continued to work in the field in search of yaws cases, which resulted confirmation of yaws re- emergence in the late 1970s-1980s in different areas.^{14, 15, 16, 17, 18}

Yaws in India since resurgence in mid 1970s

Following the resurgence of yaws in Madhya

Pradesh during 1977,¹⁸ National Centre for Disease Control (NCDC) earlier known as “National Institute of Communicable Diseases (NICD)” undertook a rapid survey in some of the states to assess the situation. A total of 18,196 individuals from three districts of Orissa (now Odisha), one district of erstwhile Madhya Pradesh, Maharashtra, Andhra Pradesh were examined and twenty- six cases were detected, six of them serologically positive, indicating continuing yaws transmission in some areas of the country (table 1).

State	District	Individuals examined	No. of Cases detected	Laboratory Samples tested and Positive	
Orissa	Phulbani,	3026	8	14	1
	Koraput,	4730	4	-	-
	Mayurbhanj	2997	7	-	-
Madhya Pradesh	Bastar*	6121	0	-	-
Maharashtra	Chandrapur	692	2**	-	-
Andhra Pradesh	Khammam***	630	5	5	5

* now part of Chhattisgarh state and divided into three districts.

** Two old cases were detected and both were serologically positive

*** now under Telengana state

Table 1. Yaws situation in 1981

Another attempt was made during 1983-85 to determine the status of yaws disease as well as its control by collecting information through a questionnaire method in the country. Diagnosis of yaws case was based on clinical findings. Information was collected from all states and Union Territories, which prior to 1950s had been endemic for yaws. The response rate was 76 per cent (93 out of 123 districts). A total of 1,349

cases were reported from Andhra Pradesh (3 districts), erstwhile Madhya Pradesh (1 district) and Odisha (6 districts). There was no report of yaws cases in Assam during 1984-1986 (table 2). Four Anti- yaws Team were constituted in the states of Maharashtra, Odisha, Andhra Pradesh and Tamil Nadu for yaws search and control activities.

State	District	1983	1984	1985 (June)
Andhra Pradesh	Khammam*	101	60	38
	Vizianagaram	143	196	161
	West Godavari	0	0	4
Madhya Pradesh	Bastar**	39	55	32
Orissa	Keonjhar	NR	42	34
	Mayurbhanj	49	NR	NR
	Dhenkanel	13	10	NR
	Phulbani	12	18	2
	Balasore	0	13	0
	Koraput	231	28	78
Total cases= 1349		588	422	339

* Now in Telengana, ** now in Chhattisgarh;

Table 2. Yaws situation during 1983 - 1985

Yaws Eradication Programme (YEP) in India

Based on this revelation that simmering focus of yaws has been continuing in different states of India, the proposal for yaws eradication was mooted for the first time during a workshop held at NCDC in 1987.^{16, 19} Finally, in 1996, Yaws Eradication Programme (YEP) was launched in India; the first of its kind in the world. Many facets of the programme have been already described by several authors.^{10, 11, 20, 21, 22} However, for the sake of continuity, summary of the programme activities are given here.

A Pilot Project was undertaken in undivided Koraput district, Odisha during the year 1996-97 to see the feasibility of the programme. Subsequently, the scheme was extended to the states of Andhra Pradesh, Gujarat, Madhya Pradesh and Maharashtra. In March 1999, the Standing Finance Committee of Govt. of India approved extension of the scheme in 49 districts from 10 states from where yaws cases were reported in the past (table 3). NCDC, New Delhi was designated as the nodal agency for planning, guiding, coordinating, monitoring and evaluating the programme. Funding in the form of grant-in-aid from the central government was routed through nodal agency.

State	Districts	
	No.	Name
Andhra Pradesh (& Telengana)	6	Khammam, Warangal, West Godavari, East Godavari, Vizianagaram, Srikakulam
Assam	1	North Cachar Hills
Chhattishgarh	13	Bastar, Kanker, Dantewara, Raipur, Dhamtari, Mahasamund, Bilaspur, Zanzgir (Champa), Korba, Surguja, Korja (Bainkatpur), Raigarh, Jaspur
Gujarat	1	Ahwa Dang
Jharkhand	2	Palamu (& Latehar), Garhwa
Madhya Pradesh	4	Shahdol (& Anuppur), Umariya, Rewa, Sidhi
Maharashtra	2	Gadchirolli, Chandrapur
Odisha (earlier Orissa)	10	Koraput, Malkangiri, Nabrangpur, Rayagada, Balasore, Keonjhar, Dhenkanal, Kandhamal, Mayurbhanj, Kalahandi
Tamil Nadu	8	Dharmapuri, Salem, Kallakurichi, Karur, Dindigul, Coimbatore, Palani, Theni
Uttar Pradesh	2	Mirzapur, Sonbhadra

Khammam & Warangal are now districts of Telengana state

Table 3. List of 49 districts under YEP

YEP has been implemented by the state directorates of health services in the affected states, utilizing existing health services and manpower. The programme strategy included: (1) manpower development, (2) case finding, (3) treatment of cases and contacts simultaneously and (4) IEC activities harnessing multi- sectoral approach.

Case finding is being done actively by making house to house visits by trained para- medical workers and community level functionaries at regular intervals. To facilitate the detection of cases, coloured disease recognition cards and other health education materials developed by NCDC were used in the field. Cases thus detected, were treated simultaneously and immediately after detection, along with their contacts. Injection Benzathine penicillin was the drug of choice was given in single dose. In penicillin sensitive cases,

erythromycin or tetracycline was used in the recommended doses for a period of 15 days.

Other activities included central level training-cum- sensitizing workshop at NCDC, followed by similar activities at state/ district level. Training of medical officers and of paramedical staff was given top priority. Expert Group finalized the strategy, operational and training manuals; and implementation schedules of YEP.

For eradication of yaws, a close inter- sectoral co-ordination and collaboration between the health and other departments like tribal development deptt., ICDS (Integrated Child Development Services), panchayati raj, forest department and education department was maintained. Community oriented activities like Mitamin, Kalajatha in Chhattisgarh, and distribution of rice through yaws programme along with ITDA (Integrated Tribal

Development Agency) in Andhra Pradesh are worth mentioning examples of inter- sectoral coordination. ASHA (Accredited Social Health Activists) workers always worked in tandem with peripheral health workers.

Under YEP, monitoring has been done at various levels. At central level, the programme has been monitored at the highest level of country's health hierarchy from time to time through a Task Force chaired by the Director General of Health Services. The programme had been regularly monitored through Review Meeting of State Yaws Programme officers & experts, field level appraisal by independent experts, and inter- state

border meetings. Two yearly active yaws case search were being undertaken by health workers in the affected states and districts, of which one was in the post monsoon season. During active case search, a high level of coverage was ensured so that all cases are detected and treated along with their contacts. The cases detected during active search were then confirmed by Medical Officer or yaws programme officer. All the identified cases and their contacts were treated simultaneously.

Number of cases declined dramatically since 1996 and last lot of cases were reported during 2003 (table 4).

States	1996	1997	1998	1999	2000	2001	2002	2003
Andhra Pradesh	223	249	338	339	442	152	135	6
Chhattisgarh	NA	71	170	40	38	12	0	0
Orissa	3348	379	111	82	124	137	145	40
Maharashtra	NA	0	48	0	1	0	0	0
Gujarat	NA	36	0	2	17	8	0	0
Tamil Nadu	NA	0	0	0	#34	0	0	0
Uttar Pradesh	NA	0	0	0	1	0	0	0
Assam	*	*	*	4	7	4	1	0
Madhya Pradesh	*	*	*	*	0	0	0	0
Jharkhand	*	*	*	*	0	0	0	0
Total	3571	735	667	467	664	313	281	46

Not confirmed, * included later under YEP. NA: Not applicable

Table 4. Year- wise reported number of cases of yaws

No case reported after 2003

No new yaws case has been reported after 2003. The zero incidences were validated by the experts during 3rd and 4th Independent Appraisal of YEP and Task Force on Yaws Eradication Programme under the Chairmanship of Director General of Health Services, Government of India recommended for the declaration of the Yaws Elimination in 2006. Accordingly, on Sept 19, 2006, Govt. of India formally declared elimination of yaws from the country in a function held at Vigyan Bhawan, New Delhi.¹¹

Post yaws elimination activity

A workshop "Roadmap from yaws elimination to yaws eradication" was held on Sept 19, 2006 to guide NCDC for achieving eradication of the disease. The experts in the workshop suggested starting three new activities viz. sero- survey among children to assess cessation of transmission of infection, rumour reporting & investigation and cash incentive scheme to encourage voluntary reporting of the cases by the community. They

also suggested continuing all the activities carried out since the beginning of the programme viz. active case search, routine reporting, training and IEC.

Sero- survey among children belonging to 1- 5 years of age

The actual challenge came in the form of sero- survey of children under- five years of age because of absence of any guidelines. Several questions about sero- survey had cropped up, viz., type of laboratory test to be employed, where to test the samples, how to test hundreds of thousands of such small children, manpower, logistic requirement, etc.

The programme adopted the following methodology for sero- survey:

(1) Villages were categorized in two groups: the villages from where yaws cases were reported in the past, and those from where no case of yaws was reported.

(2) Survey undertaken in all the villages reported to have yaws cases and double the number of villages with no yaws case reports.

(3) Segmentation of the village done if the population is quite large.

(4) At the national level, sample size was calculated at 95% level of confidence, 10% relative precision and 1.5 as design effect.

(5) The study covered only rural parts of identified

districts of ten states.

(6) Ten per cent of the children from the identified 807 yaws villages and 1617 non- yaws villages were surveyed.

(7) Yaws village remained constant, but the non-yaws villages changed every year.

(8) Sero- surveyed continued for three consecutive years.

State (District)	No. of villages to be surveyed		Children (under five years of age) to be surveyed	
	Yaws	Non-yaws	Yaws village	Non- yaws village
Andhra Pradesh & Telangana (6 Districts)	215	185	1875	2267
Assam (1 district)	11	15	58	75
Chhattisgarh (13 Districts)	44	396	363	3481
Gujarat (1 district)	3	8	18	59
Jharkhand (2 Districts)	0	85	NA	85
Maharashtra (2 Districts)	58	75	763	567
Madhya Pradesh (4 Districts)	0	158	NA	1298
Tamil Nadu (8 Districts)	0	103	NA	1499
Uttar Pradesh (2 Districts)	8	80	131	765
Odisha (10 Districts)	468	509	3976	3513
Grand total (49 districts)	807	1614	7184	14150

Table 5.No. of villages and children surveyed (for 2009 only)

Accordingly, by 2008, NCDC worked out the number of samples to be collected from all the yaws and non- yaws villages in the ten states (table 5).

NCDC in collaboration with state health

directorates carried out sero- survey for three consecutive years (2009 – 2011) in all the identified villages. Year- wise summary of sero-survey coverage is given in table 6. All the samples collected were found to be negative for yaws.

Year	Yaws villages (target 807)	Non- yaws villages (Target 1614)	No. of sera samples tested among children of 1- 5 years of age				Percent coverage
			Yaws village		Non- yaws village		
			Target	Covered	Target	Covered	
2009	397	996	7184	3711	14009	11556	72
2010	729	1464	7184	6818	13908	13776	98
2011	797	1546	7184	7688	14317	13987	100

Table 6.Coverage of sero- survey from 2009- 2011

Active case search

Active yaws case search operation was undertaken as per programme guidelines. The case detection was done by making house to house visits by multipurpose workers and community level functionaries. The activity had been organised twice in a year (April to May and October to

November). The search activity was completed within two weeks covering the total population. Every effort was made to have a high level of coverage (more than 80%) during active search operations. During 2008 to 2011, on an average 83% population in the endemic area was covered by the active searches, with overall coverage as high as 94% in Andhra Pradesh (& Telangana).

No confirm case of yaws could be detected during any of the active search after 2003.

Incentive scheme

Following the recommendations by the senior public health experts during the workshop "Roadmap from Yaws Elimination to Eradication" on 19th September 2006, Govt. of India announced an incentive scheme on 29th Sep 2007, to encourage voluntary reporting of yaws cases. As per the scheme, Rs.5000/- was to be given to a confirmed case and Rs.500/- to the first informer of a confirmed yaws case on voluntary reporting. However, despite wide publicity about the scheme, nobody came forward for incentive.

Yaws Eradication in India: At what Cost & what Benefit

Yaws, though, is not a fatal disease by itself, but cripples people thereby contributing further to the disability and economic drain of the already underserved and underprivileged segments of our society. The loss of man days of work due to yaws for the tribal population stricken with poverty and living in remote inaccessible areas under primitive conditions is incalculable.

J. P. Narain estimated that, of 52 million tribal population (in 1985), in India, 9 million were considered to be at risk of yaws.¹⁹ Though there was no clear data about number of yaws cases in the country, various researchers reported that the prevalence rate varied from 0.085% - 0.29% among the affected community, i.e. 1 of 630 Khammam (0.16%), 8 of 3026 Phulbani (0.27%), 4 of 4730 Koraput (0.085%), 7 of 2997 Mayurbhanj (0.24%) and 2 of 692 Chandrapur (0.29%).^{15, 16, 17}

During 1996, at a rough estimate, there were 60 million rural population of which 2.7 million were at risk of getting yaws infection in the yaws endemic areas. Taking presumed prevalence rate of 0.1%, the expected number of cases would have been 2700. Through active case search and routine reporting, about 7000 infectious cases and their contacts were detected and treated during the first half of the programme. The strategy of active search and treatment of cases and their contacts was highly effective and the detection of new cases started declining rapidly. The programme exterminated the infectious pool quickly, which resulted in a rapid decline in the development of new infectious cases. In the absence of YEP, the community would have been burdened each year with thousands having crippling bony deformities.

The total cost of controlling the disease included cost of treatment, care, remuneration for health staff, remuneration for other technical staff, logistic cost, training cost, IEC cost, monitoring cost, etc. As per the records available, Govt of India had released Rs. 84.7 million to the states during 1996 - 2013. In addition, World Health Organization released about Rs. 6,039,833/- (about six million rupees) to the nodal agency for various activities, such as Task Force meetings, Review meetings, Independent Appraisals and Training of various health staff. The Yaws Eradication Programme did not hire any additional manpower. The existing manpower available at various levels was utilized in implementation, monitoring and supervision of the programme. During the programme, a total of about 74000 injection Benzathine penicillin were given to the cases and their contacts, costing about Rs. 0.8 million. The training cost, IEC cost and most of the logistic & monitoring cost were met from the funds provided under the programme.

However, the direct cost of the programme to eradicate this disease was about Rs. 90 million. The value of economic output lost because of illness related work disability i.e., value of activity days lost due to short- term and long- term disability, leading to years of life lost, is huge but difficult to quantify in terms of money.

The benefit in terms of disease and crippling deformities prevented is huge. Compared to this, the cost of the programme implementation is a peanut. Beside this, the programme also helped the other health and social sector services reaching these underserved, underprivileged and isolated populations thereby improving their self- esteem and overall socio- economic development. We can confidently say that the Yaws Eradication Programme in India was highly cost effective and has brought many other collateral benefits to these poor people for whom there was no access to health services. Whether YEP is cost effective or not, the motive is purely humanitarian

Discussion

WHO accepted India's yaws elimination status.²⁴ WHO defines yaws eradication from a country when the country achieves: (1) absence of any report of the diseases (case) for 3 consecutive years supported by high coverage with active surveillance and information, education and communication and (2) continuous negative serological test (rapid treponemal test; qualitative and quantitative rapid plasma regain tests) for at

least 3 consecutive years in all children aged under five years in the community.

The WHO roadmap targeted yaws for eradication by 2020. India has achieved this landmark much earlier. India is the first country in the world to attempt eradication of yaws. At one point of time, scientists believed yaws to be not eradicable.²⁵ The most crucial and major obstacle in the process was the sero-survey among children belonging to 1-5 years of age. WHO recommended sero-survey among children under five years of age, but there were no proper guidelines. India developed its own guidelines based on scientific knowledge and logistic considerations. The sero-survey guidelines developed by India were later agreed by the WHO and formed a part of the WHO document in 2012.²⁶

Sero-survey guidelines developed by NCDC are now part of WHO document. Coverage of sero-survey (table 6) in the country leaves no doubt about the claim of no sero-reactivity.

Active yaws case search was *prima facie* the most important activity of the programme. We tried to summarise the findings of active yaws case search in the districts under YEP during 2009 to 2011. Search coverage varied from district to district, but most of the districts reported appreciably high coverage.

India is a vast country, where even number of children of 1-5 years of age in the districts under the programme could be more than a million. So, the programme developed a *via media* to do sero-survey in statistically valid sample size. The situation in India may be a different one, as in no other yaws endemic countries, sero-survey needed to be carried out in such a large number of children.

It is not intended to discuss other activities under the programme viz., IEC, Manpower development, Inter-state Border Meeting of YEP programme officers, etc. To strengthen voluntary case reporting by the community, the programme launched an incentive scheme to confirmed cases and to the first informer of confirmed yaws case since 2007. This incentive scheme was also given wide publicity. But, so far there has been no claimant.

The programme activities have been reviewed at various levels. At central level, a National Task Force headed by Director General of Health Services, Ministry of Health & Family Welfare,

Govt. of India and eminent public health & clinical experts as its members reviewed the programme as per the necessity. The last Task Force meeting held in July 2014 recommended initiation of the process to get yaws eradication certificate from WHO.

Asiedu²³ had cautioned that just dealing with a specific geographic area without being sure of the disease status of one's neighbours will lead to the disease transferring from endemic to non-endemic places. In the Indian context, though it may be hypothetically correct, but to consider that infected children from a remote, underprivileged marginalized community to go to a yaws non-endemic developed area and spread the infection in the other place is impractical, especially so, when the health care system is growing at a tremendous pace.

The above findings clearly indicate that "it is no point beating a dead horse". Health care delivery system in the country is improving very fast and reaching the people in most remote areas. It is hoped that, WHO will agree with our submission that, India is free from yaws disease since 2003 and that there is no sero-positivity to RPR test for yaws infection in the community. It is high time that India gets the Yaws Eradication certificate from the World Health Organization which is the only logical conclusion of this arduous journey of YEP.

YEP is a central sector scheme and is implemented through existing health care delivery system of the state health directorates without engaging any additional manpower. Political support is essential for success of any programme. YEP is fortunate to have the required support from the beginning. The then Union Minister of H&FW himself presided and declared yaws elimination from open platform. YEP probably is the only eradication programme with such a low financial budget. The programme implementation became possible, because it utilized manpower and other paraphernalia of the existing health care delivery setup to its best possible outcome. Because of this strategy, any modifications about the programme routinely percolated to the most peripheral workers. Finally, the success of the programme could be attributed to the sound strategy and high level of commitment at all levels. India can share its experience with other endemic countries and that can help them devise their own strategies as per local requirements.

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