

MISCELLANEOUS ARTICLE - PUBLIC HEALTH

TAMIL NADU AT THE BRINK OF ELIMINATING LYMPHATIC FILARIASIS

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Abstract

INTRODUCTION : Tamil Nadu was one among the nine states which contributed to 95% of total burden of filariasis in India. Tamil Nadu is the pioneer state in the country to launch the MDA program during 1996 as pilot project even before the declaration by WHO Assembly for Elimination of Lymphatic Filariasis. Based on the successful results, the program has been extended to the other 26 endemic districts of Tamil Nadu from 1998. Mass Drug Administration with Diethyl carbamazine was implemented in all 26 districts from 2007 -12 (4 rounds). The state achieved coverage of >65% in all these rounds. The state completed 3 rounds of Transmission Assessment Survey in 2014, 2016 and 2018 with microfilaria rate of 0.18%, 0.21% and 0.10% respectively. The mass drug administration with DEC was stopped since 2015. Morbidity management and disability prevention strategies includes morbidity survey and line listing of patients with morbidity related to filariasis, promotion of Hydrocele operation in camp approach and all operable hydrocele cases were operated and all lymphoedema cases were trained by doctors on limb oedema management and morbidity management kits are distributed. The state is currently in the stage of dossier preparation and submission for verification process, following which the state will be certified for achieving lymphatic filariasis elimination status.

KEYWORDS : Lymphatic filariasis, Elimination, Elephantiasis

INTRODUCTION

Lymphatic filariasis, one of the ancient parasitic diseases was ranked by World Health Organization (WHO) as the 2nd leading cause of long-term chronic disability worldwide in 1995. *Wuchereria bancrofti* is responsible for 90% of the infection throughout the world, with the rest 10% due to *Brugia malayi* and a small proportion by *Brugia timori*. The adult form of these worms live inside human lymphatic system, causing the dilation of lymphatic vessels and damage them. The microfilaria which are produced in millions by the female worm circulate in the human blood, which are suck by the adult female *Culex* mosquitoes. Within the mosquitoes, the microfilariae develop into infectious larvae. The infection is passed on to other human beings when these mosquitoes with infected larvae have their next blood meal in humans. This life cycle determines the potential areas of breaking the cycle of infection. There are various strategies that can be used to interrupt the transmission of the parasite; various countries have adopted specific strategies to eliminate LF. For example, Japan adopted mass screening and selective treatment approach,² China used a combination of selective treatment and mass treatment using medicated salt approach,³ Solomon Islands achieved elimination by adopting only mosquito control.⁴ However, improvement in the predisposing conditions like sanitation was the major reason for elimination in major countries across the world.

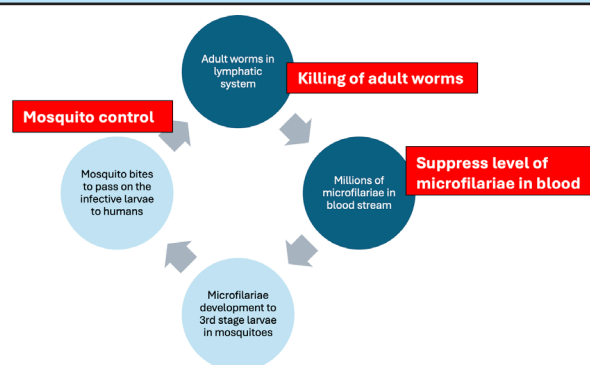


Figure 1 : Life cycle of filariasis and potential intervention strategies

Global Program to Eliminate Lymphatic Filariasis

In 1994, the international task force for disease eradication, listed LF as one of the 6 diseases that could be potentially eradicated. WHO became optimistic and announced the Global Program to Eliminate Lymphatic Filariasis (GPELF) in 1998 and was under implementation since 2000. One goal of the NTD road map towards achievement of SDG 3.3.5 is a 90% reduction in the population that requires interventions

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for NTDs by 2030.⁶ For LF, this is measured as the population of endemic Implementation Units (IU) that no longer require mass drug administration (MDA).

GPELF endorses two pillar strategy wherein it includes both interruption of transmission and providing care to those who currently suffer the disease.⁵

- **Interruption of transmission** focuses on selective screening to detect high risk areas followed by mass drug administration.

- **Morbidity Management and Disability prevention** - providing clinical intervention to alleviate morbidity and prevent disability.

Interruption of transmission

In order to interrupt transmission, districts in which lymphatic filariasis is endemic should be mapped and a strategy of preventive chemotherapy called mass drug administration (MDA) implemented to treat the entire at-risk population. The following drug regimens are recommended for use in annual MDA for at least 5 years with a coverage of at least 65% of the total at-risk population:

- 6 mg/kg of body weight diethylcarbamazine citrate (DEC) + 400 mg albendazole; or
- 150 µg/kg of body weight ivermectin + 400 mg albendazole (in areas that are also endemic for onchocerciasis);
- 400 mg albendazole preferably twice per year (in areas that are also endemic for Loa loa).
- Since 2017, WHO recommended Triple drug therapy called IDA (Ivermectin, DEC, Albendazole) except in areas which are endemic for onchocerciasis.⁷

An alternative regimen in endemic regions is the use of cooking salt fortified with DEC. DEC fortified salt has been used in only a few settings.⁸

This intervention should be repeated annually with effective coverage of $\geq 65\%$ of the total population to ensure the prevalence of infection has been reduced to low level that transmission of infection is no longer sustainable. After at least 5 rounds of MDA with adequate coverage, a transmission assessment survey (TAS) is conducted in the implementation units to demonstrate reduction in infection rate in the community⁵

Milestones towards validation⁵

1. Stop the spread of infection through MDA

1. Implement MDA in all endemic areas (100% geographical coverage)

2. Reduce infection below a threshold at which transmission is not sustainable in all endemic areas and stop

MDA

3. Demonstrate sustained reduction of infection below the threshold for atleast 4 years after stopping MDA.

2. Alleviate suffering by managing morbidity and preventing disability (MMDP)

1. Define burden of disease (estimates of the number of patients)

2. Recommended minimum package of care available in all areas of known patients (100% geographical coverage)

Validation process⁹

A programme area (Implementation Unit (IU) or multiple IUs) is considered eligible for TAS when all of the following criteria are met:

- at least five rounds of MDA have been implemented,
- coverage exceeds 65% of the total population in the IU for each of five rounds of MDA, and
- the prevalence of infection in sentinel and spot-check sites is below 1% (assessing microfilaremia) or below 2% (assessing antigenemia, usually by a rapid card test; ICT).

Once an area passes the TAS, it can stop MDA and transition to post-MDA surveillance. Additional rounds of MDA are implemented in areas failing the TAS. Once MDA has ceased, surveillance is necessary in order to provide evidence that recrudescence has not occurred, and that transmission can be considered as interrupted. Currently, the TAS also serves as the method for post-MDA surveillance. Based on present recommendations, post-MDA TAS should be repeated at least twice at an interval of 2–3 years before beginning the final phase of “verification of the absence of transmission”

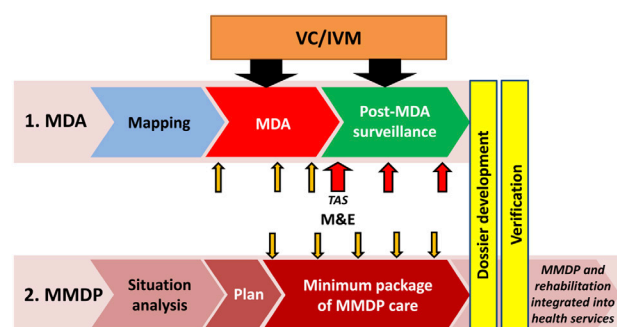


Figure 2 : Two pillar strategy for lymphatic filariasis elimination

Source : Ichimori K, King JD, Engels D, Yajima A, Mikhailov A, Lammie P, et al. (2014) Global Programme to Eliminate Lymphatic Filariasis: The Processes Underlying Programme Success. PLoS Negl Trop Dis 8(12): e3328. <https://doi.org/10.1371/journal.pntd.0003328>¹⁰

VC – vector control, IVM – integrated vector control

management, TAS – Transmission Assessment Survey, MDA – Mass Drug Administration, MMDP – Morbidity Management and Disability Prevention, M&E – Monitoring and Evaluation

As per the 2022 WHO progress report, 760 million people have passed TAS and doesn't require MDA, representing a 53.3% reduction. Of the 72 countries listed by WHO as being endemic for LF, 19 countries have achieved the elimination status, and 10 are in post MDA surveillance. India is one among the 36 countries which had scaled up MDA in all endemic areas.

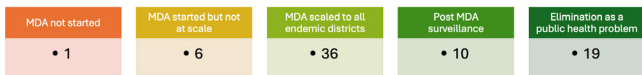


Figure 3 : Country progress against Lymphatic Filariasis : MDA status of countries 2022.

MDA- Mass Drug Administration

Source :Weekly Epidemiological Record - Global programme to eliminate lymphatic filariasis: progress report, 2022.¹¹

Elimination of Lymphatic Filariasis in Tamil Nadu

Tamil Nadu was one among the nine states (Andhra Pradesh, Bihar, Gujarat, Kerala, Maharashtra, Orissa, Tamil Nadu, Utter Pradesh and West Bengal) which contributed to 95% of total burden of filariasis in India.

Tamil Nadu is the pioneer state in the country to launch the MDA program in Cuddalore district during 1996 as pilot project even before the declaration by WHO Assembly for Elimination of Lymphatic Filariasis.

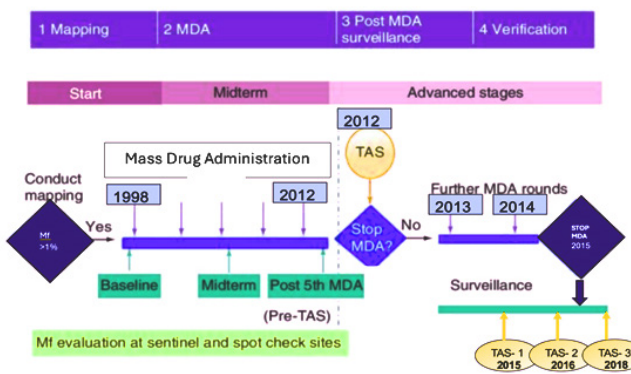


Figure 4 : Timeline of events towards filariasis elimination in Tamil Nadu

Based on the successful results, the program has been extended to the other 25 endemic districts of Tamil Nadu from 1998.

The state has an unique administrative set up with

regards to filariasis, in the form of 42 filaria clinics and 21 control units run in the State. The timeline of events with regards to efforts towards filariasis elimination is given in Figure 4.

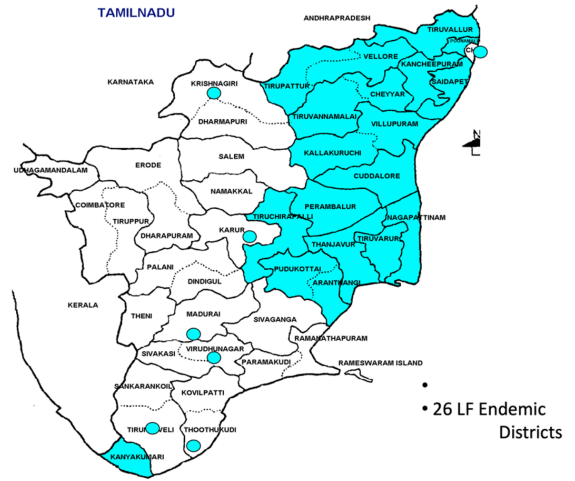


Figure 5 : Endemic districts for lymphatic filariasis in Tamil Nadu

Interruption of transmission of filariasis

In Tamil Nadu, there are 26 endemic districts for LF. In 1994, a rapid assessment survey was done to confirm mapping of endemic districts. The drug regimen that was adopted for MDA in Tamil Nadu was 6 mg/kg of body weight diethylcarbamazine citrate (DEC) alone to begin with. Later since 2001, the regimen that was adopted was 6 mg/kg of body weight diethylcarbamazine citrate (DEC) + 400 mg albendazole. MDA was implemented in all 26 districts from 2007 -12 (4 rounds) (Figure 5). The coverage evaluation survey was done for each round. Coverage rate and microfilaremia rate preceding each MDA round is given in table 1.

Table.1 : MDA and its coverage rate in the endemic districts of Tamil Nadu

Round	Year	Drug	% of Coverage	Mf rate	
I	1996	DEC (One District)	93		
II	1998	DEC (11 Districts)	94	0.83	
III	1999	DEC (11 Districts)	95	0.3	
IV	2000	DEC (12 Districts)	94	0.18	
V	2001	DEC (6 Districts) DEC+ALB (6 Districts)	96	0.15	
VI	2002		94	0.1	
VII	2003		95	0.08	
VIII	2004		95	0.04	
IX	2007		93	0.29	
X	2008		94	0.14	
XI	2009		94	0.11	
XII	2012		95	0.09	
XIII	2013		DEC+ALB (6 Districts)	95.3	0.17
XIV	2014		DEC+ALB (3 Districts)	97.3	0.11

The characteristics required of a sentinel site are as follows :

- a population of at least 500 people (in order to collect samples from at least 300 people);
- chosen from an area of known high transmission (high disease or parasite prevalence or vector abundance) or from an area where difficulty in achieving high drug coverage is anticipated.

These are the areas within the districts likely to require the longest period of time for interruption of transmission. Once chosen, the same site should act as the sentinel site throughout the course of the programme.

Characteristics of spot-check sites

Spot-check sites have the same characteristics as sentinel sites but, unlike the sentinel sites, which remain the same over the course of the programme, different spot-check sites are chosen for every assessment. Spot-check sites provide additional information on the prevalence of microfilaremia in the districts. They should be in an area considered at high risk for continued transmission.

After successful completion of 5 rounds, TAS was conducted to take a decision on whether to continue MDA or not in the year 2015.

Transmission assessment survey (TAS)

Tamil Nadu conducted TAS as we achieved the following conditions:

- Five rounds of MDA completed.
- Prevalence of Mf is <1% in sentinel and spot-check sites after fifth MDA.
- At least 65% coverage of total population in each MDA.

(TAS)

Since the net primary-school enrolment ratio is $\geq 75\%$, cluster survey with Lot Quality Assurance Sampling analysis was done among children in first and second years of primary schools. Immunochromatographic test to detect W. bancrofti antigen was used. The cut off that was used to declare TAS pass was Ag <2%. The first TAS was conducted in July 2014, followed by November 2016 and September 2018. The survey was done among 36,833 children in TAS-I, 38,954 in TAS-II, and 39,754 children in TAS-III. After the first TAS was passed, decision to stop MDA was taken. Microfilaremia rate in the three TAS were 0.18%, 0.21% and 0.10% respectively. The state has now passed all three TAS and is in process of preparing dossier for verification.

Post-MDA surveillance

After MDA has stopped, the following activities are undertaken in Tamil Nadu as surveillance measures. One time confirmatory mapping was done in all TAS confirmed blocks of previously endemic districts, and in non-endemic districts. Among a total of 2,80,305 night blood samples collected in 45 HUDS in the year 2022, 3 were tested positive for Microfilaria as shown in Table 2.

Table 2 : One time confirmatory mapping in Tamil Nadu -2022

S.No	Name of the HUDs	No of the Sentinel Site	No of the Random Site	Total NBS Collected	No. of Mf Positives			Total
					<5 years	5-14 Years	15 +years	
1	Kancheepuram	6	6	3604	0	0	0	0
2	Chengalpattu	9	9	5554	0	0	1	1
3	Thiruvallur	13	13	7842	0	0	0	0
4	Poonamallee	2	2	1200	0	0	0	0
5	Vellore	14	14	8400	0	0	0	0
6	Thirupathur	6	6	3600	0	0	0	0
7	Ranipet	11	11	6602	0	0	0	0
8	T.V.Malai	11	11	6600	0	0	0	0
9	Cheyyar	11	11	6600	0	0	1	1
10	Cuddalore	22	22	13261	0	0	0	0
11	Villupuram	16	16	9214	0	0	0	0
12	Kallakurichi	9	9	5400	0	0	0	0
13	Thanjavur	16	16	9600	0	0	0	0
14	Thiruvallur	10	10	6034	0	0	0	0
15	Nagapattinam	8	8	4800	0	0	0	0
16	Mayiladuthurai	7	7	4212	0	0	0	0
17	Tiruchirappalli	15	15	9007	0	0	0	0
18	Karur	10	10	6014	0	0	0	0
19	Ariyalur	8	8	4800	0	0	0	0
20	Perambalur	4	4	2400	0	0	0	0
21	Pudukottai	8	8	4806	0	0	0	0
22	Aranthangi	7	7	4200	0	0	0	0
23	Madurai	13	13	7988	0	0	0	0
24	Theni	8	8	4800	0	0	0	0
25	Dindugal	7	7	4286	0	0	0	0
26	Palani	10	10	6035	0	0	0	0
27	Ramanad	8	8	4829	0	0	0	0
28	Paramakudi	7	7	4213	0	0	0	0
29	Sivagangai	16	16	9641	0	0	0	0
30	Virudhunagar	5	5	3025	0	0	0	0
31	Sivakasi	6	6	3432	0	0	0	0
32	Thirunelveli	10	10	6062	0	0	0	0
33	Tenkasi	10	10	6084	0	0	0	0
34	Thoothukudi	10	10	6043	0	0	0	0
35	Kovilpatti	5	5	3000	0	0	0	0
36	Kanyakumari	13	13	7885	0	0	0	0
37	Salem	16	16	9632	0	0	0	0
38	Attur	10	10	6115	0	0	0	0
39	Namakkal	20	20	12097	0	0	0	0
40	Dharmapuri	8	8	5424	0	0	0	0
41	Krishnagiri	12	12	7230	0	0	0	0
42	Coimbatore	16	16	9688	0	0	0	0
43	Thirupur	13	13	7873	0	0	0	0
44	Erode	15	15	8723	0	0	1	1
45	Nilgiris	4	4	2450	0	0	0	0
	Total	465	465	280305	0	0	3	3

Testing and Treating" strategy was implemented among high-risk populations such as migrants. Under this strategy, migrant population are surveyed using night blood smear test. The positive cases are treated with a single dose of DEC and albendazole. For the year 2023, around 44,208 migrants were tested with night blood smear and 152 (0.3%) tested positive for Mf. All those who tested positive were treated with 12 days of DEC.

Entomological data collection

For such data collection, four "Sentinel Sites" (3 from rural & 1 from urban areas) were identified on the basis of past Mf survey data. Besides, four random (spot) sites (3 from rural & 1 from urban areas) were selected each year afresh by multi-stage random sampling method.

From each of such sentinel and random (spot) site,

entomological data collection should be made from 10 catching stations spending 15 minutes in each catching station using flash light and aspirator tube in the early morning between 6 a.m. and 10 a.m. All the female Culex quinquefasciatus mosquitoes shall be dissected to find out the filarial infection (Filarial larvae).

A minimum of three collections at an interval of 10 days used to be carried out in each site once a year during October-November each year and four indices are to be calculated.

Table 3 : Entomological data collection in Tamil Nadu for 2022-23

	S1	S2	S3	S4	R1	R2	R3	R4
10 MHVD	150	183	204	136	149	200	170	152
Infection Rate	0	0	0	0	0	0	0	0
Infectivity Rate	0	0	0	0	0	0	0	0
Mean mosquito infectivity	0	0	0	0	0	0	0	0

MHVD – Man Hour Vector Density S- Spot check sites, R- random sites; Infection rate is presence of filarial larvae in any stage; Infectivity rate – presence of stage 3 filarial larva in the mosquito.

With respect to the 1st pillar, Tamil Nadu has satisfied all the requisite criteria for entering into the validation stage.

Morbidity Management and Disability Prevention

Morbidity management is aimed at giving relief to the LF patients who have been suffering from Lymphoedema and Hydrocele. The following activities are done for MMDP :

1. Morbidity survey and line listing of patients with morbidity related to filariasis.
2. Promotion of Hydrocele operation in “Camp Approach” and all operable hydrocele cases were operated.
3. All lymphoedema cases were trained by doctors at PHC, CHC and government hospitals on to how to take care of the affected body part(s). Such training are given twice a year. Following training each patient were is a “morbidity management kit” containing a plastic mug, soft towel, soft soap and antifungal/antibacterial cream.
4. Financial assistance of Rs 1000/ per month is given by the Government for patients with Grade-4 lymphedema.

Dossier preparation

The state has successfully completed all the essential rounds of MDA and passed the TAS. The state is now in the stage of verification process for which dossier is being prepared. A state level committee and district level committee is formed for collecting and collating all the necessary documents for dossier preparation.

The state has completed all the necessary requirements

for achieving the elimination status and sustained efforts are continued to ensure the elimination status. The compilation and collation of all the details taken towards elimination is underway and the complete document will be submitted to appropriate authority for certification of elimination status.

Table.1 : MDA and its coverage rate in the endemic districts of Tamil Nadu

	(Cumulative)*	2022	2023	(in 2022)
1 Ariyalur	288	0	0	332
2 Chengalpeta	554	0	0	616
3 Chennai	83	0	0	83
4 Coimbatore	2	0	0	3
5 Cuddalore	811	1	0	1154
6 Dharmapuri	80	1	0	88
7 Dindigul + Palani	35	0	0	36
8 Erode	17	0	0	18
9 Kallakurichi	994	10	11	994
10 Kancheepuram	611	6	0	606
11 Kanyakumari	2614	0	0	2601
12 Karur	81	0	0	78
13 Krishnagiri	76	2	0	79
14 Madurai	70	0	0	74
15 Mayiladuthurai	909	20	22	1065
16 Nagapattinam	214	2	3	284
17 Namakkal	12	0	0	15
18 Nilgiris	0	0	0	0
19 Perambalur	394	0	0	399
20 Pudukottai+ Aranthangi	63	0	0	67
21 Ramanathapuram + Paramakudi	57	0	0	58
22 Ranipet	1362	0	0	1385
23 Salem + Attur	128	1	1	132
24 Sivagangai	19	0	0	21
25 Thanjavur	1961	0	0	1972
26 Theni	19	0	0	21
27 Thenkasi	39	0	0	45
28 Thirunelveli	118	0	0	119
29 Thirupathur	898	0	0	1380
30 Thirupur	28	0	0	33
31 Thiruvallur + Poonamallee	1682	0	0	1682
32 Thiruvannamalai+Cheyyar	3510	70	3	3725
33 Thiruvarur	405	1	2	444
34 Thoothukudi + Kovilpatti	114	0	4	125
35 Trichy	417	3	0	444
36 Vellore	1522	0	0	1535
37 Villupuram	1459	12	14	1423
38 Virudhunagar + Sivakasi	112	2	3	115

Challenges

- Migration from endemic regions increases the likelihood of new cases emerging.
- Enhancing morbidity management, particularly through the expansion of Acute dermato-lymphangitis prevention activities, is essential.
- Development of guidelines, tools/diagnostics, and strategies for post-MDA and post-validation surveillance is crucial.
- Collaborative networks between vector-borne disease control programs and surgical societies have been lacking, or at most, minimal.
- In urogenital health, while hydrocele holds significant importance, other conditions such as scrotal elephantiasis, chyluria, and chylocele receive less attention.

CONCLUSION

Tamil Nadu stands as the only state in the country to successfully accomplish all requisite MDA rounds and attain a MF rate below 1%. This achievement owes itself to persistent endeavours and diligent surveillance of the disease by committed teams. The documented progress towards elimination serves as a potential benchmark for other states and offers valuable insights for addressing various diseases.

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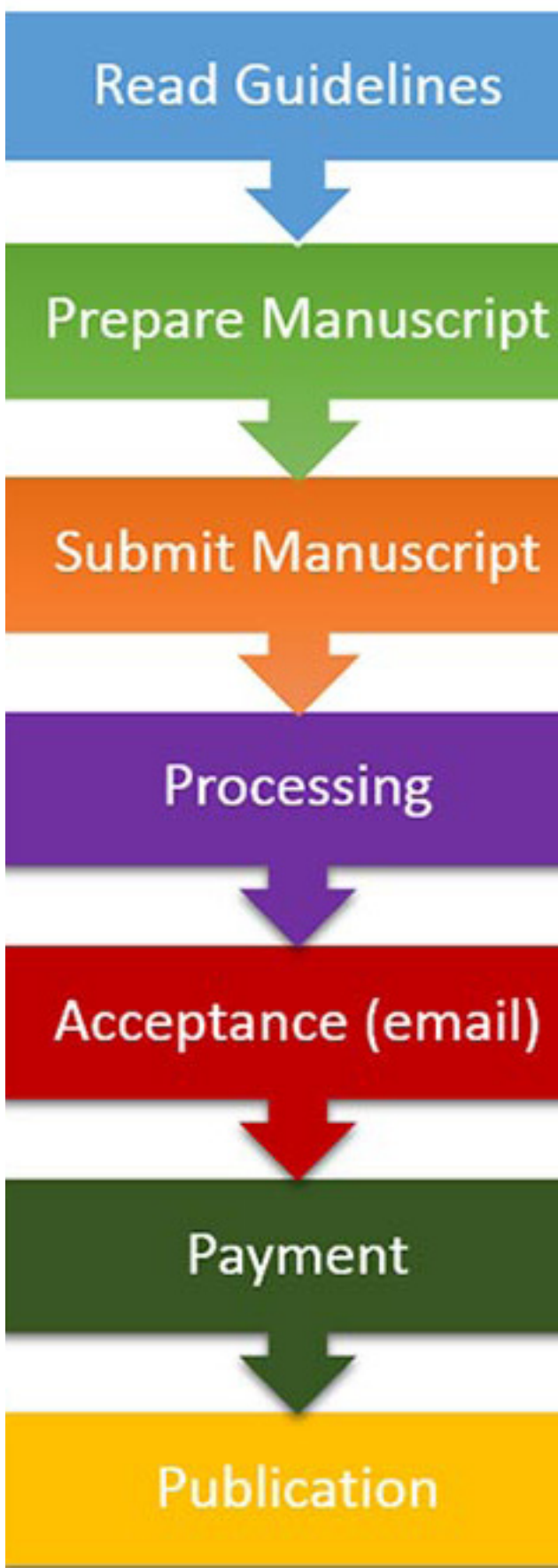
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