

# Intrapartum monitoring using partograph at secondary level public health facilities—A cross-sectional study in Odisha, India

Subrata Kumar Palo<sup>1</sup>, Kripalini Patel<sup>1</sup>, Shalini Singh<sup>2</sup>,  
Subhadra Priyadarshini<sup>1</sup>, Sanghamitra Pati<sup>1</sup>

<sup>1</sup>ICMR-Regional Medical Research Center, Bhubaneswar, Odisha, <sup>2</sup>ICMR-NICPR, New Delhi, India

## ABSTRACT

**Context:** Partograph is a simple, effective and low-cost intrapartum monitoring tool that helps in early identification of complications if any and helps in prompt intervention to save the life of the mother and the newborn. There is limited study about its usage and challenges in plotting from India particularly Odisha. **Aim:** To determine the usage of partograph and explore the issues/challenges in its plotting at various levels of health facilities **Settings and Design:** A cross-sectional study was carried out from April to June 2018 in ten different public health facilities from two tribal districts of Odisha, India. **Materials and Methods:** Quantitative information from 1552 mothers using pre-tested epi-info questionnaire tool and qualitative information through 22 in-depth interviews among health care providers. **Statistical Analysis Used:** Quantitative data using Ms Excel 10 and IBM SPSS ver. 22 and qualitative data using the inductive content analysis method. **Results:** Partograph plotting was found in 48.7% (adherence) while its completeness was only 1.03%. Partograph plotting was significantly better at CHCs compared to DHH and SDH ( $P = 0.000$ ). No significant association of partograph adherence was observed with the birth outcome, complications, referral status and type of delivery. Though majority health care providers knew the importance of the partograph, hardly they use it. The main reasons were increased workload, shortage of staff, cases arriving at a later stage and lack of monitoring from a higher level. **Conclusions:** On job training on partograph, regular monitoring and strict policy will improve the adherence and completeness in partograph plotting.

**Keywords:** India, intrapartum, maternal complications, monitoring, Odisha, partograph

## Introduction

A clear divergence in relation to reproductive and maternal health indicators continue to be reflected between developed and developing countries.<sup>[1]</sup> World Health Organization (WHO), in 2015 estimated a total of 303,000 maternal deaths globally, yielding a maternal mortality ratio (MMR) of 216 per 100,000 live births of which about 99% is contributed from the developing countries.<sup>[2]</sup> Reduction in maternal and child mortality has been

a priority of Governments across the globe and was targeted under Millennium Development Goals and remained as an unfinished agenda in most of the developing countries especially Goals 4 and 5.<sup>[3]</sup>

As per sample registration system report 2016, MMR of India remains at 167 per lakh live births against the target to bring it down to 70 per lakh live births by 2030 as per sustainable development goal.<sup>[4]</sup> The situation is even worse in Odisha, India, having MMR of 180 per lakh live births.<sup>[5]</sup> Odisha is one of the eastern states of India with about 4.2 crores of population and 83.3% of which residing in rural areas (census 2011).<sup>[6]</sup>

**Address for correspondence:** Dr. Subrata Kumar Palo,  
ICMR-Regional Medical Research Center, Nalco Square,  
Bhubaneswar, Odisha - 751 023, India.  
E-mail: drpalsubrat@gmail.com

**Received:** 18-06-2018 **Revised:** 19-06-2019 **Accepted:** 12-07-2019

### Access this article online

#### Quick Response Code:



**Website:**  
www.jfmpc.com

**DOI:**  
10.4103/jfmpc.jfmpc\_472\_19

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** reprints@medknow.com

**How to cite this article:** Palo SK, Patel K, Singh S, Priyadarshini S, Pati S. Intrapartum monitoring using partograph at secondary level public health facilities—A cross-sectional study in Odisha, India. J Family Med Prim Care 2019;8:2685-90.

The majority of maternal deaths happen because of complications during the intrapartum period and postpartum period.<sup>[7]</sup> Regular monitoring during intrapartum period helps in early detection and prompt management of any complications, thereby improves the delivery outcome.<sup>[8]</sup> Partograph (graphical recording of progress of labor) is a simple, effective, and low-cost monitoring tool to record the intrapartum events. If used appropriately and timely, it helps the health care providers to early identify any complications, such as fetal distress,<sup>[9]</sup> obstructed labor,<sup>[10,11]</sup> and maternal problems.<sup>[12]</sup> Thus, this low-cost tool assists the service providers as an “early warning system” for “improved decision making” in labor management.<sup>[13,14]</sup> WHO promoted partograph as the “gold standard” method and mandated for its plotting in every delivery to monitor the labor progress in the developing countries including India.<sup>[12]</sup>

A study from Uttar Pradesh, India, had identified lack of quality monitoring for progress of labor.<sup>[15]</sup> There is a dearth of information about the usage and issues/challenges of partograph plotting in India, particularly in Odisha. This study highlights the current status and challenges toward partograph plotting in public health facilities and intends to be the torch bearer in guiding the primary care physicians for improving intrapartum monitoring to save the life of mother and fetus.

## Materials and Method

### Study design

A cross-sectional, facility-based study was carried out from April 2018 to June 2018 in two randomly selected districts (Kandhamal and Kalahandi) of Odisha, India. Both the districts are covered with hilly terrains and forest landscapes having about 40%–50% population as aborigines<sup>[16]</sup> and having comparable sociodemographic profile.<sup>[17]</sup>

### Study facilities

From each district, five health facilities [one district hospital (DHH), one subdivisional hospital (SDH), and three community health centers (CHCs)] were selected. CHCs with the highest delivery load in the district were purposively selected.

### Data collection

Adopting a mixed method approach, both quantitative and qualitative data were collected. Quantitative data of 1552 mothers were collected using a tablet-based pretested Epi-info questionnaire tool. For qualitative data, in-depth interviews (IDIs) were carried out using a field-tested semistructured questionnaire guide in local vernacular language (Odia). The interview process was flexible giving the participants freedom to participate and discuss the topics.

### Study participants

IDIs were carried out among the healthcare providers of the study facilities, who conduct delivery [health worker females (HWFs), staff nurses (SNs), and doctors]. A total of

22 IDIs were done (till information saturation and repetitions obtained) among 4 doctors, 8 HWFs and 10 SNs.

### Data analysis

Quantitative data were entered, cleaned, and validated using MS Excel 2010 ver. and analyzed using IBM SPSS ver. 22. The categorical variables were summarized by proportion and the continuous variables were summarized by the mean and standard deviation. Partograph usage was determined by assessing its adherence and completeness and was calculated using the formula given ahead.

*Adherence:* No. of labor cases with partograph plotting/total no. of deliveries × 100

*Completeness:* No. of labor cases with completely filled-in partograph/total no. of deliveries × 100.

All the IDIs were audio recorded, transcribed in verbatim, and translated into English. The data were analyzed using inductive content analysis method as categories and themes to explore participant’s perceptions about the importance of partograph, its benefits, actual practice, and the issues and challenges in plotting.

### Ethical consideration

The study was approved by the Institutional Ethics Committee at ICMR-RMRC Bhubaneswar and the State Research and Ethics Committee, Government of Odisha. Approval was also obtained from the Chief District Medical Officers (CDMOs) of both the districts and informed consent was obtained from each study participant prior to their participation.

## Result

### Findings from quantitative data

Among 1552 mothers studied, 921 (59.3%) and 631 (40.7%) were from Kalahandi and Kandhamal, respectively, and 868 (55.9%), 271 (17.5%), and 413 (26.6%) had undergone delivery at DHH, SDH, and CHC level health facilities, respectively. The mean age of mothers was 26.7 (±10.6) years and on an average, each mother had 1.2 (±1.0) numbers of children. While 590 (38%) were primigravida, 479 (30.9%), 241 (15.5%), and 242 (15.6%) were G<sub>2</sub>, G<sub>3</sub>, and G<sub>4</sub> or more, respectively.

Out of 1552 deliveries, 1376 (88.7%) were normal vaginal deliveries, 151 (9.7%) were C-Sections, and 25 (1.6%) were assisted. A total of 1289 (83%) mothers had visited the facilities directly, whereas 263 (16.9%) were referred from lower health facilities.

Partograph plotting was found in 756 (48.7%) deliveries (adherence) while in only 16 (1.03%) deliveries plotting was complete (completeness). Out of total 1561 babies delivered, 1543 were singletons and 18 were twin babies, whereas 1524 were live births and 37 were stillbirths with a stillbirth rate of 23.7 per

thousand births. The district- and facility-wise status of delivery and its related outcomes is detailed in Table 1.

Association of various factors with partograph adherence was determined as significant by considering  $P < 0.05$ . Significant association of partograph adherence was observed with the type of health facilities ( $P = 0.000$ ). No association of adherence was observed with birth asphyxia, birth outcome, complications, mother referred-in or referred-out, and type of delivery. Detailed association of partograph adherence is depicted in Table 2.

The plotting of seven important parameters were analyzed individually and given in Figure 1. The maternal pulse rate was found to be plotted in maximum (14.3%) cases and maternal temperature the least (7.2%). Cervical dilatation plotting in only 9.2% cases reflects the knowledge inadequacy among providers.

A total of 133 (8.6%) mothers were detected with some complications or problems and none was found to have multiple complications. Among cases having complications, majority (24.8%) had premature rupture of membrane (PROM) followed by 22.6% with anemia. Detailed status of complications is presented in Figure 2.

### Findings from qualitative data

The study participants had an average 7.6 years (range 3–16 years) of experience in conducting deliveries. The results are presented under four major themes: 1) perception toward partograph plotting, 2) monitoring and supervision to ensure plotting, 3) issues and challenges with respect to adherence and completeness, and 4) suggestions for improvement.

## Theme 1: Perception toward partograph plotting

### Category A: Benefits of partograph

The majority of the participants emphasized the importance of the partograph. Few participants added the usefulness of partograph for better decision making during labor.

*“Yes, plotting of partograph is very important because any complication related to mother or child can be known early and lives can be saved. We can prevent stillbirth also if we do partograph” (Staff Nurse).*

*“Partograph usually helps us to know the treatment process to be given to the mother.”*

Participants mentioned that early identification of complication, such as prolonged labor, obstructed labor, and fetal distress, and

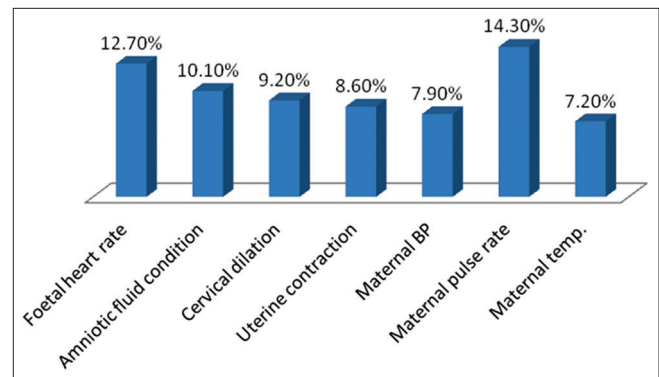


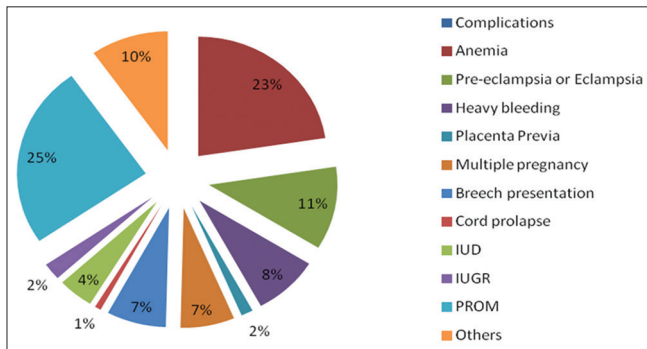
Figure 1: Parameter-wise plotting of partograph

Table 1: District- and facility-wise comparison of different variables

| Variables                                      | Kalahandi    |              |              |                | Kandhamal    |              |              |                | Grand total<br>n (%) |
|--|--------------|--------------|--------------|----------------|--------------|--------------|--------------|----------------|----------------------|
|  | DHH<br>n (%) | SDH<br>n (%) | CHC<br>n (%) | Total<br>n (%) | DHH<br>n (%) | SDH<br>n (%) | CHC<br>n (%) | Total<br>n (%) |                      |
| Number of deliveries                           | 492          | 205          | 224          | 921            | 376          | 66           | 189          | 631            | 1552                 |
| Type of delivery                               |              |              |              |                |              |              |              |                |                      |
| Number of NVD                                  | 415 (84.3)   | 201 (98)     | 213 (95.1)   | 829 (90.)      | 340 (90.4)   | 61 (92.4)    | 165 (87.3)   | 566 (89.7)     | 1395 (89.9)          |
| Number of CSs                                  | 77 (15.7)    | 4 (1.9)      | 11 (4.9)     | 92 (10)        | 32 (8.5)     | 5 (7.6)      | 22 (11.6)    | 59 (9.3)       | 151 (9.7)            |
| Number of assisted deliveries                  | 0            | 0            | 0            | 0              | 4 (1.1)      | 0            | 2 (1.1)      | 6 (0.9)        | 6 (0.4)              |
| Referral status of cases                       |              |              |              |                |              |              |              |                |                      |
| Number of cases referred in                    | 68 (13.8)    | 15 (7.3)     | 15 (6.7)     | 98 (10.6)      | 122 (32.4)   | 9 (13.6)     | 34 (18.0)    | 165 (26.1)     | 263 (16.9)           |
| Total no. of cases referred to higher facility | 0            | 0            | 2 (0.9)      | 2 (0.2)        | 15 (4.0)     | 3 (4.5)      | 7 (3.7)      | 25 (4.0)       | 27 (1.7)             |
| Delivery outcomes                              |              |              |              |                |              |              |              |                |                      |
| Number of live births                          | 486 (98.8)   | 203 (99)     | 220 (98.2)   | 909 (98.7)     | 360 (95.4)   | 63 (95.4)    | 183 (96.8)   | 606 (96)       | 1515 (97.6)          |
| Number of still births                         | 6 (1.2)      | 2 (1)        | 4 (1.8)      | 12 (1.3)       | 16 (4.2)     | 3 (4.5)      | 6 (3.2)      | 25 (4)         | 37 (2.4)             |
| Still birth rate (per thousand births)         | 12.1         | 9.7          | 17.8         | 13             | 42.3         | 44.8         | 31.4         | 39.3           | 23.7                 |
| Complications identified                       |              |              |              |                |              |              |              |                |                      |
| Number of cases identified with complications  | 45 (9.1)     | 8 (3.9)      | 11 (4.9)     | 64 (6.9)       | 46 (12.2)    | 2 (3.0)      | 21 (11.1)    | 69 (10.9)      | 133 (8.6)            |
| Number of maternal deaths                      | 0            | 0            | 0            | 0              | 0            | 0            | 0            | 0              | 0                    |
| Total no. of birth asphyxia cases              | 18 (3.6)     | 6 (2.9)      | 10 (4.4)     | 34 (3.6)       | 10 (2.6)     | 6 (9)        | 4 (2.1)      | 20 (3.1)       | 54 (3.4)             |
| Blue discoloration of baby                     | 37 (7.5)     | 17 (8.2)     | 22 (9.8)     | 76 (8.2)       | 5 (1.3)      | 1 (1.5)      | 9 (4.7)      | 15 (2.3)       | 91 (5.8)             |
| Usage of partograph                            |              |              |              |                |              |              |              |                |                      |
| Adherence to partograph (%)                    | 253 (51.4)   | 1 (0.5)      | 201 (89.7)   | 455 (49.4)     | 203 (54.0)   | 3 (4.5)      | 95 (50.3)    | 301 (47.7)     | 756 (48.7)           |
| Completeness of partograph (%)                 | 3 (0.6)      | 1 (0.5)      | 1 (0.4)      | 5 (0.5)        | 4 (1.1)      | 3 (4.5)      | 4 (2.1)      | 11 (1.7)       | 16 (1.0)             |

**Table 2: Association of various factors with adherence to partograph plotting**

| Variable name    | Category    | Adherence |        | Chi-square | P     |
|------------------|-------------|-----------|--------|------------|-------|
|                  |             | Yes (n)   | No (n) |            |       |
| Facility type    | DHH         | 456       | 412    | 333.24     | 0.000 |
|                  | SDH         | 5         | 266    |            |       |
|                  | CHC         | 296       | 117    |            |       |
| Birth asphyxia   | Yes         | 22        | 32     | 1.423      | 0.268 |
|                  | No          | 734       | 764    |            |       |
| Birth outcome    | Live Birth  | 738       | 777    | 0.101      | 0.751 |
|                  | Still Birth | 19        | 18     |            |       |
| Complications    | Yes         | 55        | 78     | 3.208      | 0.073 |
|                  | No          | 702       | 717    |            |       |
| Mother ref out   | Yes         | 13        | 14     | 0.004      | 0.948 |
|                  | No          | 744       | 781    |            |       |
| Mother ref in    | Yes         | 126       | 137    | 0.082      | 0.775 |
|                  | No          | 630       | 659    |            |       |
| Type of delivery | NVD         | 681       | 714    | 0.582      | 0.747 |
|                  | CS          | 73        | 78     |            |       |
|                  | Assisted    | 2         | 4      |            |       |
| District         | Kalahandi   | 456       | 465    | 0.491      | 0.484 |
|                  | Kandhamal   | 301       | 330    |            |       |



**Figure 2: Different complications identified**

decision making could be done using partograph to save the life of new-born and mother.

*“We can identify the complication by observing the graph and by doing so, we can take the decision about the procedure to be followed during labor” (Staff nurse).*

*“Partograph helps us to know the complication so that we are prepared to provide care to mother as per the situation or complication” (Doctor).*

**Category B: Training on Partograph**

All most all the participants emphasized that training along with the regular practice of partograph plotting are critical to sustaining it.

*“Proper training is needed for partograph plotting because SBA training has not been given to all staff in our labor room. Some freshers have joined newly and they don’t know to plot partograph. Otherwise, those who know how to plot, do the partograph plotting” (O and G specialist).*

*“Training is important for plotting partograph because we have to remember symbols as well. Each and every staff, especially those who newly join the labor room or not trained need proper training by the government, so that everyone can do partograph plotting” (staff nurse).*

**Theme 2: Monitoring and supervision to ensure plotting**

Many participants informed that there is no system in place to monitor the labor room or partograph plotting. However, a few participants from DHH Kalahandi told that their CDMO often monitors the partograph plotting. Lack of proper monitoring and mentoring support to the health care providers were noticed as one of the reasons for partograph nonadherence.

*“Whenever any officer comes to see our documentation and ask for partograph, we show them whatever we have” (Staff nurse).*

**Theme 3: Issues and challenges with respect to adherence and completeness**

**Category A: Practice on partograph plotting**

A few participants told that they want to do the partograph plotting and many times they initiate this, but could not complete due to other work or patient emergency. It was understood that the plotting of partograph depends on the competency, interest, and attitude of the staff as the important determining factors.

**Category B: Issues and challenges in partograph plotting**

Different reasons were cited by the participants for nonadherence to plotting or incomplete plotting. The major reasons they explained were shortage of health staff, work overload, skill inadequacies, and mothers coming to the hospital at a later stage of labor.

*“If a mother comes in the first stage, we are able to plot the partograph after monitoring the mother, but if she comes late, due to a shortage of staff we can’t do the partograph plotting as we have to attend other cases too.” (Staff Nurse).*

*“The delivery load has increased now, so the maximum time we leave half-filled partograph due to these overall problems.” (Staff Nurse).*

*“As partograph includes graphs, symbols we have to regularly practice of filling-up the partograph.” (Health worker female).*

**Theme 4: Suggestions for improvement**

Some participants suggested strengthening the monitoring and mentoring support including some institutional policy (making monitoring routine and regular) to improve its adherence and completeness.

*“Due to a heavy workload we ignore to do partograph but if someone visits regularly to see it, then everyone shall be bound to plot partograph” (Staff Nurse).*

*“if someone will supervise or monitor then we have to do the partograph plotting properly, in spite of the workload”(Staff Nurse).*



## Discussion

To our knowledge, this is the first ever study assessing the adherence and completeness in partograph usage at different levels of peripheral public health facilities. An adherence of 48.7% to partograph plotting shows the existing gap in intrapartum monitoring. A study from Madhya Pradesh, India, on JSY scheme had shown that only in 6% of the cases, partographs were done.<sup>[18]</sup> However, an interventional project study in Bangladesh had found initiation of partograph in 98% of the cases<sup>[11]</sup> and another study from Ethiopia had found some form of partograph filling in 69.9% cases,<sup>[19]</sup> much higher than what we observed. Among total deliveries, completeness in partograph plotting was in 1% and among the total partograph adhered cases, it was 2.1%. A study from Uganda had found that among all the partograph plotted cases, completeness of plotting to be 2.3% in the busy facilities,<sup>[20]</sup> similar to our finding.

This study found that fetal heart rate, cervical dilatation, and maternal pulse rate were recorded in 12.6%, 9.2%, and 14.3%, respectively. This showed that in at least 5.1% cases, the partographs were wrongly plotted without plotting the cervical dilatation, implying knowledge inadequacies. As per the guideline, the partograph plotting should start from recording the cervical dilatation, when the cervix is at least 4 cm dilated.<sup>[21]</sup> The Uganda study had shown in about 61%, the specific parameters for fetal monitoring, maternal monitoring, and labor progress were incomplete.<sup>[20]</sup> An overall stillbirth rate of 23.7 per thousand births was observed, which is quite high compared to a study in India that found the overall stillbirth rate to be 10.<sup>[22]</sup> Such a high rate of stillbirth can be attributed to a lack of intrapartum monitoring. Studies had recommended for perinatal audit systems to improve the quality of care that prevents stillbirths.<sup>[23-25]</sup>

A significant association of partograph adherence was observed with the type of health facility visited, which was better in CHCs compared to SDH and DHH. The reason could be a low delivery load at CHCs compared to SDH and DHH. No significant association of adherence with other variables like birth asphyxia, birth outcome, complications, referral out of cases, and type of delivery could be observed. The reason could be because of low adherence and low completeness in partograph plotting. Based on this finding, the role of partograph plotting for early identification of complication and decision making for case management cannot be denied.

The major complications identified in this study include PROM, anemia, pre-eclampsia or eclampsia, and heavy bleeding. Many studies have found these factors to attribute for maternal deaths.<sup>[26,27]</sup>

Qualitative data showed that shortage of health staff, inadequate knowledge and skill, increased workload, lack of monitoring, and personality problems as the critical factors for low labor room documentation including partograph plotting. A study from Cameroon had found that less or no knowledge on partograph as

a factor preventing its routine use.<sup>[28]</sup> Wakgari *et al.* in their study from Ethiopia had suggested for giving due attention to health care providers through monitoring and supportive supervision for better partograph plotting.<sup>[29,30]</sup> According to a systematic review findings, the barriers like professional skills and practice, clinical leadership, and quality assurance need to be addressed for the provision of better obstetric care.<sup>[31]</sup> A study from India had also suggested training the health staff to maximize partograph utilization,<sup>[32]</sup> whereas findings from a systematic review on maternal health inequities from India has suggested for a positive accountability to address the gaps in monitoring.<sup>[33]</sup>

## Limitation of the study

Our study was limited to peripheral public health facilities from the high priority districts of Odisha. Its generalization in other places needs to be done carefully. It does not include the findings from private facilities.

## Conclusion

Lack of interest to plot the partograph, nonavailability of partograph record, shortage of healthcare providers, inadequate training, increased workload, and lack of monitoring were identified as the important factors for poor adherence and incomplete partograph plotting. This study suggests the urgent need for on-the-job training on partograph plotting, regular monitoring, and supportive supervision including policy level decisions for improving adherence and completeness to partograph plotting for improving the maternal and perinatal health outcomes.

## Acknowledgements

The authors would like to thank all the authorities and the health care providers who participated in our study and provided valuable information.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## References

1. Graham W, Woodd S, Byass P, Filippi V, Gon G, Virgo S, *et al.* Diversity and divergence: The dynamic burden of poor maternal health. *Lancet* 2016;388:2164-75.
2. You D, Hug L, Ejdemyr S, Idele P, Hogan D, Mathers C, *et al.* Global, regional, and national levels and trends in under-5 mortality between 1990 and 2015, with scenario-based projections to 2030: A systematic analysis by the UN Inter-agency group for child mortality estimation. *Lancet Lond Engl* 2015;386:2275-86.
3. Chatterjee A, Paily VP. Achieving millennium development goals 4 and 5 in India. *BJOG Int J Obstet Gynaecol* 2011;118(Suppl 2):47-59.

4. Maternal Health Task Force. The Sustainable Development Goals and Maternal Mortality [Internet]. The Role of the MHTF. Available from: <https://www.mhtf.org/topics/the-sustainable-development-goals-and-maternal-mortality/>. [Last accessed on 2019 Apr 28].
5. Special Bulletin on Maternal Mortality In India 2014-16 [Internet]. Sample Registration System Office of Registrar General, India; 2018. Available from: [http://www.censusindia.gov.in/vital\\_statistics/SRS\\_Bulletins/MMR%20Bulletin-2014-16.pdf](http://www.censusindia.gov.in/vital_statistics/SRS_Bulletins/MMR%20Bulletin-2014-16.pdf). [Last accessed on 2019 Jun 05].
6. Census India 2011. Executive Summary [Internet]. Census India; Available from: [http://www.censusindia.gov.in/2011census/PCA/PCA\\_Highlights/pca\\_highlights\\_file/Odisha/Executive\\_Summary.pdf](http://www.censusindia.gov.in/2011census/PCA/PCA_Highlights/pca_highlights_file/Odisha/Executive_Summary.pdf). [Last accessed on 2019 Jun 05].
7. Merdad L, Ali MM. Timing of maternal death: Levels, trends, and ecological correlates using sibling data from 34 sub-Saharan African countries. *PLoS One* 2018;13:e0189416.
8. Das MK, Arora NK, Dalpath S, Kumar S, Qazi SA, Bahl R. Improving quality of care for perinatal and newborn care at district and subdistrict hospitals in Haryana, India: Implementation research protocol. *J Adv Nurs* 2018;74:2904-11.
9. Zelell DA, Tegegne TK. Level of partograph utilization and its associated factors among obstetric caregivers at public health facilities in East Gojam Zone, Northwest Ethiopia. *PLoS One* 2018;13:e0200479.
10. Rani J, Sharma D, Sehgal A. Role of partogram in high risk pregnancies: An experience at a tertiary centre. *Arch Gynecol Obstet* 2015;291:73-8.
11. Hailu T, Nigus K, Gidey G, Hailu B, Moges Y. Assessment of partograph utilization and associated factors among obstetric care givers at public health institutions in central zone, Tigray, Ethiopia. *BMC Res Notes* [Internet] 2018;11. Available from: <https://bmcresnotes.biomedcentral.com/articles/10.1186/s13104-018-3814-7>. [Last cited on 2019 Jul 23].
12. Khan ANS, Billah SM, Mannan I, Mannan II, Begum T, Khan MA, *et al.* A cross-sectional study of partograph utilization as a decision making tool for referral of abnormal labour in primary health care facilities of Bangladesh. *PLoS One* 2018;13:e0203617.
13. Bhutta ZA. The million death study in India: Can it help in monitoring the millennium development goals? *PLoS Med* 2006;3:e103.
14. Neilson JP, Lavender T, Quenby S, Wray S. Obstructed labour. *Br Med Bull* 2003;67:191-204.
15. Saxena M, Srivastava A, Dwivedi P, Bhattacharyya S. Is quality of care during childbirth consistent from admission to discharge? A qualitative study of delivery care in Uttar Pradesh, India. *PLoS One* 2018;13:e0204607.
16. Mallik BK, Panda T, Padhy RN. Ethnoveterinary practices of aborigine tribes in Odisha, India. *Asian Pac J Trop Biomed* 2012;2:S1520-5.
17. Prusty RK, Gouda J, Pradhan MR. Inequality in the utilization of maternal healthcare services in Odisha, India. *Int J Popul Res* 2015;2015:1-10.
18. Chaturvedi S, Upadhyay S, De Costa A, Raven J. Implementation of the partograph in India's JSY cash transfer programme for facility births: A mixed methods study in Madhya Pradesh province. *BMJ Open* 2015;5:e006211.
19. Markos D, Bogale D. Documentation status of the modified World Health Organization partograph in public health institutions of Bale zone, Ethiopia. *Reprod Health* 2015;12:81.
20. Mukisa J, Grant I, Magala J, Ssemata AS, Lumala PZ, Byamugisha J. Level of Partograph completion and healthcare workers' perspectives on its use in Mulago National Referral and teaching hospital, Kampala, Uganda. *BMC Health Serv Res* 2019;19:107.
21. Yisma E, Dessalegn B, Astatkie A, Fesseha N. Completion of the modified World Health Organization (WHO) partograph during labour in public health institutions of Addis Ababa, Ethiopia. *Reprod Health* 2013;10:23.
22. Altijani N, Carson C, Choudhury SS, Rani A, Sarma UC, Knight M, *et al.* Stillbirth among women in nine states in India: Rate and risk factors in study of 886,505 women from the annual health survey. *BMJ Open* 2018;8:e022583.
23. Tamburlini G, Yadgarova K, Kamilov A, Bacci A; Maternal and Neonatal Care Quality Improvement Working Group. Improving the quality of maternal and neonatal care: The role of standard based participatory assessments. *PLoS One* 2013;8:e78282.
24. Bhutta ZA, Darmstadt GL, Haws RA, Yakoob M, Lawn JE. Delivering interventions to reduce the global burden of stillbirths: Improving service supply and community demand. *BMC Pregnancy Childbirth* 2009;9(Suppl 1):S7.
25. Singh S, Kashyap JA, Chandhiok N, Kumar V, Singh V, Goel R, *et al.* Labour and delivery monitoring patterns in facility births across five districts of India: A cross-sectional observational study. *Indian J Med Res* 2018;148:309-16.
26. Prakash A, Swain S, Seth A. Maternal mortality in India: Current status and strategies for reduction. *Indian Pediatr* 1991;28:1395-400.
27. Say L, Chou D, Gemmill A, Tunçalp Ö, Moller AB, Daniels J, *et al.* Global causes of maternal death: A WHO systematic analysis. *Lancet Glob Health* 2014;2:e323-33.
28. Sama CB, Takah NF, Danwe VK, Melo UF, Dingana TN, Angwafo FF. Knowledge and utilization of the partograph: A cross-sectional survey among obstetric care providers in urban referral public health institutions in northwest and southwest Cameroon. *PLoS One* 2017;12:e0172860.
29. Waggari N, Tessema GA, Amano A. Knowledge of partograph and its associated factors among obstetric care providers in North Shoa Zone, Central Ethiopia: A cross sectional study. *BMC Res Notes* 2015;8:407.
30. Waggari N, Amano A, Berta M, Tessema GA. Partograph utilization and associated factors among obstetric care providers in North Shoa Zone, Central Ethiopia: A cross sectional study. *Afr Health Sci* 2015;15:552-9.
31. Ollerhead E, Osrin D. Barriers to and incentives for achieving partograph use in obstetric practice in low- and middle-income countries: A systematic review. *BMC Pregnancy Childbirth* 2014;14:281.
32. Dalal AR, Purandare AC. The partograph in childbirth: An absolute essentiality or a mere exercise? *J Obstet Gynaecol India* 2018;68:3-14.
33. Hamal M, Dieleman M, De Brouwere V, de Cock Buning T. How do accountability problems lead to maternal health inequities? A review of qualitative literature from Indian public sector. *Public Health Rev* [Internet] 2018;39. Available from: <https://publichealthreviews.biomedcentral.com/articles/10.1186/s40985-018-0081-z>. [Last cited on 2019 Jun 21].