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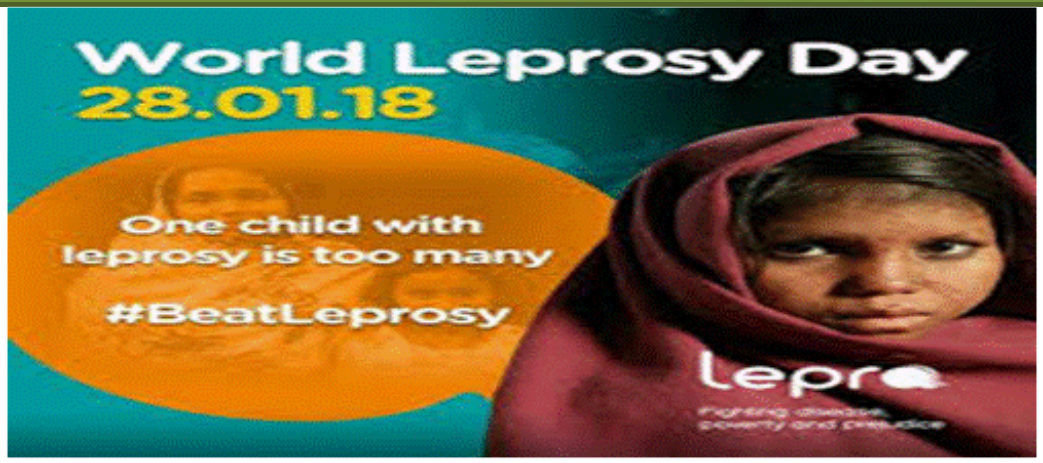

International open trial of uniform multidrug therapy regimen for leprosy patients: Findings & implications for national leprosy programmes

The mainstay of leprosy treatment until 1984 was dapsone monotherapy. Although it resulted in reduction of leprosy prevalence globally and the leprosy trends started plateauing, deformities and complications continued to occur and dapsone resistance was documented [1]. Subsequently, from 1985 onwards, multidrug therapy (MDT) was the key public health intervention that helped in reducing the global leprosy burden substantially [1]. Initially, the duration of MDT was recommended as two years or until smear negativity for multibacillary (MB) leprosy. For paucibacillary (PB) leprosy, a two-drug combination of rifampicin and dapsone for six months and rifampicin once a month were recommended. Subsequently, over the years, based on the collective experience, the WHO through its two expert committees and a study group modified the treatment regimen. The key modifications were two years of fixed period for MB (1988) and later reduced duration for MB to 12 months (1998). Further, the WHO recommended single-dose regimen (rifampicin, ofloxacin and minocycline) for single-lesion PB patients [1]. During the implementation of MDT, national vertical programmes focussed on early case detection and treatment of all leprosy patients with MDT [2]. Most countries were successful in achieving leprosy elimination by the end of first decade of the current century, and vertical leprosy programmes were integrated into the primary health care services [3],[4]. Such integration demanded further simplification of patient management practices including follow up. The WHO strategy for 2011-2015 focuses on sustaining the initiatives to reduce burden of leprosy in all the endemic communities[5].

A simplified approach to leprosy diagnosis and treatment is deemed important for the sustainability of leprosy control services under programmatic conditions. In this context, MB-MDT regimen given for six-month duration was proposed as uniform MDT (U-MDT) regimen for all types of leprosy. Ji and Saunderson [6] expressed concerns regarding this approach and the trial design not having a control group. These have been addressed in our earlier publication [7]. The goal of chemotherapy should be to shorten and optimize treatment regimen to achieve desired outcomes with minimum/acceptable side effects. For reducing the duration of MB-MDT, supportive evidence was available from experimental and clinical trials. Experimental studies suggested that MDT for 2-3 months was capable of killing almost all viable bacilli in the mouse footpad model[8],[9]. Further, the rifampicin-resistant mutants in an untreated lepromatous patient were likely to be eliminated by three months' daily treatment with dapsone-clofazimine combination and by that time rifampicin with three monthly doses would have killed over 99.9 per cent of the viable *Mycobacterium leprae*[8]. This was further confirmed by a clinical trial, in which loss of infectivity of *M. leprae* after only one month of the WHO MB-MDT or with a single dose of rifampicin was documented [10]. It is, therefore, reasonable to believe that patients would respond to six months' MB-MDT, but a smaller number of them may relapse, who could continue on MDT without any risk of drug resistance. Second issue of importance is the addition of clofazimine for PB-MDT. Evidence from a randomized controlled clinical trial of PB-MDT plus daily clofazimine versus routine PB-MDT suggested that the proportion with persisting active skin patches was considerably lower in the clofazimine arm (7.5%) compared to PB-MDT arm (16%), and in the six month post-PB-MDT follow up, clofazimine group demonstrated better response than the control group (80 vs. 30%)[11]. Further, clofazimine could be potentially beneficial against type 2 reactions in leprosy patients [12]. In addition, the combination of three drugs may possibly reduce the chance of drug resistance. A controlled trial with control group could be justified only for a small fraction of highly bacteriologically positive patients (about 2% of newly diagnosed leprosy patients), who could be at risk of possible inadequate treatment and increased risk of relapse. However, based on the principle of equivalence, one would require a substantially large sample size for such a trial, which is practically not feasible. In view of the discontinuation of skin smears in the programmes [1], it will not be possible to identify such high-risk patients. U-MDT trial was undertaken as programme implementation research with phase IV clinical trial perspective. National Institute of Epidemiology (NIE) of the Indian Council of Medical Research (ICMR), in Chennai, India, coordinated the U-MDT trial. The primary objective of this trial was to assess treatment response to U-MDT in terms of relapse rate not exceeding a maximum cumulative level of five per cent at the end of five years. The secondary objectives were to assess acceptability, safety and compliance to the U-MDT regimen. Here, we present the final results of the trial.

Material & Methods

It was a single-arm open-field trial. The trial was initiated in October 2003 and the final five years' follow up at the last site (Rohtas in Bihar, India) was completed in January 2014.

Sample size: Considering the five year maximum relapse rate of five per cent as acceptable limit (Poisson distribution; P_o=5%; P_a=3%) with the power of 90 per cent, type 1 error of 5 per cent (one-tailed test) and loss to follow up of 30 per cent in field situations, the required sample size was 2223 which was rounded off to 2500 for each type of leprosy.

Study settings: During 2003-2004, the trial was initiated at six sites - four districts in India (Pune, Kanpur, Tiruvannamalai and Villupuram) and two provinces in P. R. China (Guizhou and Yunnan). Two sites from India - Gaya and Rohtas districts were subsequently included in 2005 and 2007, respectively. The trial was conducted at the district level by leprosy control programme officers in three sites in India (Tiruvannamalai and Villupuram in Tamil Nadu and Pune in Maharashtra). At Kanpur in Uttar Pradesh, the trial was conducted by the National JALMA Institute for Leprosy and Other Mycobacterial Diseases (ICMR), Agra. In two sites of Bihar (Gaya and Rohtas), Damien Foundation India Trust, Chennai, conducted the trial in collaboration with the leprosy programme. In PR China, the trial was conducted as part of national leprosy control programme.

Study participants: Newly detected and treatment-naive leprosy patients were recruited in the trial. Patients with access to the clinic and available to receive U-MDT under supervision and willing for long-term follow up were included after obtaining written informed consent. Patients who had only neuritic manifestations or who had been previously treated for leprosy, were excluded.

Study drugs and treatment schedule: Study participants were given monthly-supervised doses of U-MDT

in the presence of the investigators for six months. For adults, the regimen consisted of supervised pulse of 600 mg rifampicin, 300 mg clofazimine and 100 mg dapsone every four weeks along with daily-unsupervised course of 50 mg clofazimine and 100 mg dapsone. The supervised dosage for children aged 10-14 years was 450 mg rifampicin, 150 mg clofazimine and 50 mg dapsone every four weeks and 50 mg clofazimine every alternate day and 50 mg dapsone daily. For children <10 yr, the dose (mg) was adjusted to body weight (kg) as follows: rifampicin 10-20 mg/kg, clofazimine 1-2 mg/kg and dapsone 1-2 mg/kg of the body weight. All the drugs were supplied by the WHO with a special labelling of U-MDT for adult and child blister packs separately for the entire duration of the trial.

Data collection: The investigators of all the sites assessed every new leprosy patient for suitability for inclusion in the study as per the protocol. Patients who decided not to join the study or found ineligible were given regular MDT as per the national leprosy programme guidelines in India or P. R. China. During the treatment period patients were interviewed and carefully examined for adverse drug reactions (ADRs), leprosy reactions and neuritis at the time of their monthly visit for receiving the supervised dose of treatment. Subsequently, occurrence of clinical events such as relapse, reactions, disability and neuritis and other events such as migrations and deaths was recorded during the yearly follow up visits after completion of treatment. Patients developing new lesions, pain in the nerves, joint pains, fever and any other complaint were requested to report and were examined and treated as early as possible. The NIE, Chennai, monitored the trial for its duration and ensured adherence to the trial protocol at the trial sites. In addition, reporting forms were collected, scrutinized and entered in the trial database at NIE. Discrepancies found during scrutiny were clarified with the study sites. Further, quality checks were conducted through on-site supervision visits and periodic monitoring throughout the study period. Operational definitions used in the trial are given elsewhere [7].

The study protocol was approved by the Institutional Human Ethics Committees of the participating organizations. All the participants in the study provided written informed consent administered in their local languages. (Clinical Trials Registry of India: 2012/05/002696).

Data analysis: Baseline characteristics of the study participants at all the study sites were analyzed and frequencies were estimated. Per protocol analysis was done and person years (PY) for study participants were calculated from the time of completion of treatment to the observation of primary outcome (relapse) or from the time of recruitment till the time of lost to follow up due to suspected ADR (during treatment period) or non-clinical events or completion of five years post-treatment. Those with relapse, suspected ADR or any of the non-clinical events were right censored and thereafter they ceased to contribute to the person-time of observation. For those who had temporarily migrated and then joined the study later, the maximum PYs contributed by them, *i.e.* from enrolment to each of those follow up time-points, were calculated. Event rates per 100 PY were also calculated. The rates were compared using Chi-square test. Further, cumulative risk [risk=1-e $^{(-\text{rate}\times\ \text{period})}$] of relapse for five years was computed. We used SPSS18.0 (SPSS Inc., Chicago, IL, USA) and Open Epi [13] were used for data analysis.

Results

During October 2003 and June 2008, 3389 (98.6%)(PB=2091; MB=1298) of the 3437 new patients screened for the trial were enrolled [Figure A], [Figure B]. Forty eight patients could not be enrolled for various reasons including ineligibility (n=34), duplication of records (n=7), other reasons (n=6) and declined to participate (n=1). Of these ineligible patients,19 had pure neuritic leprosy and were put on routine MDT. Of the total recruited, MB% ranged between 27 per cent (168 of 631) in Gaya and 67 per cent (111 of 166) in P. R. China (Tiruvannamalai: 46% of 520; Villupuram: 45% of 505; Pune: 34% of 812; Kanpur: 40% of 316; Rohtas: 33% of 439). Of the total enrolled, 3169 completed the prescribed treatment. Thirty participants (PB=21 and MB=9) completed the treatment beyond nine months after initiation, and hence, they were excluded from subsequent analysis.

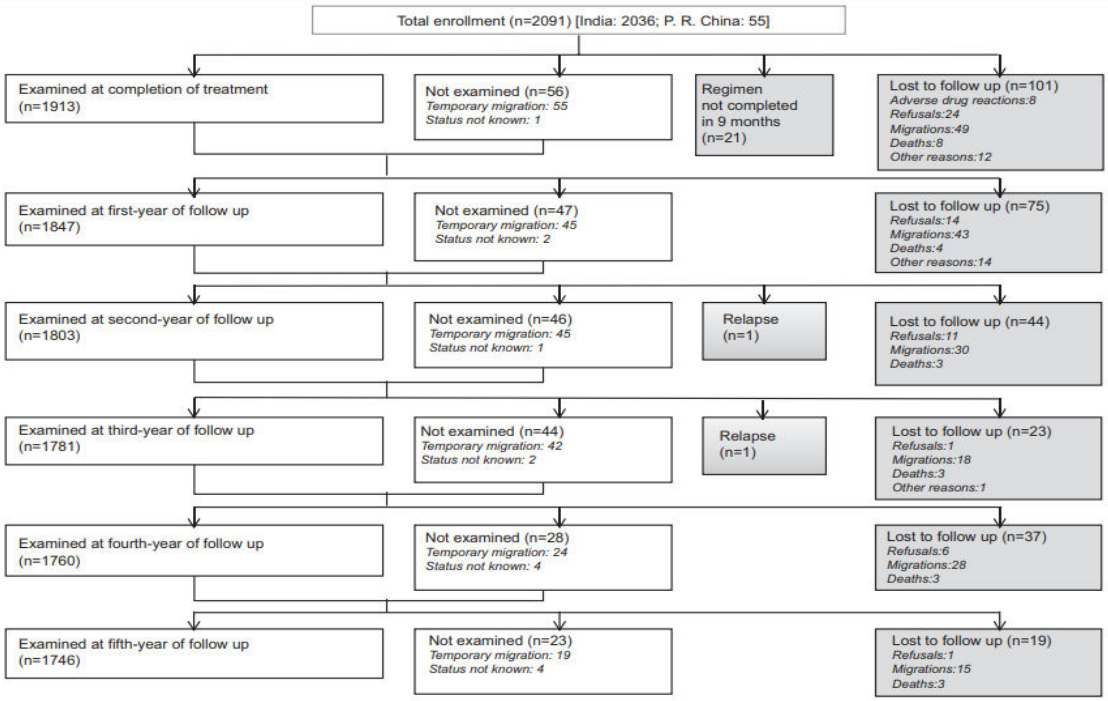

Fig. A Intake and follow up of paucibacillary leprosy patients from all the study sites, uniform multidrug therapy trial, 2003-2014.

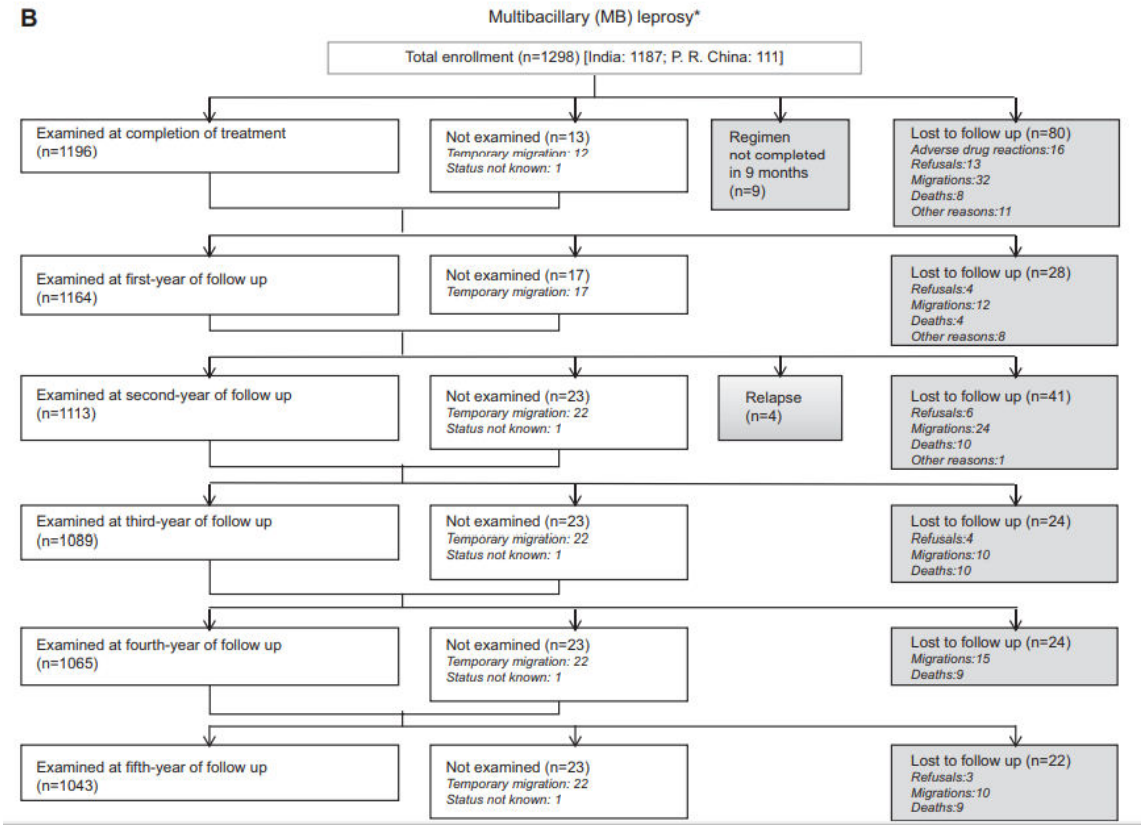

Fig. B Intake and follow up of multibacillary leprosy patients from all the study sites, uniform multidrug therapy trial, 2003-2014.

Findings among PB type of patients:

Of the total 2091 PB patients enrolled,19 per cent (n=396) were younger than 15 years (mean age±SD of 29.3±15.1 yr) and 54 per cent (n= 1135) were male [Table 1]. Grade 2 disability (G2D) was present in three per cent (n=55) of them at recruitment, and nerve lesions were present in 33 per cent (n=691) of the patients. Evidence of mild reactions was found in one per cent (n=25) of the patients and 51 (2%) had neuritis at the time of enrolment

Table 1: Baseline characteristics of study participants, uniform multidrug therapy trial, 2003-2014

Characteristics	PB (n=2091) n (%)	MB (n=1298) n (%)
Age group (yr)		
≤14	396 (19)	129 (10)
15-64	1652 (79)	1113 (86)
65+	43 (2)	56 (4)
Male gender	1135 (54)	853 (66)
Nerve lesions		
0	1400 (67)	486 (37)
1	452 (22)	227 (17)
2	146 (7)	242 (19)
≥3	93 (4)	343 (26)
Grade 2 disability	55 (3)	66 (5)
Mild reactions	25 (1)	49 (4)
Neuritis	51 (2)	61 (5)

MB, multibacillary; PB, paucibacillary

Primary outcome: Two PB patients had clinically confirmed relapse [Table 2]. The relapse rate per 100 person years (PY) was 0.02 (total PY=8780) and the cumulative risk over five years was 0.11 per cent. One of the relapses occurred in the second year and the patient was put on routine MDT by the site investigator. The second relapse occurred in the third year [Table 3] of follow up and was put on one more course of U-MDT. Both had their skin lesions 'improved' at the completion of the trial.

Table 2: Rate of occurrence of clinical and non-clinical events* . (per 100 person years) by type of leprosy, uniform multidrug therapy trial, 2003-2014

Type of events	PB		MB	
	n	Rate/100 person years	n	Rate/100 person years
Clinical events leading to lost to follow up				
Clinically confirmed relapse among new lesions	2	0.02	4	0.07
Suspected adverse drug reactions	8	0.79	16	2.64
Non-clinical events leading to lost to follow up				
Death	24	0.25	50	0.88
Migration†	183	1.94	103	1.81
Refusal	57	0.61	30	0.53
Others	27	0.29	20	0.35
Clinical events not leading to lost to follow up				
Neuritis	37	0.39	78	1.37
Type 1 reactions	51	0.54	114	2.01
Type 2 reactions	3	0.03	28	0.49
New lesions on account of reactions	23	0.24	76	1.34

*Multiple events were reported for each patient; †Refers to permanent migration leading to lost-to-follow up from the study; temporary migrations were 230 among PB and 117 among MB patients. MB, multibacillary; PB, paucibacillary

Table 3. Profile of the relapsed patients by type of leprosy, uniform multidrug therapy (U-MDT) trial, 2003-2014

Type of leprosy (study site)	Age (yr)	Gender	Time of occurrence of relapse	Clinical profile	Course of treatment	Status of skin lesion at completion of the study
MB						
Tiruvannamalai, India	41	Male	One year, eight months	Diagnosed and recovered from type 1 reaction during the first year post-U-MDT. Multiple, raised, combination of ill and well-defined, erythematous, new lesions	One more course of U-MDT	Inactive
Tiruvannamalai, India	37	Male	One year, seven months	Multiple, raised, combination of ill and well-defined, erythematous new lesions of two months duration	One more course of U-MDT	Improved
Villupuram, India	57	Male	One year; six months	A few erythematous well-defined smooth surface patches on face and both ear lobes. Great auricular nerve thickened on both sides	One more course of U-MDT	Inactive
P. R. China	38	Male	One year	Type 2 reactions. Many new skin lesions and oedemain hand. Had many nodules & erythema	One more course of U-MDT	Static*
PB						
Kanpur, India	34	Male	One year, nine months	New lesion, Type 1 reaction, neuritis	Routine MDT†	Improved
Tiruvannamalai, India	40	Female	Two years, six months	12 raised, combination of ill and well-defined, erythematous patches of various sizes in new sites (MB)	One more course of U-MDT	Improved

*Principal investigator communicated that the most recent skin smear examination of this patient was negative; †As preferred by the principal investigator. MB, multibacillary; PB, paucibacillary

Secondary outcomes: Acceptance of the U-MDT regimen was 100 per cent for all the sites. Totally, 94 per cent completed U-MDT within nine months (52% within six months and rest in nine months). There were no complaints about clofazimine pigmentation. The investigators reported that skin pigmentation due to clofazimine was of short duration and acceptable to the enrolled patients with PB leprosy.

During the study period, a total of 645 special events were reported among PB patients. Of these, 301 events resulted in lost to follow up due to clinical (n=10) or non-clinical events (n=291). The remaining 344 were events that did not lead to lost to follow up (clinical events=114 and temporary migrations=230) [Table 2].

At the end of five years post-treatment follow up, the death rate was 0.25 per 100 PY (n=24) among PB patients. Of these deaths, one was reportedly due to complications following leprosy reactions from Guizhou site in P. R. China. Seven deaths were due to injuries (suicide=2, snake bite=1 and motor vehicle accidents=4), followed by four cardiac problem-related deaths. Cause of death was unknown for four deaths.

Of the total PB patients recruited, 2.7 per cent (n=57) refused to continue in the study for various reasons. Majority of them were self-refusal for clinical examination during follow up (n=30). Twelve participants did not report any reason for discontinuation.

Among the lost to follow up, 27 were due to various reasons such as shifting outside the study area (n=20) and being found ineligible during the treatment period (wrong diagnosis or pregnancy). P. R. China site removed four patients from the trial since they were either put on routine MDT by investigators (n=3) or as opted by the patient (n=1).

The clinical events leading to lost to follow up included eight suspected ADR (total PY=1009; rate=0.79). As per the WHO/TDR guidelines (*http://www.who.int/tdr/publications/documents/investigator.pdf?ua=1*) and based on available clinical notes, one of the

ADR was classified as 'probably'(exfoliative dermatitis with jaundice) and seven as 'possibly' related to the drug. Of the reported clinical events, rate of occurrence (per 100 PY) of new lesions on account of reactions was 0.24 (n=23) and that of neuritis was 0.39 (n=37). Of the total neuritis, 24 were reported independently and 13 were reported along with type 1 reaction. Rate of occurrence of type 1 reaction was 0.54 (n=51). Type 2 reaction was 0.03 (n=3) per 100 PY from two PB patients (first year=2 and fourth year=1) who also had nerve lesions at the time of enrolment.

Status of skin lesions during follow up: Of the total PB patients, 97 per cent patients had either inactive or improved skin lesions at the time of completion of treatment and 0.5 per cent had static lesions at the end of fifth year of post-U-MDT [Table 4].

Table 4: Clinical status of skin lesions at the completion and post-treatment by type of leprosy, uniform multidrug therapy trial, 2003-2014

Clinical status	PB, n (%)				MB, n (%)			
	Lesion inactive	Improved	Static	Total	Lesion inactive	Improved	Static	Total
At the completion of treatment	803 (42.0)	1060 (55.4)	50 (2.6)	1913	125 (10.4)	1016 (84.9)	56 (4.7)	1197*
First year post-treatment	1229 (66.5)	597 (32.3)	21 (1.1)	1847	474 (40.7)	669 (57.5)	21 (1.8)	1164
Second year post-treatment	1443 (80.0)	343 (19.0)	17 (0.9)	1803	642 (57.7)	464 (41.7)	7 (0.6)	1113
Third year post-treatment	1562 (87.7)	215 (12.1)	4 (0.2)	1781	788 (72.4)	292 (26.8)	9 (0.8)	1089
Fourth year post-treatment	1585 (90.0)	173 (9.8)	3 (0.2)	1761†	836 (78.5)	223 (20.9)	6 (0.6)	1065
Fifth year post-treatment	1594 (91.2)	146 (8.4)	8 (0.5)	1748‡	842 (80.7)	190 (18.2)	11 (1.1)	1043

*One patient (MB) refused during treatment from Gaya site was examined and the clinical status of skin lesion was static in the first year; †One patient (PB) who discontinued - refusal during first year from Gaya site was examined and the clinical status of skin lesion was cured in the fourth year; ‡Two patients (PB) who discontinued - refusal during first year and fourth year, respectively, from Gaya site were examined and the clinical status of skin lesions were cured in the fifth year. MB, multibacillary; PB, paucibacillary

Findings among MB type of patients

Of the 1298 MB patients enrolled (mean age 35.3±16.1 yr), 10 per cent (n=129) were children younger than 15 years and 66 per cent (n=853) were male [Table 1]. G2D was present in five per cent (n=66) at recruitment and nerve lesions were present in 63 per cent (n=812) of the study participants. At enrolment, four per cent (n=49) had evidence of mild reactions and five per cent (n=61) had neuritis.

Primary outcome: Of the MB patients, four had clinically confirmed relapse [Table 2] and the relapse rate was 0.07 per 100 PY (total PY=5379) and cumulative risk for five years was 0.37 per cent. Three relapses occurred during the second year and one in the first year. All of them were put on one more course of U-MDT. At the fifth year of post-treatment follow up, one patient from P. R. China had static skin lesions [Table 3] and the rest had either 'inactive' (n=2) or improved (n=1) lesions.

Secondary outcomes: All of the MB patients accepted U-MDT regimen in all the sites. There were no complaints about clofazimine. The skin pigmentation due to clofazimine was reported to be of short duration and acceptable to the enrolled patients with MB leprosy. Of the total 1298 who accepted U-MDT, 94 per cent (n=1220) completed the regimen and 52 per cent (n=675) consumed doses within six months.

In all, 636 special events were reported among MB patients. Of these, 223 were clinical (n=20) or non-clinical (n=203) leading to lost to follow up. The remaining 413 events (clinical=296 and temporary migrations=117) did not result in lost to follow up [Table 2]. Fifty MB patients died during the follow up period (rate: 0.88 per 100 PY). Of these, nine each were due to respiratory failure and liver diseases and eight deaths were due to cardiac problems. Seven deaths were reportedly due to injuries (suicide=4; drowning=2; homicide=1). Ten MB patients died due to various causes. Cause of death was unknown for seven patients.

Of the 30 patients who refused to continue in the study for various reasons, 12 patients refused clinical examination during follow up, and for five of them, the regimen was

changed and nine did not report any reason for discontinuation. Three patients refused because they were not interested in continuing in the study and one patient refused on account of stigma.

Among the lost to follow up reported under 'others' events, 20 were due to various reasons such as shifting outside the study area (n=13). P. R. China site removed seven patients from the trial since five of them were put on routine MDT [either by the investigators (n=4) or as opted by patient (n=1)] and two patients received additional dose of clofazimine.

Of the clinical events leading to lost to follow up, 16 were due to suspected ADRs (total PY=605; rate=2.64 per 100 PY). Of these, seven had dapsone-induced exfoliative dermatitis and were classified as 'probably' and rest as 'possibly' related to the drug. Of the reported clinical events, rate of occurrence (per 100 PY) of new lesions on account of reactions was 1.34 (n=74) and that of neuritis was 1.37 (n=78). Of the neuritis, 43 were reported independently and 29 were reported along with type 1 and six with type 2 reactions. Rate of occurrence of type 1 reaction was 2.01 (n=114) and that of type 2 reaction was 0.49 (n=28) per 100 PY [Table 2]. Type 2 reactions (28 events from 24 patients) occurred during treatment and throughout the follow up.

Status of skin lesions during follow up: Proportion of MB patients with inactive and improved skin lesions was 95 per cent at the end of the completion of treatment. Static lesions were present in 1.1 per cent at the end of fifth year of post-U-MDT [Table 4].

Discussion :

Our observation of low level of relapse was consistent with the findings from the most recent randomized controlled trial from Brazil that compared U-MDT with regular MDT (0.09 per 100 PY; two relapses during 2139 PY)[14],[15]. Rate documented in our trial was much lower than the reported relapse rates from programmatic settings and other field trials [16],[17],[18],[19],[20],[21][maximum rates (per 100 PY): 0.65 in PB and 2.04 in MB]. Based on information available from leprosy programmes, the WHO reports frequency of relapse per year as 0.1 per cent for PB and 0.06 per cent for MB [22]. According to India's leprosy programme, the country as a whole reported 433 clinical relapses for the year 2013-2014 with one larger province reporting the maximum (n=236)[21].

In the present study, almost all the new patients in the eight centres (98.6%) were enrolled and 94 per cent of them completed U-MDT treatment in nine months indicating good acceptability and compliance. The profile of study participants represented the actual scenario of new leprosy cases at the community level. Among these patients, low relapse rates were observed after completion of U-MDT. Thus, in this trial, apart from the question of extent of relapses in PB and MB patients, it was possible to consider overall effectiveness of this treatment regimen under routine programmatic conditions. Since this study was taken up for patient treatment, case detection became more proactive from the point of view of recruitment. This would explain a lower level of MB proportion among the new cases in this study.

With regard to safety of the regimen, the addition of clofazimine could potentially offer clinical and cost benefits. In terms of clinical benefits, clofazimine possibly reduces incidence of neuritis in PB and type 2 reactions in MB. The present study was not designed to test these beneficial effects. However, the observed incidence rates of neuritis and type 2 reactions and cumulative risk of neuritis (1.94% and 6.63% in PB and MB, respectively) and type 2 reactions (0.16% and 2.43% in PB and MB, respectively) were lower than those reported in the literature. For instance, the overall incidence of neuritis reported ranges between 6.1 and 34 per cent [23],[24],[25],[26],[27],[28],[29]. Similarly, reported rates (range) of type 2 reactions are higher in hospital-based studies (overall: 2-28.9%) than in the field leprosy programmes (overall: 0.2-4.6%; MB: 1-8.9%)[23],[24],[25],[26],[27],[30],[31],[32],[34]. India's national leprosy programme reported 12,901 episodes of reactions/neuritis episodes for 2013-2014 for the entire country [18]. In the programmatic context, addition of clofazimine may theoretically add to the cost to treat leprosy. However, such costs will be offset by reduction in morbidity among PB patients and hence reduced cost of management of such morbidities. Reduced duration of regimen for MB will further halve the cost of regimen. Thus U-MDT regimen will actually reduce the cost of leprosy treatment.

Advantages and implications for leprosy programmes

U-MDT trial was essentially a programmatic implementation research. Hence, it is worth considering the findings in the context of its implications for programmes. Nearly all new treatment naive patients from the study areas were included. Proportion of MB was lower than PB (38 vs. 62%) and MB patients had nerve involvement. We expect this to be generally representative of the real-life situation in the programme. We tried to keep implementation of the U-MDT as per the programme routine. However, the case detection had been proactive and the follow up of the patients was more rigorous. It is expected that if U-MDT is implemented in the programme situation with appropriate sensitization of patients and providers, it will help in effectively reducing leprosy prevalence at the district/regional levels as well.

In the national leprosy programme (India), skin smear and

skin biopsies are not performed. In the absence of such testing, it is essential to consider how much could be the probable misclassification in the present study. PB-MB grouping is employed primarily on the assumption that the protective immunity is inversely correlated with the number of lesions [35]. In programmatic conditions, it was thus possible that some of the leprosy patients would have been misclassified as PB or MB [36]. However, the extent of such misclassification in the present study seems to be minimal. For instance, a low rate of type 2 reactions among PB (rate=0.03; risk=0.16%) was observed as compared to 0.49 per 100 PY among MB patients (risk=2.43%, P<0.001).

Two study sites carried out skin smear test as part of their implementing agency's or country's policy and practice although skin smear examination was not required as per common protocol. P. R. China sites performed skin smear examination and documented rapid fall in bacteriological index with almost 95 per cent MB patients becoming smear negative at the end of five years of follow up[37],[38]. This information further supports the applicability of U-MDT in the programme.

Finally, there is a need to consider implications of trial findings on the follow up strategy while adopting U-MDT in programmes. All the suspected ADRs were reported within a maximum of three months, and all the relapses occurred within first three years after treatment completion. Further, it was noted that the occurrence of type 2 reactions was continuing during post-treatment follow up. Hence, the primary health care physicians will require necessary clinical expertise to recognize and manage such clinical events. There is a need to educate and counsel patients to be alert about any such event and report immediately to the primary health care providers.

Only a small number of patients in PB and MB had static lesions at the end of five years post-U-MDT. Since relapses occurred within first three years after U-MDT, a carefully crafted strategy for periodic follow up algorithm during the first three years after MDT might help in picking up relapse patients relatively early. In 2013-2014, India's leprosy programme confirmed that a sizeable number of suspected relapses at the primary health care level (n=486) were referred and confirmed at the district hospital level (n=433)[21]. Hence, the national leprosy programmes could implement such a strategy of identification, referral and management at appropriate levels.

Limitations and biases

Our study had few limitations and biases. Key limitation was that of inability to meet the sample size requirements for MB. Due to overall reduction in prevalence, adequate number of patients could not be enrolled in the given geographic areas of the study sites. Further, the sample size was calculated for an expected relapse rate of three per cent (P_a) in the study groups, *i.e*., two per cent less than an assumed level of five per cent (P_o). At the end of the trial, we observed relapse of <1 per cent. The power to detect this two per cent difference (*i.e*., between 3 and 1%) was 100 per cent for PB and 99.9 per cent for MB group. Therefore, even with the recruited number of participants, we had closer to 100 per cent power to support our conclusions of efficacy of the six-month U-MDT regimen to prevent relapses in PB and MB types of leprosy patients.

In terms of biases, two types of selection biases might be considered. The study sites were purposively selected on the basis of ability to recruit patients and to offer better services and follow up. Further, as only those patients who were willing, were enrolled, there could be some level of selection bias at the level of participants. However, in most of our field sites, almost all the patients opted for U-MDT, and hence, such selection bias would be minimal. Further, due to the active nature of follow up from the investigators and the coordinating centre, it is possible that research bias might have contributed to the higher treatment completion rates than the reported figures in programme settings.

On the basis of our findings, it is concluded that the observed low relapse among the newly detected PB and MB leprosy patients from India and P. R. China demonstrates efficacy and effectiveness of U-MDT regimen in both PB and MB patients. The regimen was found to be acceptable and safe for both the groups of patients. The negligible proportion of static lesions in the MB patients of our trial documented the effectiveness of shortened duration of regimen. Treating physicians need to be aware as well as vigilant about monitoring leprosy patients for special events during and after completion of MDT for about three years. Based on such monitoring and assessments, treating physicians can decide to prolong treatment duration for individual patients. The global and national programmes should consider the evidence for programmatic adaptation of U-MDT strategy for all types of leprosy patients.

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Janani Suraksha Yojana: Maternal morbidity on the decline, finds study

A study by the Centre for Study of Social Exclusion and Inclusive Policy (CSSEIP), University of Mysore, has found that the Janani Suraksha Yojana (JSY) which was launched as part of the National Rural Health Mission (NRHM), has played a key role in reducing 'socio-economic disparities' and maternal morbidity in rural areas.

The study, funded by Indian Council of Medical Research (ICMR), New Delhi, was carried out from 2015–2017 in Karnataka, Tamil Nadu and undivided Andhra Pradesh. It found that the gap in accessing healthcare between women from vulnerable group and those who are financially better off has drastically decreased since the launch of JSY. D.C. Nanjunda, Associate Professor and Deputy Director, CSSEIP, and his group has shown that increase in the use of JSY has reduced the long prevalent disparities in maternal healthcare delivery. Also, OBC, Dalit, Adivasi and Muslim women have shown much interest to utilise the scheme. Delivery at houses is found to be around 1.2% even today in Karnataka. This is mainly because of traditional health behaviour and poor transport facilities in rural areas, the centre said in its report.

The study has shown the drop in maternal morbidity and rise in deliveries in government hospitals. However, required antenatal care and postnatal care needs much improvement in all the three states, says Dr. Nanjunda. In most cases, pre- and post-natal care will depend on the decision and attitudes of the family, according to the study.

The beneficiaries were largely from various segments of the society having different socio-economic backgrounds, a handout by the centre said here.

The Hindu| January 19, 2018

Tobacco use is taking a high toll on the health of Indians

According to the World Health Organization, tobacco use kills more than seven million people every year, globally. With nearly 270 million adults, above the age of 15 years, using tobacco in some form or the other in India, the death toll due to tobacco use in the country is more than one million every year. While globally, cigarette smoking is the biggest killer, for India and most of the neighboring countries from the Region smokeless tobacco (SLT) form is the larger part of the tobacco use burden. According to the recent Global Adult Tobacco Survey India Report, 2017, one in every five Indian is hooked to SLT. Among men, two most commonly used tobacco products are SLT i.e. khaini (8.5 crore) and gutkha (5.1 crore). Amongst women, the three most commonly used are SLT i.e. betel quit (2 crore), oral application (2 crore) and khaini (1.9 crore).

SLT causes several health problems for its users. SLT can cause oral and other cancers, in addition to other mouth diseases and heart disease. In India, the use of SLT remains the dominant cause of tobacco-attributable diseases, including oral cancer. SLT not only causes adverse health effects but is also responsible for a huge economic burden. According to the Ministry of Health and Family Welfare report, on the health cost of tobacco use, males contributed 91% of the total economic burden of Rs 1,04,500 crore in the year 2011. However, the contribution from females was much higher at 29 per cent for SLT. If one considers only the direct medical cost, female share in costs attributable to SLT increased substantially to 66 per cent. In addition, the average expenditure on purchase of SLT has doubled to Rs 12.8/- in 2017 compared to 2010. With almost 20 crore SLT users, this amount is a huge dent in household expenditure, exposing poor and vulnerable families to further poverty. This expenditure on SLT use which otherwise could be used in essentials like education, food and milk for children.

SLT use is also responsible for creating a huge amount of solid and non-bio-degradable waste. Besides, tobacco cultivation impacts the environment in many ways, e.g. tobacco growing leads to depletion of nutrients from the soil and leads to soil erosion, deforestation, disturbance in patterns of bio-diversity including continuous ecological damage due to deforestation. Disposal of tobacco-related waste and litter is another grave environmental burden due to tobacco use. Invoking the principle of 'Polluter pays' the High Court of Rajasthan directed the tobacco manufacturers in the state against the use of plastic packaging. The Supreme Court of India upheld the order and as a result, the Ministry of Environment and Forest amended Plastic Waste (Management and Handling) Rules, 2011 to prohibit the use of plastic materials in sachets for storing, packing or selling gutkha, tobacco and pan masala.

Taking further steps to prevent the use of SLT, the Indian government issued a notification under the Food Safety and Standards law stating that food products must not contain any substance which may be injurious to health. The regulation prohibited tobacco and nicotine from being used as ingredients in food items. This led a series of ban on sale and manufacture of gutkha across the country with Madhya Pradesh being the first state to initiate the ban.

The Union Ministry of Health and Family Welfare suggested state governments to take further stronger measures to curb SLT use in the country by issuing a prohibitory order against manufacture and sale of any kind of SLT products. The state of Assam became the first state to issue a blanket ban on all SLT products in February 2014. Several states, including Bihar, Maharashtra and Mizoram have since then issued stronger regulations concerning ban on SLT products.

Evidence suggests that any tobacco control regulation, unless comprehensive, does not yield the intended public health objective. To make sure that the intended objectives of gutkha ban and the proposed SLT ban are achieved, all stakeholders must work together for a comprehensive ban on manufacture and sale of smokeless tobacco in the country. Provision for accessible and affordable cessation services for all SLT users who plan to quit is the first step towards meeting this objective.

SLT use mixed with areca nut is a common practice in India and stated in the beginning, betel quid and gutkha the two most commonly used forms of SLT have areca nut as a common ingredient. Areca nut itself is classified as having class one carcinogen properties i.e. cancer-causing properties, besides responsible for other adverse health effects. The combination of tobacco and areca nut put their users, mostly women from the poor and vulnerable sections of the society, to a completely preventable risk of disease and death.

We the people of this country should enter into another final combat, this time against the use of tobacco, and set ourselves free from the clutches of this ill-habit.

The author is Director, ICMR – National Institute of Cancer Prevention and Research

DNA:| January 25. 2018

High prevalence of vitamin D deficiency in elderly

It leads to weakening of bones and hypertension. Deficiency of vitamin D in the elderly may be more commonplace than thought, suggests a recently-published study by researchers from the National Institute of Nutrition (NIN).

In a study published in the journal Annals of Human Biology earlier this month, a team of scientists concluded that prevalence of vitamin D deficiency was high among elderly population in Hyderabad. For the study, researchers randomly selected 298 people aged over 60 and collected blood samples to asses concentrations of 25-hydroxy vitamin D in the serum. The mean level in study population was 19.3 nanogram per millilitre. Universally, 20 ng/ml is considered a cut-off for vitamin D deficiency. NIN researchers found that nearly 56 % of study participants had vitamin D deficiency. It is known that vitamin D deficiency leads to weakening of bones and also affects growth in

children. Researchers found strong links between vitamin D deficiency and hypertension. Several studies have shown a link between cardiovascular disease and vitamin D deficiency, said cardiologists.

"Vitamin D deficiency is known to cause stiffening of arteries, which increases blood pressure. A person with cardiovascular disease has higher risk of morbidity and mortality if vitamin D deficiency is present," said city-based cardiologist A. Sai Ravi Shankar, general secretary for T.S. Chapter of Cardiovascular Society of India.

Though it is not clearly established why vitamin D deficiency is highly prevalent in India, Dr. Shankar offered a few explanations including reduced exposure to sunlight, diet and cooking preferences.

While mentioning their findings, NIN researchers pointed out that the odds of vitamin D deficiency in an elderly person with clinical hypertension was twice that of a same-age individual without hypertension. This suggests that vitamin D deficiency should be investigated in elderly with hypertension.

The Hindu: January 28, 2018

ICMR News

Can't Ask Doctors to Compensate Over Failed IVF Treatments: National Consumer Commission

National Consumer Commission, doctors and hospitals cannot be made to pay compensation in case the In Vitro Fertilization (IVF) treatments do not succeed. The article adds that the Commission emphasized that if the doctors have treated patients in accordance with the well-established norms under the ICMR guidelines, they cannot be faulted.

News18.com | January 4, 2018

ICMR soon to begin research on 'Viral hepatitis in India'

The article informs that ICMR will soon begin research on Viral Hepatitis in India. It states that ICMR's initiative is significant as viral hepatitis is increasingly being recognized as a public health problem, having epidemic proportions that cause 1.34 million deaths each year. The article adds that there is a paucity of nationally representative data to establish accurate disease burden of viral hepatitis.

Pharmabiz.com | January 8, 2018

STD alarm: Drugs fail to control gonorrhea

The article states that scientists of National AIDS Research Institute, Pune, along with by Osmania and Gandhi Medical College researchers have found multi-drug resistant strains of sexually transmitted disease, gonorrhea. Informing that the emergence of Neisseria gonorrhoeae is a big public health challenge in controlling sexually transmitted diseases, the article adds that at least 124 strains of gonorrhea causative were isolated in past few years in Delhi, Pune, Mumbai, Secunderabad and Hyderabad to determine antimicrobial susceptibility.

The Times of India | January 8, 2018

Scope of Zika virus test set to increase

The article states that a network of 32 laboratories across India has been readied for the Zika virus detection. Dr. Devendra Mourya, Director, National Institute of Virology (NIV) Pune, stated that the identified laboratories are expected to commence Zika virus testing after completing their training at NIV. Dr. Mourya added that the patients found negative in tests for dengue and chikungunya shall be included in testing for Zika infection. Pradip Awate, State Surveillance Officer, stated that the aim of training of the staff of the identified government laboratories is to strengthen the laboratory facilities so that Zika virus can be detected at the same place where other vector borne diseases, including dengue and chikungunya, are detected.

The Times of India | *January 12, 2018*

Newborns Don't Need Hepatitis B Vaccine Immediately After Birth, Can Wait For 6 Months, Says ICMR Study

The article states that an ICMR funded study has shown that newborns are protected at birth by natural antibodies to Hepatitis-B, and lends support to the government's pragmatic approach to vaccinate babies born at home starting at six weeks instead of birth. Dr. Puliyel however has cautioned that more studies are needed to confirm this before changes in immunization practice can be recommended.

Outlook India | *January 13, 2018*

Govt. mulls PPP model to detect cancer centers: Ashwini Kumar Choubey, MoS, Health & Family Welfare

Quoting Mr. Ashwini Kumar Choubey, Minister of State for Health & Family Welfare, the article states that the government is considering a public-private partnership (PPP) model for cancer detection centers with Tata Trust in states like Bihar, Jharkhand and Chhattisgarh to reach out to a larger population. Dr. Ravi Mehrotra, Director, National Institute of Cancer Prevention and Research (NICPR), is quoted stating that India has no ambassadors for cervical cancer. The joint study on 'Cervical Cancer' prepared by ASSOCHAM-NICPR reveals that India has one fourth of the global burden of cervical cancers and that it accounts for 17% of all cancer deaths among women aged between 30 and 69 years. The study estimates that cervical cancer will occur in approximately 1 in 53 Indian women during their lifetime compared with 1 in 100 women in more developed regions of the world.

Business Standard | *January 22, 2018*

TB 5 times higher among city's homeless, finds study

The article reports on a pilot study by National Institute for Research in Tuberculosis (NIRT), Chennai and Vector Control Research Centre, Puducherry on Chennai's 301 homeless adults from May 2013 to December 2013. The study found the prevalence of tuberculosis (TB) to be at least five times higher when compared to the normal population. The article quotes Dr. Srikanth Tripathy, Director, NIRT, stating that homeless people are more prone to TB as they are malnourished and lack facilities to maintain personal hygiene. He added that to curtail TB prevalence in the community, one must specifically target all high risk groups.

The Times of India | *January 24, 2018*

Kali Tiger Reserve to host workshop on Western Ghats

The article informs that KLE Academy of Higher Education, Belagavi, in association with ICMR and Society of Ethnophamracology, Kolkata, will organize the 6th national-level workshop with the theme "Globalizing Traditional Medicinal Knowledge" in Western Ghats at Kali Tiger Reserve, Dandeli, from January 31 to February 3, 2018. Informing that over 50

scientists and researchers representing 10 states shall participate in the workshop, the article states that the workshop will focus on survey, identification of medicinal plants, classification, plant specimen collection, locally processing and preservation through natural byproducts.

The Times of India | *January 27, 2018*

Swadeshi, the new NITI

The article reports on the views of M. Somasekhar VK Saraswat, Member (Science & Technology), NITI Aayog, on the S&T Policy. Mentioning aspects including self-reliance, societal needs, challenges, technologies and Make-In-India, he opines that the reluctance of research institutes (including CSIR, DRDO, ICAR, ICMR) to work collaboratively with industry and tendency to prefer publication in scientific journals, has resulted in the overall low research impact.

The Hindu Business Line | *January 29, 2018*

'Arsenic & pesticide in water cause cancer and infertility'

The article informs of an ongoing research project which was given to SS Hospital and Research Centre, Kankarbagh by ICMR in 2015. In the project, researchers from Patna conducted studies on Swiss albino mice to determine whether genes get affected by the toxic metalloid and pesticide. Proof of gene expression abnormalities causing cancer and infertility due to arsenic and endosulfan (widely used pesticide) poisoning was found in Gangetic and stagnant water in Bihar. It also states that the samples tested revealed that it caused cancer and infertility. The article adds that the final report with definite results about the change in gene expression shall be submitted to ICMR by June 2018.

Deccan Chronicle | *February 12, 2018*

Centre's study to uncover 'village of science'

A detailed study shall be conducted in Dhadkai, 'The Village of Silence' in Jammu & Kashmir to discover reasons why most babies are born deaf and dumb in the remote hamlet. It adds that a study published in the latest edition of the Indian Journal of Medical Research (IJMR) had pointed out "considerable genetic heterogeneity in the causation of hearing loss in Dhadkai." It quotes Geetika Yadav, researcher from ICMR, stating that population-based genetic counselling may be the key to prevent the same in future.

The Pioneer | *February 14, 2018*

'ICMR institutes' merger to improve resource allocation, boost capacities'

The article is an interview of Dr. Sanjay Mehendale, Additional Director General, ICMR where he states the need of restructuring ICMR institutes. Dr. Mehendale highlighted that the merger of institutes will enable ICMR institutes to share resources, reduce expenditure and provide holistic public health research. He also added that this decision was based on the recommendations of Performance Evaluation Committee constituted by the Ministry of Health and Family Welfare which has also recommended to increase the research funding of ICMR, strengthen technical capacity to undertake health research by attracting new talent, modernise extramural research platforms, undertake world class research training, increase the age of superannuation to the same as those of central medical institutes, and to nurture multi-sector collaboration.

The Indian Express | *February 17, 2018*

Researchers to study epilepsy & marriage to standardize support

The article states that researchers from Indian Council of Medical Research (ICMR) will be conducting

detailed research on epilepsy. The article also highlights that ICMR recently convened a meeting of neurologists with expertise in epilepsy management, neuropsychologists and social scientists to identify research gaps and pose research questions in relation with marriage and the pre-existing occurrence of epilepsy.

The Times of India | *February 18, 2018*

Govt moves to protect medical records of terminally ill patients

The article reports of the draft policy on data processing and disclosure that aims to protect patient confidentiality and privacy in disease registries developed by National Centre for Disease Informatics and Research (NCDIR), Bengaluru, ICMR. The policy will help safeguard registries for cancer, stroke and cardiovascular diseases which are thought to be vulnerable to data breaches. The article quotes Dr. Ravi Mehrotra, Director, National Institute of Cancer Prevention and Research stating that the policy is needed as in the near future, there may be a statutory mandate for hospitals and other sources to supply data on non- communicable diseases to the ICMR-NCDIR.

Livemint | *February 20, 2018*

THSTI, ICMR sign MoU for building research ecosystem

The article informs on signing of a Memorandum of Understanding (MoU) between ICMR and Translational Health Science and Technology Institute (THSTI), an autonomous institute of the Department of Biotechnology, Ministry of Science and Technology. The main objective of this association is to build the basic, clinical, translational and implementation research ecosystem in India.

Biospectrum | *February 20, 2018*

Focus on eliminating kala azar, leprosy, TB & malaria

The article informs on the directives issued by Anupriya Patel, Minister of State for Health & Family Welfare in a high-level meeting to review the activities and achievements of the Department of Health Research (DHR) and the ICMR. The Minister has directed ICMR to prioritize the elimination of kala azar, leprosy, tuberculosis and malaria and asserted that ICMR should work on a mission mode to achieve the target by 2018-end. She also stressed on the need to increase Viral Research Diagnostics Laboratories (VRDL) in states, including in Uttar Pradesh, and directed officials to set up more Multi-Disciplinary Research Units in the northeastern states.

India Today | *February 23, 2018*

Commercial launch likely for male contraceptive

The article informs of decades-old male contraceptive invention that has undergone several trials that may soon see a commercial launch, after the country's regulators have formally seen that it is reversible. It quotes Dr. R.S. Sharma, Head of Reproductive Health, Indian Council of Medical Research (ICMR) stating that the injectable molecule's efficiency is beyond question and it has also shown to have been reversible in primates. He added that besides the reversible studies, a Phase III B clinical trial would be held, after which it is likely that the molecule could be commercially launched within the next five years.

The Hindu | *February 26, 2018*

Congo fever virus widely prevalent in the country's livestock, finds NIV

The article states that National Institute of Virology (NIV) has confirmed wide prevalence of an extremely virulent tick-borne virus in the country's livestock that has killed 31 people since 2011, when it was first identified in humans in India. It quotes Dr. DT Mourya,

Director, NIV stating that from the blood samples of 5,636 domestic animals picked up randomly across the country, 354 animals were found carrying the virus in their blood. He added that active surveillance may reveal even more prevalence of the virus in our livestock, which is a serious concern. NIV scientists have developed a diagnostic kit (CCHF IgG Elisa) for tracking the virus transmission in domestic animals.

The Times of India | February 27, 2018

Various Technical Committees/Groups' Meetings

The following meetings of various technical committees/Groups of the Council were held in January-February 2018		
1.	Project Steering Committee meeting on PrEp study	3/1/2018
2.	ICMR Task Force expert group meeting on Non alcoholic Fatty Liver Disease	4/1/2018
3.	Selection committee meeting for the post of computer programmer-Grade 'A'	5/1/2018
4.	Brain storming meeting on UBT	8/1/2018
5.	Meeting on "Cohorts for HIV resistance and progression in Indian children and adults"	9/1/2018
6.	Review of extramural projects by the "Advisory Group"	9/1/2018
7.	Expert Committee on Researchable Areas in Traditional Medicine	10/1/2018
8.	Meeting of Task Force on "CVD" National Heart Failure Registry	12/1/2018
9.	The meeting of ICMR- Task force expert group for PMUY impact assessment	12/1/2018
10.	27th Sub-Committee Meeting of National Apex Committee for Stem Cell Research and Therapy	16-1-2018
11.	ICMR-BIRAC Advisory Committee Meeting (ITR)	16-1-2018
12.	Meeting Health Ministry's Screening Committee (HMSC)	17-1-2018
13.	Indo-German workshop on AMR	18 to 19-1- 2018
14.	Meeting of the ICMR technical committee for the procurement of the scientific equipments at its Institute's/ Center's	22-1-2018
15.	The review committee meeting for the Post Doctoral Fellowship (PDF)14th batch	29-1-2018
16.	Fellowship experts group meeting RBMH&CH	30-1-2018

17.	Technical Advisory Committee (TAC) meeting NCD-II	2/2/2018
18.	The meeting of expert group on fellowship	2/2/2018
19.	Signing of Memorandum Of Understanding between Indian Council Of Medical Research and Translational Health Science and Technology Institute building the basic clinical, translational and implementation research ecosystem in India	2/2/2018
20.	Indian Council of Medical Research Socio-Behavioral & Health System Research (SBHSR) Division Project Review Group Meeting	5/2/2018
21.	Experts groups meeting - RBMH&CH	5/2/2018
22.	Meeting of the ICMR Experts Committee for discussion with the firm's for various related logistic issues	5/2/2018
23.	Task Force Expert group meeting on "The Indian Metabolic and Liver Disease (IMELD) study	6/2/2018
24.	Written test for the post of MTS-OBC on contractual mode in the Indian Journal Of Medical Research (IJMR) Unit	7/2/2018
25.	Technical advisory group meeting on "India Hypertension Management Initiative (IHMI)	7/2/2018
26.	The meeting of Project Review Committee (PRC) Other Microbial Infections" (OMI)	8/2/2018
27.	The meeting on Material Transfer in Clinical Trial	8/2/2018
28.	Walk in interview for the post of scientist 'B' (Medical) in the multicentric project entitled "Global Climate Change & Health	9/2/2018
29.	Task force project meeting of "Prevalence and Etiology of Hearing Impairment"	9/2/2018
30.	Project Review Committee meeting on FGTB	9/2/2018
31.	Expert group meeting to discuss study protocol on consumption of high in fat, salt and sugar food items	12/2/2018
32.	The first meeting of ICMR's Internal Committee On Media Policy	12/2/2018
33.	Evaluation of progesterone vaginal ring as a new contraceptive option for women in India for the post of "Technical Officer"	12/2/2018
34.	Expert group meeting of ICMR task force on IDD	13-2-2018
35.	The 3rd meeting of International Scientific Advisor Group (ISAG) of the "India TB Research Consortium	19-2-2018
36.	Meeting of brain storming session on "Cancers in North East region	20-2-2018
37.	Expert group meeting of ICMR Task Force Study on FLUOROSIS	20-2-2018
38.	Brain storming session on Gall Bladder Cancer	20-2-2018
39.	The walk in interview for the post of Consultant (Finance), Consultant (Admin) and Consultant (Legal)	23-2-2018

SEMINARS/ SYMPOSIA/ CONFERENCES/ WORKSHOPS ETC SUPPORTED BY ICMR

Sr. No.	TITLE	DATE/ DURATION/ PLACE	ORGANISERS
1.	2nd Workshop on Advanced Epidemiology and Biostatistics	25th Dec. 2017-6th Jan. 2018 At Chandigarh	PGIMER
2.	Seminar on Faculty Development Program on Big Data Analytics- Tools & Techniques A Programming Perspective	2-8 Jan. 2018 at Bengaluru	School of Engineering & Technology, Jain University
3.	Seminar on Recent Advances in Oral Fluid Biosensors for Healthcare Applications	3-4 Jan. 2018 at Salem (TN)	AVS Engineering College
4.	National Conference on Rehabilitation Engineering and Healthcare in India – Current Scenario and Future Perspectives	4-5 Jan. 2018 at Chinna Kolambakkam (Kanchipuram) TN	Karpaga Vinayaga College of Engineering & Technology
5.	Seminar on Advanced Biomaterials Applied in Periodontal Disease Management	4-5 Jan. 2018 at Thindal (ERODE) TN.	Velalar College of Engineering & Technology
6.	International Conference on Innovative Food and Nutrition Technologies for Public Health Care (ICNPH-2018)	4-5 Jan. 2018 at Salem (TN)	Periyar University
7.	Seminar on Recent Trends on Recycling of Bio Waste Management	5th Jan. 2018 at Coimbatore	Sri Ramakrishna Engineering College
8.	Workshop on Research Supervisors and Research Scholars On high Impact Research Skills	8-11 Jan. 2018 at Chennai	Loyola College
9.	Seminar on Awareness of Mobile Phone Radiation Exposure and Their Ill Effects on Human Beings	9-10 Jan. 2018 at Coimbatore	Sri Ramakrishna Institute of Technology,
10.	Conference on Empowering Nursing Education Through Nursing Research	10th Jan. 2018 at Guwahti (Assam).	Sankar Madhab College of Nursing
11.	24th ISCB International Conference (ISCBC-2018) Frontier Research in Chemistry & Biology Interface	11-13 Jan. 2018 at Jaipur (Raj.)	Manipal University Jaipur
12.	Workshop on Ingenuity in Biological Sciences	11-12 Jan. 2018 at New Delhi	University of Delhi
13.	Conference on Bridging The Gap Between Basic and Clinical Research From Bench to Bed Side	11-12 Jan. 2018 at AIIMS, New Delhi	AIIMS
14.	National Seminar on Genetics of	12-13 Jan. 2018 at	Institute for

	Complex Disorders	Shoranur (Kerala)	Communicative & Cognitive Neurosciences (ICCONS)
15.	International Course in Nutrition Research Methods	15-26 Jan. 2018 at Bangalore	St. John's Medical College & St. John's Research Institute, St. John's National Academy of Health Sciences
16.	Conference on Indigenous People, Human Security And Sustainable Development: Emerging Challenges in The Present Global Context	17-19 Jan. 2018 at Kolkata	West Bengal State University
17.	Symposium on Early Childhood Development as A Part of Acies-2018 (Students' National Conclave on Public Health)	18-20 Jan. 2018 at Gandhinagar (Guj.)	J N Medical College, Datta Meghe Institute of Medical Sciences
18.	National Workshop on Animal Cell Culture: Techniques and Applications-2018	18 -24 Jan. 2018 At Bilaspur (CG)	Guru Ghasidas Vishwavidyalaya
19.	International Conference on Antimicrobial Resistance	19-20 Jan. 2018 at Thanjavur (TN)	School of Chemical & Biotechnology, Sastra University
20.	Seminar on Application of Engineering Materials in Medical Sector	22-23 Jan. 2018 at Pollachi (TN).	P.A. College of Engineering & Technology
21.	4thnirma Institute of Pharmacy International Conference on Innovation in Pharmaceutical Research by Inter Disciplinary Approach	23-25 Jan. 2018 at Ahmedabad (Guj.)	Institute of Pharmacy, Nirma University
22.	Seminar on Mathematical Modeling of three Dimensional Cell Culture and Bioreactors for Liver Toxicity Testing	24-25 Jan. 2018 at Pollachi (TN)	P.A. College of Engineering & Technology
23.	National Seminar on Big Data Analytics IOT for Healthcare Applications	24-25 Jan. 2018 at Hyderabad	Malla Reddy College of Engineering & Technology
24.	Seminar on Effects on Environment and Human Health Due to E-Waste	25-26 Jan. 2018 at Thindal (ERODE) TN.	Velalar College of Engineering & Technology
25.	42nd Annual Conference of Environmental Mutagen Society of India (EMSI) and National Conference on Environmental Mutagenesis: Integration of Basic Biology & Omics to Improve Human Health	25-27 Jan.2018 at Mumbai.	Bhabha Atomic Research Centre (BARC)
26.	Ijhrmlp Academic 2018 (CME) Of International Journal Of Health	27th Jan. 2018 at Guwahati (Assam).	Guwahati Medical College & Hospital

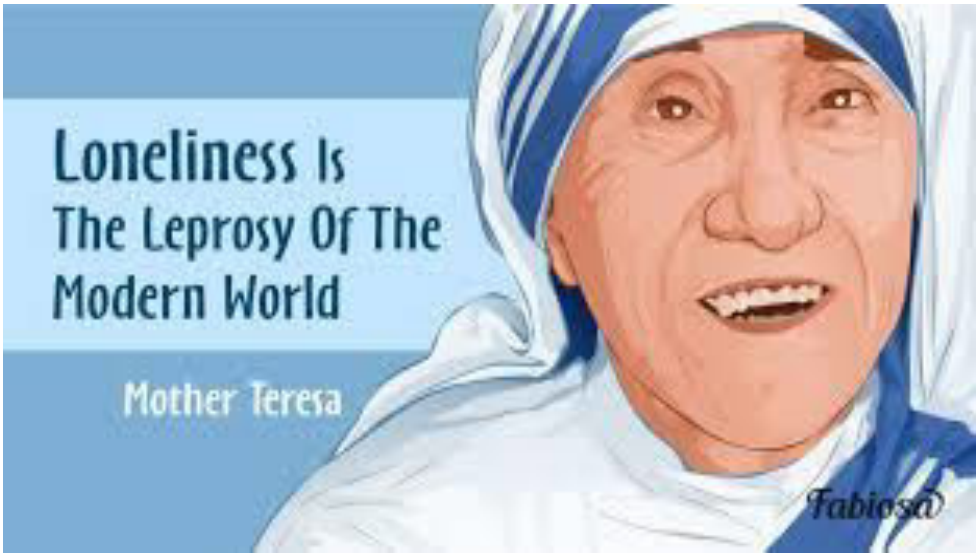
	Research And Medico Legal Practice		
27.	International Congress of Cell Biology 2018 (ICCB 2018)	27-31 Jan. 2018 at Hyderabad	CSIR-Centre for Cellular & Molecular Biology
28.	18th All India Congress of Cytology and Genetics and International Symposium on Translating Genes and Genomes	29-31 Jan.2018 at Kolkata	CSIR-Indian Institute of Chemical Biology
29.	National Conference on Innovations, IPR and Entrepreneurial Opportunities in Biotechnology	29-31 Jan. 2018 at Bangalore.	Sir M. Visvesvaraya Institute of Technology,
30.	Seminar on Non-Invasive Imaging for Congenital Heart Disease- Recent Progress in Cardiac MRI	30-31 Jan.2018 at Arasur (Villupuram) TN	V.R.S. College of Engineering & Technology
31.	6thnationalconference on Emerging Trends and new Challenges in Biotechnology-Advances in Biomaterials And Applications	31st Jan. -1st Feb. 2018 at Hosur (TN)	Research Center In Biotechnology
32.	National Level Field Workshop on Medicinal Plants of Western Ghats	31st Jan. -2 Feb. 2018 at Dandeli (Kar.)	KLE Deemed to be University, College of Pharmacy
33.	Organizing International Conference on Radiation Research: Impact on Human Health And Environment (ICRR-HHE,2018) and 2nd biennial Meeting Of The Society for Radiation Research (SRR)	1-4 Feb. 2018 at Hyderabad	School of Medical Sciences, University of Hyderabad
34.	National Conference Cum Workshop on Road Traffic Injury and Public Health Importance	1-2 Feb.2018 at Thiruvarur (TN).	School of Social Science & Humanities, Central University of Tamil Nadu,
35.	International Conference on Reshaping Libraries: Emerging Global Technologies and Trends (ICRL 2018)	1-3 Feb. 2018 at Jaipur (Raj.).	Ambedkar University Delhi
36.	South Asian Evidence Summit-SES 2018	1-3 Feb. 2018 at Manipal (Kar.)	Kasturba Medical College, Manipal University,
37.	Intzoocon 2018	1-3 Feb.2018 at Kolkata.	University of Calcutta
38.	International Conference on Advances in Biosciences and Biotechnology	1-3 Feb. 2018 at Noida (UP)	Jaypee Institute of Information Technology
39.	PGIMET- AIPNA 2nd Pediatric Pathology CME 2018	1-3 Feb. 2018 at Chandigarh	PGIMER
40.	Seminar on Recent Advances in Cochlear Implant on Healthcare Application for Deaf Mute People Rehabilitation	2-3 Feb. 2018 At Salem (TN).	AVS Engineering College
41.	International Conference on Technological Impact on	2-3 Feb. 2018 at Mohali (PB).	Rayat Bahra College of Nursing

	Epidemiology and Healthcare-2018		
42.	SGPGI Breast Course 2018	2-4 Feb. 2018 at Lucknow (UP).	Sanjay Gandhi Postgraduate Institute of Medical Sciences
43.	33rd Annual National Conference Of The Indian Society for Study of Pain, ISSPCON 2018	2-4 Feb. 2018 at New Delhi	Sir Ganga Ram Hospital
44.	International Conference on Challenges for Global Competitiveness of AYUSH and Natural Products and IASTAM Oration & Award Function	2-4 Feb. 2018 at New Delhi	Delhi Pharmaceutical Sciences & Research University
45.	Connect 2018 AIIMS, Bhopal	3rd Feb. 2018 at Bhopal (MP).	AIIMS
46.	9th International CME on Oncopathology	3-4 Feb. 2018 at Pune	Smt. Kashibai Navale Medical College & General Hospital
47.	Conference on Biochemical Understanding Of Cancer Cell Survival and Progression	5-7 Feb. 2018 at Coimbatore	Karpagam Academy of Higher Education
48.	66th Armed Forces Medical Conference -2018	6-9 Feb. 2018 at Pune	Armed Forces Medical College,
49.	Symposium on Epigenetic Regulation of Inflammation "The Shotha"	7th Feb. 2018 at Varanasi (UP)	Institute of Medical Sciences, Banaras Hindu University
50.	10th World Congress for Neurorehabilitation (WCNR2018)	7-10 Feb. 2018 Atmumbai	Kokilaben Hospital
51.	National Conference on Trans Disciplinary Approaches In Bioethics-2018 (TDAB-2018)	8-9 Feb.2018 at Bengaluru	The School of Integrative Health Sciences, Trans Disciplinary University
52.	Seminar on Recent Trends in Pharmacovigilance and Clinical Trials	8-9 Feb. 2018 at Karjat (Raigad) MS.	Konkan Gyanpeeth Rahul Dharkar College of Pharmacy & Research Institute
53.	Seminar on Mathematical Modelling of Brain Tumor Detection Using Image Segmentation	8-9 Feb. 2018 at Pollachi (TN).	P.A. College of Engineering & Technology
54.	Pedoguide2018: 15th National ISPPD PG Convention Direction Towards Excellence, Symposium on Management of Special Child	8-10 Feb. 2018 at Vadodara (Guj.).	K M Shah Dental College & Hospital
55.	6th International Conference On Molecular Signalling	8-10 Feb. 2018 at Hyderabad	School of Life Sciences, University of Hyderabad
56.	6thinternational Conference on Molecular Signalling	8-10 Feb. 2018 at Hyderabad	School of Life Sciences, University of Hyderabad

57.	71st Indian Dental Conference	8-11 Feb. 2018 at Bhubaneswar (Odisha).	SCB Dental College
58.	10th Conference on Yeast Biology	8-11 Feb. 2018 at New Delhi	Jawaharlal Nehru University
59.	Conference on Biology and Therapy of Infections	9-10 Feb. 2018 at Pennalur (Sriperumbudur) TN	Sri Venkateswara College of Engineering,
60.	62nd Annual National Conference of Indian Public Health Association	9-11 Feb. 2018 at Lucknow (UP).	King George's Medical University
61.	Workshop on Research Methodology-Basic of Medical Statistics	9-11 Feb. 2018 at Jaipur (Raj.)	Rajasthan University of Health Sciences,
62.	Seminar on Nano Medicine in Diagnosis & Theranostics in Cancer Biology	10-11 Feb. 2018 at Bhubaneswar	Utkal University
63.	National Conference on Environment, Health and Disease: Ecogenetics and Toxicogenomics	12th Feb. 2018 at Puducherry	Sri Balaji Vidyapeeth, Mahatma Gandhi Medical College
64.	27th National Congress of Veterinary Parasitology And National Symposium on Technologies for Sustainable Parasite Control And Readdressal of Detection Methods Directed for Upliftment of Rural Economy	12-14 Feb.2018 at Udaipur (Raj.)	College of Veterinary & Animal Science
65.	International Conference on Trends In Biochemical and Biomedical Research: Advances and Challenges (T B B R-2018)	13-15 Feb.2018 at Varanasi (UP)	Institute of Science, BHU
66.	International Conference on Trends In Biochemical And Biomedical Research: Advances and Challenges (T B B R-2018)	13-15 Feb.2018 at Varanasi (UP)	Institute of Science, BHU
67.	Seminar on Modeling The Human Cardivascular System: The Factors That Affect Blood Flow Rate	14-15 Feb. 2018 at Pollachi (TN).	P.A. College of Engineering & Technology,
68.	Golden Jubilee Concluding Celebrations & Annual Conference Of Indian Pharmacological Society (IPSCON – 2017)	14-17 Feb. 2018 at Mumbai	SVKM's NMIMS,
69.	National Conference on Towards Rational Use of Antibiotics; Problems, Priorities and Future Implications	15-16 Feb. 2018 at Thiruvalla (Kerala).	MAR Thoma College
70.	Seminar on Nanobots: An Ultimate Transition in Medical Era for Guarding Against Infections	15-16 Feb. 2018 at Pollachi (TN).	P.A. College of Engineering & Technology
71.	Workshop on Harnessing the Power of Oncology Data Analytics for Early Diagnosis and Treatment	15-16 Feb. 2018 at Coimbatore.	Sri Krishna College of Engineering & Technology
72.	National Symposium on Contribution of Women in Science in	**15** -16 Feb. 2018 at Kolkata	Indian Science News Association (ISNA),

	India (NSCWSI-2018)		
73.	East Asian Regional Conference of International Biometrics Society	15-17 Feb. 2018 at Pondicherry	JIPMER
74.	National Workshop on Bio-Medical Imaging and Analysis with Deep Learning Techniques	15-17 Feb. 2018 at Tirupati (AP).	Sri Venkateswara College of Engineering
75.	International Conference on Specialized, Ayurvedic and Innovative Foods and Nutrition: Sai Food and Nutri Summit (SAIFN,2018)	16-17 Feb.2018 at Anantapur (AP)	Sri Sathya Sai Institute of Higher Learning, Anantapur Campus
76.	Workshop on Nuclearmedicine for Medical Devices and Early Stage Cancer Cell Tracer	16-17 Feb. 2018 at Karur (TN)	M.Kumarasamy College of Engineering
77.	NPSICON 2018, 3rd Annual Conference of Neuropathology Society of India	17-18 Feb. 2018 at Lucknow (UP).	Dr. Ram Manohar Lohia Institute of Medical Sciences
78.	16th Annual Meeting of The Society of Free Radical Research In India-2018 & International Conference on Translational Research in Free Radicals, Micronutrient Antioxidants and Functional Foods	18-20 Feb. 2018 at AIIMS, New Delhi	AIIMS
79.	Workshop on Phytoconstitutents from Medicinal Plants- Extraction & Isolation	20-21 Feb.2018 at Thanjavur (TN).	Bon Secours College For Women
80.	Seminar on Anthropology, Health and Development: Trends and Future Perspectives	20-21 Feb. 2018 at Delhi.	University of Delhi
81.	International Conference on Cell Death in Cancer and Toxicology (CDCT-2018)	20-22 Feb. 2018 at Lucknow (UP)	Food, Drugs and Chemical Toxciology Group, CSIR- Indian Institute of Toxicology Research
82.	10TH Symposium Cum Workshop on Recent Trends in Structural Bioinformatics and Computer Aided Drug Design [SBCADD' 2018]	20-23 Feb. 2018 at Karaikudi (TN).	Alagappa University
83.	5th Global Forum on TB Vaccines	20-23 Feb. 2018 at New Delhi	Translational Health Science & Technology Institute, NCR-Biotech Science Cluster
84.	Seminar on Trending Technology in Laparoscopy and Endoscopy	21-22 Feb. 2018 at Pollachi (TN).	P.A. College of Engineering & Technology
85.	Indian Anthropology Congress-2018 on Changing Facets Of Human Biology and Culture: Prospects For Development	21-23 Feb. 2018 at Guwahati (Assam)	Gauhati University
86.	Seminar on Medical Imaging for	22-23 Feb. 2018 at	KCG College Of

	Health Care Assistance	Chennai	Technology
87.	Technical Symposium on Recent Trends on Bio Sensors and Bio Electronics	22-23 Feb. 2018 at Coimbatore	Sri Ramakrishna Engineering College
88.	4th National Workshop on Research Methodology	22-24 Feb. 2018 at Tiruchirapalli (TN)	Institutional Research Board, Chennai Medical College Hospital & Research Centre (SRM Group),
89.	28th National Congress of Parasitology on Challenges and Innovations in Controlling Parasitic Diseases	22-24 Feb. 2018 at Belagavi (Kar.).	ICMR-National Institute of Traditional Medicine
90.	Nationalseminar on Ethnomedicines - A Source of Complementary and Alternative Medicines for Navigatingthe Future in Therapeutics	23rd Feb.2018 at Bilaspur (C.G.)	School of Pharmacy, Chouksey Engineering College
91.	Seminar on Prediagnosis of Tumor and Lung Cancer Using Biosensors	23-24 Feb. 2018 at Thindal (Erode) TN.	Velalar College of Engineering & Technology
92.	Workshop on Biostatistics, Epidemiology And Research Methodology: Translation of Research into Practice	23-24 Feb. 2018 at Guntur (AP).	Vignan Pharmay College
93.	National Seminar on Current Status and Future Scope for Nanomaterials and Nanotechnology in Drug Discovery and Development	23-24 Feb. 2018 at Bela (Nadaun) Hamirpur (HP).	Himachal Institute of Pharmaceutical Education & Research (HIPER),
94.	National Workshop on Management of Oropharyngeal Dysphagia in Children with Cerebral Palsy	23-24 Feb. 2018 at Mysore	All India Institute of Speech & Hearing, Manasagangothri
95.	World Congress on Reproductive Health With Emphasis on Family Planning and Assisted Reproductive Technology	23-25 Feb. 2018 at Hyderabad	Indian Society for the Study of Reproduction & Fertility (ISSRF)
96.	World Congress on Reproductive Health with Emphasis on Family Planning Andassisted Reproductive Technology	23-25 Feb. 2018 at Hyderabad	Owaisi Hospital & Research Center, Deccancollege Of Medical Sciences
97.	Conference on Clinical Psychologisis in Mentalhealth Advocacy: Challenges & Perspectives in Global Scenario	23-25 Feb. 2018 at Gr. Noida (UP).	School of Humunities & Social Sciences, Gautam Buddha University
98.	2nd Indian C. Elegans Meeting	23-26 Feb. 2018 at New Delhi.	National Institute of Immunology



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