

## Maternal Mortality: A FOGSI Study (Based on Institutional Data)

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### Abstract

**Objective** The aim of this study of maternal deaths through FOGSI members is to see its current STATUS.

**Method** A three-year retrospective observational study from January 2005 to December 2007 formed the basis for collection of the data for analysis.

**Results** A wide variation of maternal mortality ratio (MMR) in the five zones (West—342; South—229; East—709; North East—709 and North—814) was observed. Leading causes of maternal deaths also varied among the zones [hemorrhage in West (31 %), South (26 %), and North East (21.5 %); hypertension in East (34 %) and North (22 %)]. When the data were analyzed as a whole, the leading causes of deaths were determined as hypertension (29.4 %), hemorrhage (21.56 %), sepsis (15.05 %), and medical disorders (12 %). Analysis of data in India (including Kerala State) for the year 2005 revealed significant drop in MMR to 147.

**Conclusion** MMR in India varied widely in zones. There is significant difference in MMR for the whole country as well as for the south zone with or without inclusion of Kerala. Areas of discrepancy in data had been observed in different sources. Prioritization of causes of death and appropriate allocation of resources are needed. A prospective study for evaluation of exact MMR in India is an immediate necessity.

**Keywords** Maternal mortality · FOGSI study · Current status · Quality data · Cause prioritization

### Introduction

In India, approximately 28 million women experience pregnancy and 26 million have live births. An estimated 67,000 maternal deaths and one million newborn deaths occur each year [1]. Averting maternal deaths remains a challenge to health care system in India as well as to the developing world. Millennium development goal 5 (MDG5) aims at reducing maternal mortality ratio (MMR) by 75 % over the period of 1990–2015 [2]. However, India has observed appreciable decline in MMR from 677 in 1980 to 254 in 2004–2006 and to 212 in 2007–2009 [3]. National Rural Health Mission (NRHM) and MDG5 target to reduce MMR to less than 100 by 2015. To achieve this target, not only India but also all the developing countries need to accelerate the current annual reduction rate of 5.5 % further, keeping in mind the time left is only 4 years.

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Commensurate with the existing rate of progress with regard to this issue in India, there is sufficient reason for optimism, though there is no place for complacency.

### Aims and Objectives

The current study is primarily aimed to review maternal deaths through FOGSI members across the country to see its current status. It was considered as immediate necessity, as the time-bound target, set up by NRHM and MDG5, has to be achieved within next 4 years. Reliable data about the rate and trends in maternal deaths are essential, and this FOGSI study was an attempt to meet this end. Secondary aim was, to see how the study can suggest prioritization of management issues, allocation of resources (man power and money) to the specific geographical area having its individualistic and specific need.

### Methods

This study was initiated by the Federation of Obstetric & Gynecological Societies of India (FOGSI). FOGSI, being the largest national organization with about 25,000 specialist members, felt the necessity to look into the issue as to why do the Indian mothers die as a result of pregnancy and child birth with a life time risk of 6 in 1,000<sup>1</sup> compared to women of Sweden having that risk of only 1 in 17,400 [4]. The gravidas and parturients are brought to government teaching and nonteaching hospitals even directly and mostly late. Most deaths occur in the hospitals [5]. Owing to this, we looked into the hospital data both teaching and nonteaching (district and referral hospitals).

A predesigned proforma was made with a total of 50 variables covering patients' personal details and important events in pregnancy, labor, and delivery. The proforma was made simple and as objective type with tick (✓) facility. This proforma was sent to a total of 215 Obstetric and Gynecological Societies affiliated to FOGSI. This was an institution-based retrospective observational study. A total of 50 centers recommended and managed by the FOGSI members across the country agreed to carry it out. All the filled in proforma were collected and analyzed. In each center, we had one principal coordinator. We discussed with the principal coordinator whenever we had any query about any individual patient information sheet.

The present study was designed to cover almost all parts of this vast country and to have the idea of maternal mortality situation of the country as a whole. With the

earlier observation over the years, it remained a fact that maternal mortality ratio in India varies widely with the states, and also varies with respect to the different causes of deaths (see Footnote 1). This prompted us to divide the country in five zones namely south, west, east, north east, and north to see the current trend and pattern of causes of maternal deaths separately.

### Results

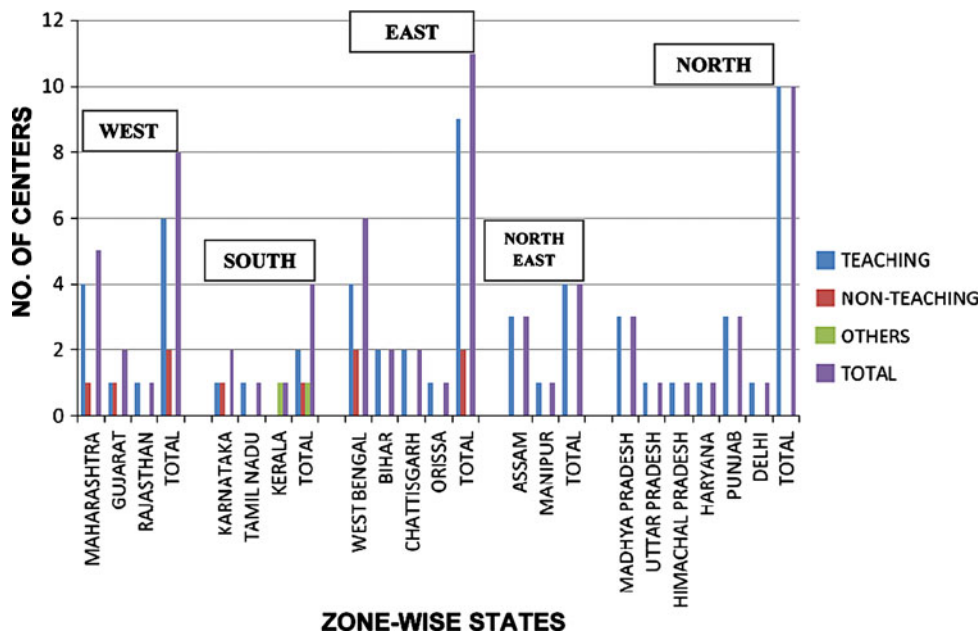
Data collected from 44 institutions belonging to 19 states in this vast subcontinent were analyzed. Institutions were classified into teaching and nonteaching, and it was observed that maximum number of responses were from teaching institutions (Fig. 1). Institutions were further classified according to average number of deliveries per year (Fig. 2). The average number of deliveries ranged from a minimum number of 421 (HJ Doshi Hospital Rajkote, Gujarat) to a maximum number of 22,390 (Safdarjung Hospital, New Delhi). We studied maternal deaths during the entire period of 2004–2008. The data so obtained suffered from the inconsistency of information as many centers had filled up the proforma incompletely. We had finally analyzed the data for the period 2005–2007 with these data from all the centers having the required uniformity and consistency. During this period (2005–2007), there were a total of 443,405 deliveries in 25 centers. The total number of maternal deaths recorded was 2,644 (Table 1). The causes of death were analyzed critically to maintain correct classification of deaths. The important causes are graded for each zone (Fig. 3), and the important causes for the country as a whole with proportionate distribution (Fig. 4). The present study includes data also from the states of Himachal Pradesh (HP) and Manipur which had not been included in the special bulletin [3].

It was observed that (2005–2007) hemorrhage is the leading cause of maternal death in the west (31 %), south (26 %), and the north east (22 %), whereas hypertensive disorders (eclampsia and severe preeclampsia) remained as the leading cause in the east (34 %) and the north (22 %) zones. Sepsis remained the second most important cause in the north east (21 %) and the north (18 %), and merely (13 %) as the third important cause in the east (Fig. 3). Hemorrhage is common in all the five zones, followed by hypertensive disorders (eclampsia and severe preeclampsia) in four zones and sepsis in three zones.

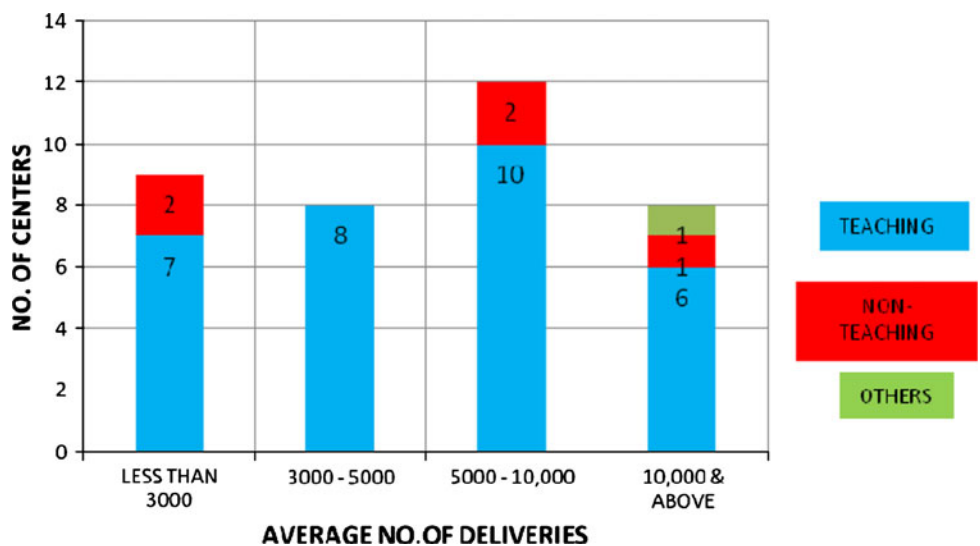
Owing to reasons discussed above, we could not include Kerala State, as the data obtained were for the years 2004 and 2005. Thereafter, we reviewed the data for the year 2005 with 19 states including Kerala. This was done for the year 2005 separately to see the changes in MMR for the five zones and especially the South Zone and the country as

<sup>1</sup> Register General, Govt. of India.

**Fig. 1** Statewise types of centers



**Fig. 2** Number of centers according to average no. of deliveries



a whole with Kerala State included as well as excluded (Table 2; Fig. 5).

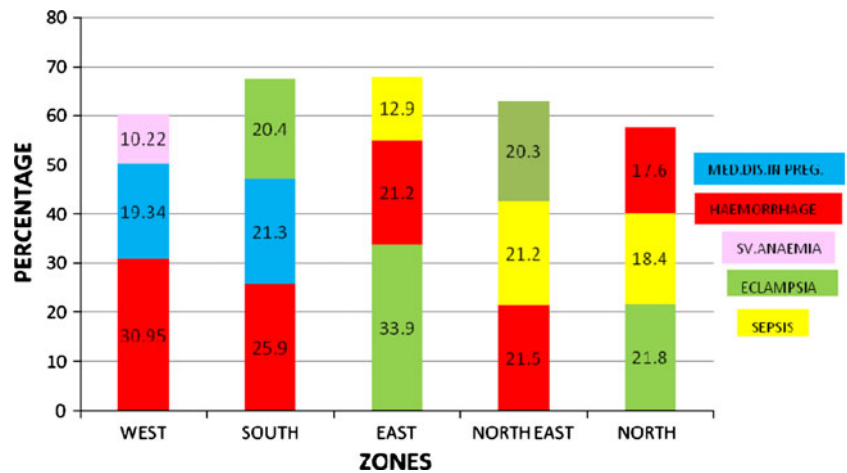
**Discussion**

In India at present, most maternal deaths take place in institutions [5]. Tertiary care Government’s teaching and nonteaching institutions are mainly involved. Poor outcomes are mainly due to the “Delay I and Delay II” though

the relatives expect excellent outcome even with the moribund state of the patient [1].

Most maternal deaths (89 %) occurred in women between 34 weeks of pregnancy and first week of delivery [6]. Our study revealed that majority (51.10 %) of women died around labor, delivery and immediate post partum with hypertensive disorders and obstetric hemorrhage (Fig. 4). These two are the leading causes of deaths. This observation indicates prioritization of strategies that involve professional health workers’ training and motivation. Resource

**Fig. 3** Zonewise leading causes of maternal deaths (2005–2007)



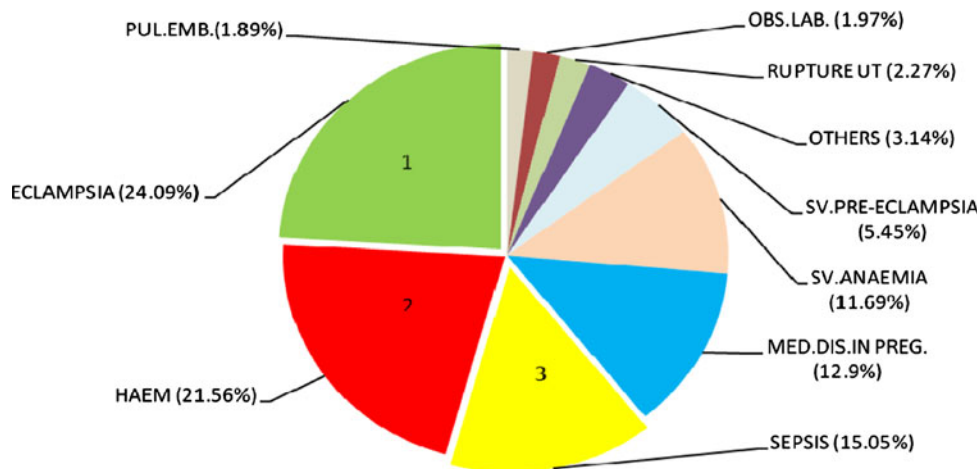
**Table 1** Statewise MMR (per 1,00,000 LB) for 2005–2007

Zones and states	No. of centers studied	No. of deliveries	No. of Mat. Deaths	MMR (per 1,00,000 LB)
<b>West</b>				
1 Maharashtra	4	77,605	215	277.0
2 Gujarat	1	1,264	57	4509.5
3 Rajasthan	1	26,918	90	334.3
Total	6	105,787	362	342.5
<b>South</b>				
1 Tamilnadu	1	41,424	87	210.0
2 Karnataka	1	5,711	21	367.7
Total	2	47,135	108	229.1
<b>East</b>				
1 West bengal	4	104,567	598	571.9
2 Bihar	1	7,214	141	1954.5
3 Chhattisgarh	2	25,020	232	927.3
Total	7	136,801	971	709.8
<b>North east</b>				
1 Assam	1	12,274	306	2493.1
2 Manipur	1	33,702	20	59.3
Total	2	45,976	326	709.1
<b>North</b>				
1 Madhya pradesh	2	35,300	332	940.5
2 Uttar pradesh	1	5,460	180	3296.7
3 Haryana	1	24,800	108	435.5
4 Punjab	3	31,382	242	771.1
5 Himachal pradesh	1	10,764	15	139.4
Total	8	107,706	877	814.3
Grand total	25	443,405	2,644	596.29

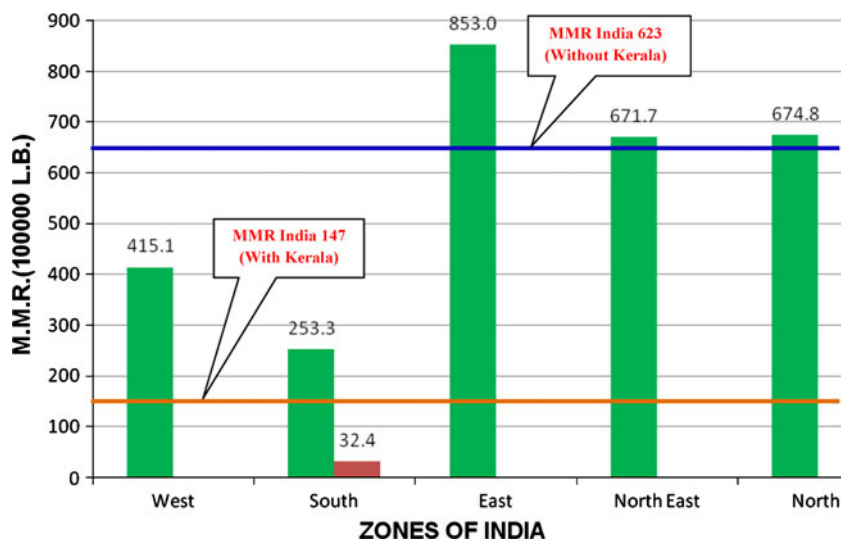
mobilization and allocation of funds need to be directed to any geographical area with specific causes. This observation highlights also the importance of emergency obstetric care.

Data analysis for the individual year, 2005, revealed differences in MMR for each zone as well as for the country as a whole. This was not an unexpected observation. The noticeable change was the significant difference

**Fig. 4** Causes of maternal deaths (2005–2007)



**Fig. 5** Zonewise (with or without) MMR India—2005



**Table 2** Zonewise (with and without Kerala) delivery, maternal deaths and MMR for the year 2005

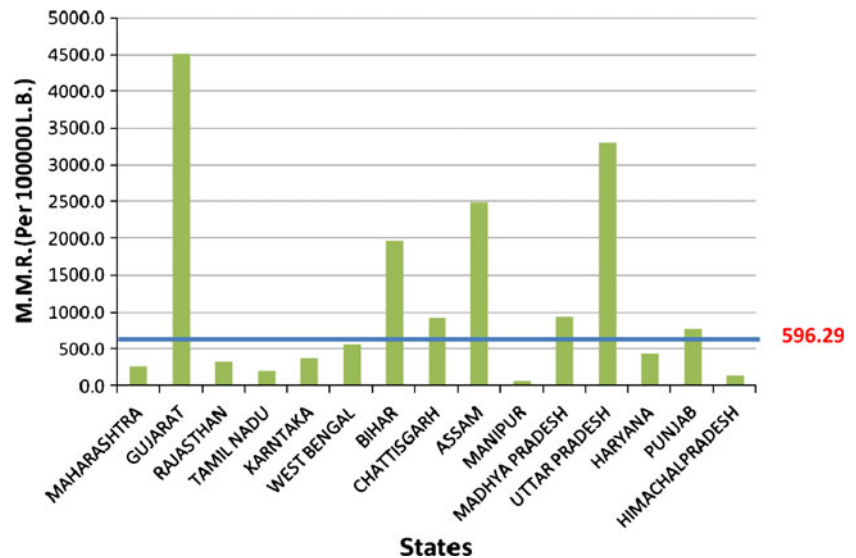
Zones	Deliveries	Mat. deaths	MMR/1,00,000 LB
West	33,002	137	415.1
South			
With Kerala	589,859	191	32.4
Without Kerala	15,002	38	253.3
East	41,734	356	853
North east	22,182	149	671.7
North	33,489	226	674.8
Total			
With Kerala	720,266	1,059	147
Without Kerala	145,409	906	623.1

in MMR for the south zone and for the country as a whole with inclusion and exclusion of Kerala (Table 2; Fig. 5). All the parameters (discussed below) being implemented in

Kerala for improvement in the outcome of maternal deaths should be a model for rest of the country before we go in search for any other model.

Majority of these referral institutions, in this study, failed to provide critical care management that those referred patients needed. This was either because such hospitals lacked adequate bed provision to accept such referral load, or such facilities were nonexistent in those centers'. This meant that the management did not achieve the goal of averting maternal deaths irrespective of the center management, be it at the Government rural referral or tertiary care urban hospitals (teaching or nonteaching).

MMR in the present study was 596.29 per 100,000 live births (Fig. 6). The leading causes of maternal deaths remained hypertensive disorders in pregnancy (29.54 %), obstetric hemorrhage (21.56 %), sepsis (15.05 %), medical disorder complicating pregnancy (12.9 %), and severe anemia (11.69 %) (Fig. 4). Significant proportion of mothers died because of medical disorders in pregnancy. It

**Fig. 6** Statewise types of centers

is a heterogeneous condition that needs a physician or an obstetrician specially trained in medical disorders in pregnancy. Till date, it remained an unresolved area as to who should see the woman when a medical disorder complicates pregnancy [7]. Differences, as observed in the pattern of leading causes of maternal deaths in different zones (Fig. 3), invite prioritization of problems to be attended in respect of specific zone and proportionate allocation of funds. Careful analysis was made for the different important causes of maternal deaths according to the five different zones of this vast country and also for the country as a whole. Therefore, good quality data are essential not only to prioritize the causes of death but also to mobilize resources (manpower and money).

Data sources could be different, like vital registration system, house-hold survey, census, and survey for deaths, published work reporting population-based studies (National and Subnational Levels), or from sample registration system (SRS). Discrepancies in maternal mortality data between sources are common. This emphasizes the need for each country to maintain accurate and comprehensive statistics. This issue is being further looked into when MMR is being compared between two countries as in India and Indonesia, in terms of yearly rate of decline in MMR to achieve MDG5 [4, 8].

Our data have got certain advantages. It is based on institutions where underreporting and nonsampling error had largely been avoided. Misclassification of causes of death had been avoided as we had critically analyzed the filled in proforma in terms of all information. Moreover, we have some data from states like Himachal Pradesh and Manipur. Data from these states were so long not available [3], though we failed to collect data from too many states

of the country. In any country having incomplete data of vital registration, there remains a possibility of underestimating the proportion of maternal deaths. There also remains the possibility of misclassification of causes. On the other hand, countries having vital registration data, include late maternal deaths beyond 42 days. Importantly, MDG5 does not recommend inclusion of late maternal deaths in MMR. However, maternal deaths are difficult to identify and exclude by the surveyor. Again maternal death survey by census includes deaths due to motor vehicles accidents, burning, drowning, and suicides etc. Such accidental and incidental causes are excluded from MMR. Countries having data from several sources (like India) run the risk of nonsampling error across data sources substantially.

However, our data have certain limitations. It is based on limited institutions selected from limited number of states of this vast country. Data may not be actually representative of either the state or the country. Truth is that, data collection is not an easy job, especially while looking for a quality data, as deaths are occurring at home also. Recording maternal deaths is not straight forward even in countries with advanced statistical system [7]. In many developed countries, estimates are coming up with promising reduction in MMR. Unfortunately, official figures based on death certification alone revealed consistent underreporting (50 % or more) even in several developed countries [9]. Main difficulties faced are underreporting of deaths and misclassification of cause. Unfortunately, no measure is available to reduce maternal mortality or to collect quality data overnight.

Maternal mortality is not an isolated issue in the MDG5 to be improved singularly. All the MDGS (eight) are

interrelated and need attention simultaneously. In India, reduction of maternal deaths (MMR) is expected. MMR is the ultimate reflection of four or more important issues. First, total fertility rate (TFR) in India has dropped from 3.8 in 1990 to 2.6 in 2009. A decline by 1.2 points means that it is down by more than a child. It is another about 10 years to achieve the replacement level of 2.1. MMR and TFR are strongly correlated [6]. Second, income per head has its direct impact on MMR in terms of nutritional status, affordability, and accessibility to quality health care system [10, 11]. Third, improved literacy rate of women is strongly correlated with decline in MMR [6]. Fourth, rise in contraceptive practice is another boon to prevent unplanned pregnancy and deaths from unsafe abortion [12, 13]. Finally, the strategy of NRHM (2005), Government of India, through its Janani Suraksha Yojana (JSY) is a step forward. It encourages rural women for institutional delivery with incentives and care through ASHA (Accredited Social Health Activities) [1]. NRHM encourages skilled birth attendants (SBAs) for partograph labor management and early referral. It empowers SBAs administering MgSO<sub>4</sub> for cases with severe preeclampsia and eclampsia, oxytocics for active management of third stage of labors and obstetric hemorrhage. Targeting interventions toward the most vulnerable groups (rural population) mean governmental genuine accountability to improve the nation's health.

It is important to mention that through MDG5 declaration, maternal mortality has featured so prominently worldwide. Government of India over the years is on the right track to reach the goal. It is evident that progress needs to be accelerated to achieve the targets. For this reason, it is equally essential to stress on continued collection of reliable data and regular clinical audit.

## Conclusion

The results of the present study revealed the area of discrepancy in data, and that the comparison of MMR should not be restricted to data published only by national offices responsible for death statistics of any country. We strongly believe that discrepancy in maternal mortality and morbidity data prevails not only in the developing country but also in the developed ones. This retrospective study has provided a strong background for a prospective study for evaluation of exact MMR. The national goal of averting maternal deaths with correct intervention strategies must prioritize the important causes according to the zones of this vast subcontinent for appropriate resource allocation. Above all, it is essential that we develop a “no blame” culture while doing the confidential review of maternal deaths.

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## Appendix: The Principal Coordinators

Name, Institute, and State of the Study are as follows: 1. Dr. RL Singh, RIMS, Imphal, Manipur; 2. Dr. S Swarupa Rani, Tanjavur MCH, Tamilnadu; 3. Dr. Hiralal Konar, NRSMCH, Calcutta, WB; 4. Dr. Laxmi Maru, MYHMGM Medical College, Indore, MP; 5. Dr. S Mahendale, Bharatiya Vidyapeeth, Medical College Hospital, Pune, Maharashtra; 6. Dr. Lavanya Rai, Kasturba MCH, Manipal, Karnataka; 7. Dr. Ojaswini Patel, VSS Medical Collage, Burla, Orissa; 8. Dr. PB Sahay, RIMS, Ranchi, Chhattisgarh; 9. Dr. Lakhbir Dhaliwal, PGI, Chandigarh, Chandigarh; 10. Dr. Shilpa Thaker, PDU Medical College & HJ Doshi Hospital, Rajkot, Gujrat; 11. Dr. PC Kalika, Guahati MCH, Assam; 12. Dr. Sabita Mahandale, GMC, Nanded, Maharashtra; 13. Dr. Sheela Sharma, Patna, PMCH, Bihar; 14. Dr. MK Mapa, Diamond Harbour Sub Division Hospital (FRU), South 24 PGN, WB; 15. Dr. PW Sambrey, BJ Medical College, Pune, Maharashtra; 16. Dr. Jaba Das, Malda District Hospital, Malda, WB; 17. Dr. Vibha Verma, Srikrishna Medical College & Hospital, Muzaffarpur, Bihar; 18. Dr. Gita Guin, NSCB Medical College, Jabalpur, MP; 19. Dr. Damayanti Sharma, Pt. BD Sharmal, PGIMS, Rohtak; 20. Dr. Pranay Phukan, Assam Medical College & Hospital, Dibrugarh, Assam; 21. Dr. Kanan Yelikar, Govt. Medical College & Hospital, Aurangabad, Maharashtra; 22. Dr. Indrani Ganguly, Sir Gangaram Hospital, New Delhi; 23. Dr. Atul Munshi, VS General Hospital, Ahmedabad, Gujrat; 24. Dr. Sheela Mane, Bowring & Lady Curzon Hospital, Bangalore; 25. Dr. Sheela Mane, Vanivilas Hospital, Karnataka; 26. Dr. Sheela Mane, Bhagavan Mahaveer Jain Hospital, Karnataka; 27. Dr. Sheela Mane, KG General Hospital, Karnataka; 28. Dr. Manjari Matah, Banaras Hindu University, Sir Sundarlal Hospital & IMS, Varanasi, Uttar Pradesh; 29. Dr. Jyoti Bindal, GR Medical College & KR Hospital, Gwalior, MP; 30. Dr. Bandana Das, Silchar Medical College & Hospital, Assam; 31. Dr. P. Kokal, JN Medical College & DMINS Hospital, Swangi (Meghe), Maharashtra; 32. Dr. Kumud B. Gupta; Indra Gandhi Medical College & Kamla Nehru Hospital, Shimla, Himachal Pradesh; 33. Dr. Madhu Nagpal, Amritsar Govt. Medical College, Punjab; 34. Dr. Anju Huri, Govt. Medical College, Chandigarh; 35. Dr. Harsha, VMNC & Safdarjung Hospital, New Delhi; 36.

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