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# Impact of Performance-Based Financing (PBF) Program on Utilization and Completeness of Partographs in Jimma

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***Abstract***

*One of the most important quality thematic areas incentivized in PBF is maternity services which among other aspects include the use and completion of partographs when monitoring women in labor. Use f partographs during labor is a key intervention but it is not widely used due to various factors. Thus, the PBF program in Jimma sought to strengthen its use and completion since Q4 2019. A quasi-experimental design was used to review 7,260 mothers' records from 2018, 2019 and 2021 from both Buno-Bedele (control) and Jimma (intervention) zones. Impact of the PBF program on partograph utilization and completeness was estimated using difference-in-differences (DiD) models in STATA 15. In 2019, partograph utilization was estimated to be 29.2% (CI: 26.6% - 31.8%) in Jimma and 23.5% (CI: 21.1% - 25.9%) in Buno-Bedele. In 2021, utilization increased to 87.2% (CI: 85.3% - 89.2%) in Jimma and 41.4% (CI: 38.7% - 44.2%) in Buno-Bedele. Out of the labor cases monitored with partographs, the completeness was 60.2% (CI: 58.1% - 62.4%) in Jimma and 51.6% (CI: 49.5% - 53.6%) in Buno-Bedele in 2019. In 2021, the completeness increased to 83.2% (CI: 82.3% - 84.2%) in Jimma and but remained the same in Buno-Bedele, 51.3% (CI: 49.7% - 52.8%). PBF accelerated the rate of improvement for both utilization (DiD: 30.8%, p-value < 0.001) and completion (DiD: 24.9%, p-value < 0.001) of partographs. Incentivizing facilities to improve quality of care coupled with coaching and mentorship of health workers is effective in improving quality of service for pregnant women in labor and delivery.*

***Keywords:*** *Labor and delivery, Maternity, Partographs, Performance based financing, Pregnancy.*

## Introduction

Globally, in 2017, 295 000 maternal deaths occurred due to complications during pregnancy or childbirth [1]. Of these deaths, 196 000 (66%) were specifically in Sub-Saharan Africa [1]. The life-time risk of a woman dying from preventable or treatable complications of pregnancy and childbirth in Sub-Saharan Africa is higher compared to developed countries [2, 3] s. According to the 2015 Ethiopia Demographic and Health Survey, maternal mortality ratio was 353 per 100,000 live births in Ethiopia [4-6]. In year 2019, maternal mortality ratio was 412 deaths per 100,000 live births in Ethiopia [7] with the major causes of maternal mortality related to poor labor and delivery care [7-9]. Most of the maternal deaths and complications in Ethiopia are attributed to obstructed and prolonged labor [7-9]. These can be prevented by using the partograph which is cost-effective and affordable health intervention [10-13].

While using a partograph during labor is a key proven intervention in the reduction of maternal labor complications and mortality, it is not widely used in Ethiopia due to various reasons [10-13]. Accordingly, the utilization of partographs is poor in Ethiopia [14]. It is either inconsistent or used incorrectly across different

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settings regardless of WHO recommendations and well-known added value. For example, in Bangladesh the utilization rate of partographs was very high at 98 % of women in labor [15]. However, in Africa the rate of partograph utilization was less than 50 % [16-18]. According to a study conducted in Ethiopia in 2013 by Abebe, majority (99%) of the participants knew about the partographs however, only 21.8% of them indicated utilization of the partograph can reduce maternal and newborn mortality [19].

According to different studies done in Ethiopia the magnitude of the utilization of partograph have a wide variation from region to region and across zones of the same region [20-29]. Studies conducted in the eastern and central zone of Tigray regional state reported the highest level of utilization from around 70 to 83 % [21, 23]. However, in contrast a study in the West Shoa zone of Oromia regional state reported the lowest utilization of partograph which was 31 % [20]. The magnitude of utilization of partograph in others region such as East Gojam Amhara Region, was 53 %, in SNNPRE Hadiya zone 54 %, and Wolayita Zone 71 % [4, 26, 27]. For the studies conducted in Addis Ababa, 57% to 69 % of obstetric caregivers utilized partograph routinely [22, 28]. The largest difference in the utilization of partograph is seen in different zones of Oromia region ranging from 31, to 71 % [20]. There are no similar studies which have been conducted specifically in Jimma zone. Thus, the PBF program in Jimma sought to strengthen the use and completion of partographs through coaching and mentoring of health workers by PBF auditors and Woreda Health experts since Q4 2019.

One of the most important quality thematic areas incentivized in PBF is maternity services which among other aspects include the use and completion of partographs when monitoring women in labor. A partograph is a simple printed graphical paper tool on which labour, maternal and foetal observations are documented [9, 23, 24, 30]. The main use of the partograph is to provide a summarised overview progress of labour to the clinicians that alerted of any deviations of maternal and foetal well-being and labour progress [31, 32]. Friedman's concept was developed into a paper tool for monitoring labour progress by adding action and alert lines on the graph in 1972 [31]. The partograph was revised by WHO to ensure that it monitors more comprehensively progress of labour and equally important the condition of the woman and the foetus during labour [33]. It consists of four main sections namely the maternal information, the foetal conditions record, the labour progress record, and the maternal conditions record [23, 24, 34]. The foetal condition section tracks foetal heart rate, amniotic liquor, and moulding of the foetal skull [4, 23, 30]. The labour progress section tracks cervical dilatation and descent of the foetus' head over time, comparing it to a pre-printed "alert" and "action" lines [4, 23, 30]. The maternal conditions record often captures contractions, blood pressure, pulse, urine output, temperature, and drugs administered including drugs to help the uterus contract [9, 14, 24, 31, 34, 35]. These parameters should be monitored frequently and plotted on a printed paper partograph [31, 34]. This monitoring data plotted on a partograph allow the clinicians to identify any possible early deviations and make timely decisions regarding to appropriate intervention or referral [31, 35]. Early detection of prolonged or obstructed labor greatly contributes to the prevention of complications such as postpartum hemorrhages, ruptured uterus, puerperal sepsis, and obstetric fistula [31, 35]. Use of partographs is the best intervention in managing women in labour and reducing complications and mortality during labor and delivery [10-13]. Various studies confirm that partographs is one of the best tools available [10-13]. It is the best proven simple instrument to help a clinician detect timely whether labour is progressing normally or not and to warn if there are signs of foetal distress

or if the mother's vital signs deviate from the normal range [35]. Partographs are referred to as an "early warning system" that helps in early decisions on transfer, intervention decisions in hospitals [29]. It also causes an impact on bettering the quality of intrapartum care, maternal health, and birth outcomes [36-38]. Partograph utilization refers to plotting or recording all the details and parameters on the partograph correctly and interpreting to make appropriate decisions and intervene where necessary [20]. The use of the partographs in monitoring women in labour reduced the incidence of prolonged labour from 6.4% to 3.4%, the proportion of labour requiring augmentation from 9.9% to 8.3%, and intrapartum stillbirth rate from 0.5% to 0.3% [35]. In a study conducted in Jimma University specialized hospital, the incidence of obstructed labour was 12.2% of which about 45.1% developed uterine rupture and 39.3% had sepsis with other complications [39] and these complications were preventable if partographs were used correctly [40]. Health workers do not always use the partograph due to various reasons like lack of human resources, time of admission, knowledge and training, attitude, Sex, low competence, lack of on-going facilitative supervision, acceptability of the tool and lack of functioning referral mechanisms [9, 30, 41, 42]. These challenges coupled with lack of institutionalized policy to utilize partograph usually hinder the effective use of the partograph [9, 30, 41, 42]. This study did not assess the factors associated with partograph use and completion by health care workers. Furthermore, while data on mothers' demographics and summary of birth were collected, the study was not designed to measure the association between birth outcome and use of partograph during labor and delivery with high statistical power.

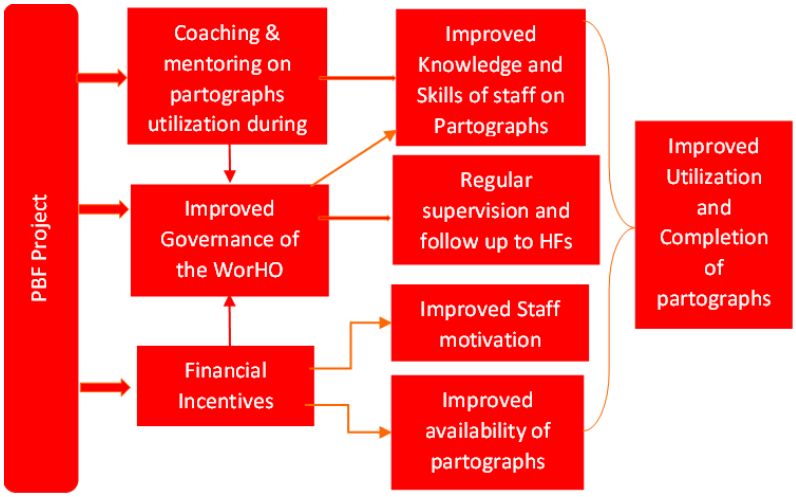


**Figure 1.** Conceptual Framework of how PBF has Impacted the Utilization and Completeness of Partographs

PBF is a complex and multifaceted approach which incentivises health facilities based on predefined performance and that acknowledges the systemic nature of health systems [43]. PBF interventions are generally part of a broader health system reform that includes autonomy, supervision, monitoring, and community oversight or engagement in facility management [44, 45]. Some authors assert that health workers respond to financial incentives by becoming more motivated to deliver better care, for example, through better adherence to clinical guidelines (including use of partographs) and by adopting strategies to achieve better quality [46-48]. PBF improves quality of care [49-58]. PBF also strengthens the regulatory function and improves supervision aspect [59].

The aim of the study was to determine the impact of PBF program on utilization and completeness of partograph in Jimma and Buno

Bedelle zone. The following were the study objectives.

1. Determine the proportion of institutional deliveries with a partograph documented during labour and delivery among PBF and non-PBF facilities.
2. Among institutional deliveries with a partograph documented, determine the completeness of partographs among PBF and non-PBF facilities.

Assessing utilization and completeness of partograph by the health workers has a critical value to inform the design of appropriate intervention strategies to improve provide quality maternity care. Understanding the utilization and completeness levels is important as basis for further research on associated factors. Therefore, the purpose of this study was to determine the impact of PBF program on utilization and completeness of partograph in Jimma and Buno-Bedelle zones, Oromia Regional State Ethiopia.

## Methods

The study was conducted in health facilities of both Jimma and Buno-Bedelle zones from December 13, 2021, to May 13, 2022. Jimma zone was the intervention site while Buno-Bedelle zone was the control site. Since the launching of the PBF program in Jimma Zone in October 2019 (phase 1), it has been implemented in 13 Woredas. From January 2021 (phase 2), the program was scaled up to the remaining 8 woredas of the zone, involving a total of 7 DH (District Hospitals), and 121 HCs (Health Centers), with estimated 3.7 million inhabitants. However, this study only assessed the impact of PBF on partograph use and completion in health facilities in phase 1.

Our study relied on a quasi-experimental design with an independent control (Buno-Bedelle zone). Health facilities in the intervention sites were exposed to PBF intervention while the control health facilities did not have the intervention. Health facilities in the intervention sites were receiving regular performance-based subsidies coupled with rigorous regular mentoring and coaching by PBF verification teams and supervisors from worada and zonal health office on proper partograph utilization. The control health facilities were not exposed to these activities. The data collection was retrospective review of 7,260 delivering mothers' records from Q3 2018, Q3 2019 and Q3 2021 from both Buno-Bedele (control) and Jimma (intervention) zones.

We estimated the difference-in-differences (DiD) to assess the impact of PBF on partograph use and partograph completion. Data from Q3 2018 and Q3 2019 were used to test the assumption of parallel trends which is critical in difference-in-differences (DiD) estimation when assessing program impact. Difference-in-differences estimators were calculated using the alternative assumptions (60). The application of alternative assumptions in STATA allow for the test of parallel trends and produce DiD estimates for both the case when parallel trends exists and when they do not exist (60). All data analysis was conducted in STATA 15.

## Results

**Table 1.** Delivering Mothers' Demographic Characteristics

| Indicator | Period | Jimma | Buno-Bedele |
|---|---|---|---|
| Age | 2018 | 24.8 (10.2) | 24.4 (11.5) |
| | 2019 | 25.1 (7.7) | 24.4 (9.3) |
| | 2021 | 25.3 (6.5) | 24.0 (9.7) |
| Parity | 2018 | 2.1 (1.7) | 1.7 (1.3) |
| | 2019 | 2.2 (1.9) | 1.7 (1.5) |

| | | | |
|---|---|---|---|
| | 2021 | 2.3 (1.9) | 1.6 (1.4) |
| Gravida | 2018 | 3.1 (2.1) | 2.7 (1.7) |
| | 2019 | 3.3 (2.2) | 2.8 (1.9) |
| | 2021 | 3.4 (2.1) | 2.7 (1.9) |
| History of Complications | 2018 | 738 (1.1%) | 533 (0.6%) |
| | 2019 | 1,021 (6.6%) | 578 (4.5%) |
| | 2021 | 1,130 (6.6%) | 709 (2.5%) |
| Tested for Syphilis | 2018 | 1,193 (10.5%) | 1,226 (10.1%) |
| | 2019 | 1,195 (17.7%) | 1,234 (21.4%) |
| | 2021 | 1,176 (61.6%) | 1,224 (31.0%) |

The average age of delivering mothers was 24.7 years (SD = 5.1) with Jimma having a higher average age of 25.1 (95% CI: 24.8 – 25.4) compared to Buno-Bedele with an average age of 24.3 (95% CI: 23.9 – 24.6). Consequently, the averages of both parity and gravida in Jimma of 2.2 (95% CI: 2.1 – 2.3) and 3.3 (95% CI: 3.2 – 3.4) respectively were higher than in Buno-Bedele with averages of 1.7 (95% CI: 1.6 – 1.7) and 2.7 (95% CI: 2.7 – 2.8) for parity and gravida respectively. This is because age, parity and gravida are collinear. The proportion of women with recorded history of complications, including caesarian sections, was 4.2% (n = 4,709) on average. Jimma had the higher average proportion women with recorded history of any complication of 5.2% (95% CI: 4.4% - 6.0%) compared to Buno-Bedele average of 2.6% (95% CI: 1.8% - 3.3%). Testing for syphilis during pregnancy was low, with an average of 25.2% (n = 7,248). Jimma had a higher average syphilis testing of 29.8% (95% CI: 28.3% - 31.3%) compared to Buno-Bedele with an average of 20.8% (95% CI: 19.5% - 22.2%). Table 1shows a summary of the demographic composition of the mothers' records reviewed by zone and year.

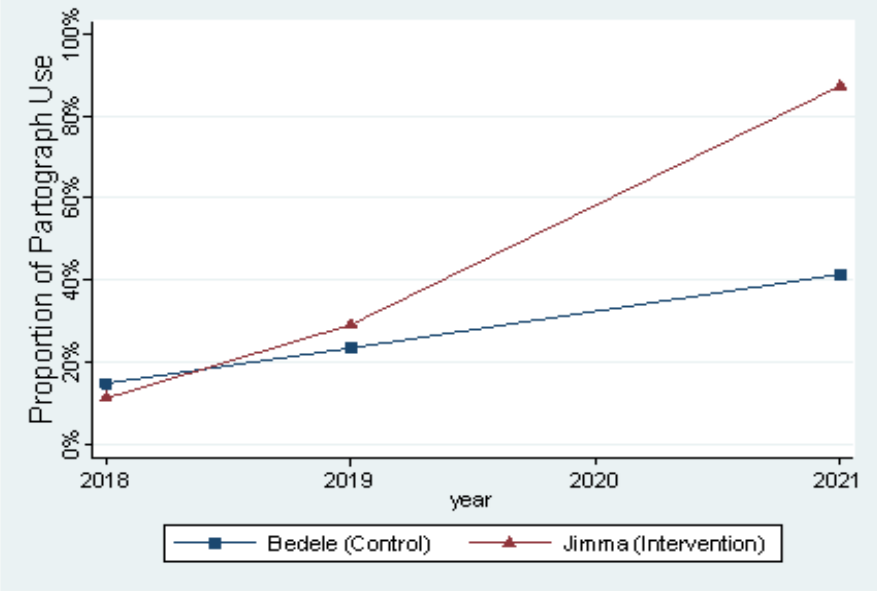


**Figure 2.** Trends in Percentage of Partograph use by Zone

In 2019, the magnitude of partograph utilization was estimated to be 29.2% (95% CI: 26.6% - 31.8%) in Jimma zone and 23.5% (95% CI: 21.1% - 25.9%) in Buno-Bedele. In 2021, utilization increased to 87.2% (95% CI: 85.3% - 89.2%) in Jimma zone and 41.4% (95% CI: 38.7% - 44.2%) in Buno-Bedele. The trends in partograph utilization between Jimma

and Buno-Bedele prior to introduction of PBF were not parallel (p-value < 0.001), thus violating the parallel trends assumption in DiD estimation. As such, the impact of PBF was estimated using alternative assumptions which considered non-parallel trends. PBF was found to significantly increase the utilization of partographs (DiD: 30.8%, p-value < 0.001).

Of the mothers whose labor was monitored with partographs, the completeness was 60.2% (CI: 58.1% - 62.4%) in Jimma and 51.6% (CI: 49.5% - 53.6%) in Buno-Bedele at baseline (2019). In 2021, the completeness increased to 83.2% (CI: 82.3% - 84.2%) in Jimma but did not change in Buno-Bedele, 51.3% (CI: 49.7% - 52.8%).

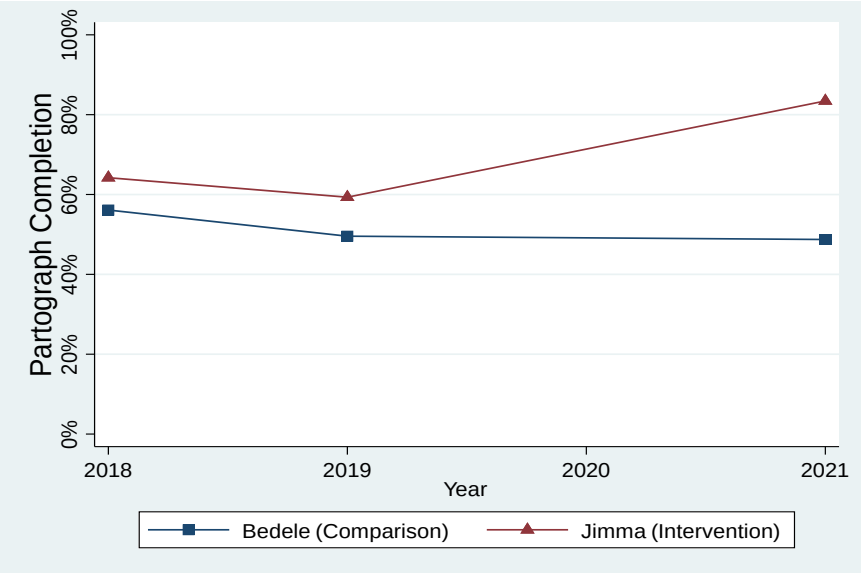


**Figure 3.** Trends in Percentage of Partograph Completion by Zone

Generally, completion of all sections of the partograph in Jimma improved significantly between baseline (2019) and 2021, although the completion of the maternal condition remains lowest (Figure 4). For Buno-Bedele, completion of all sections did not change significantly between baseline and 2021, with foetal condition and maternal condition still lower than 50% (Figure 5).

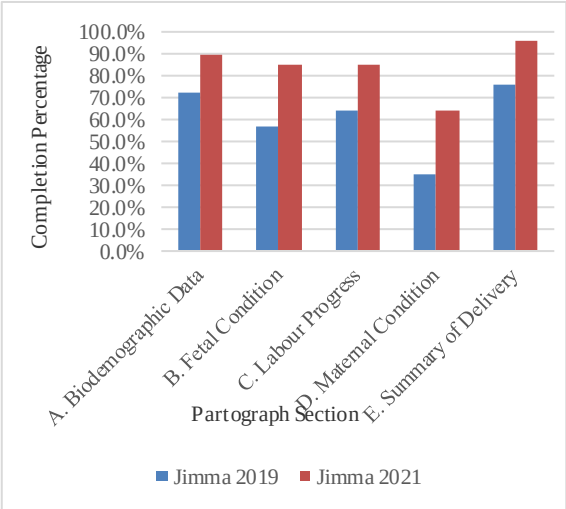


**Figure 4.** Partograph Completion by Section, Jimma Zone, 2019 and 2021

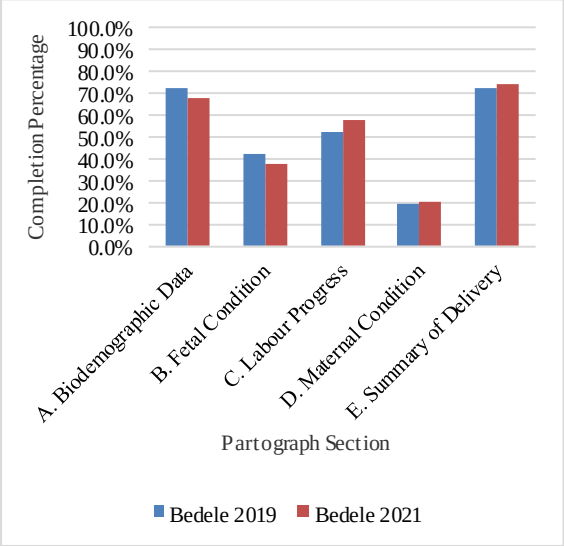


**Figure 5.** Partograph Completion by Section, Buno-Bedele zone, 2019 and 2021

The trends in partograph completion between Jimma and Buno-Bedele (Figure 3) prior to introduction of PBF were parallel (p-value = 0.591). Thus, the impact of PBF on partograph completion was estimated using standard DiD assumptions. PBF was found to significantly increase the completion of partographs (DiD: 24.9%, p-value < 0.001).

**Table 2.** Impact of PBF on Partograph Utilization and Completeness using Difference-in-Differences (DiD)

| | **DiD** | **95% CI** | **p-value** |
|---|---|---|---|
| Partograph Use | 30.8% | 22.6% - 39.0% | <0.001 |
| Partograph completeness | 24.9% | 21.2% - 28.7% | <0.001 |

Note: DiD estimates for partograph use were produced using alternative assumptions

## Discussion

This study revealed that PBF program in Jimma zone has strengthened the utilization and completion of partographs among obstetric care provider found in Jimma zone through coaching and mentorship of health workers by PBF verifiers and Woreda Health experts since Q4 2019. Unlike other studies Our findings for Jimma partograph utilization indicate 87.2% and 41.4% for Buno-Bedele and the difference can be attributed to obstetric care providers who have been incentivized through performance-based financing and given mentorship and coaching in Jimma. According to the systematic review and meta-analysis studies done in Ethiopia the overall pooled prevalence of partograph utilization was low (59.95%) [29]. The differences between these findings might be due to difference in levels of knowledge and attitude of obstetric care providers and adherence in implementation of partograph for all laboring mothers.

In comparison with other studies in Africa, our study findings in Jimma on partograph use prevalence compares with that found in South Africa which was for 79.4%, Ghana 87%, Gambia 78%, and Uganda 69.9% [61-64]. Different reasons may account for these differences for example level of knowledge of obstetric care providers on the use of partographs differ across countries [65; 66]. There are also and different interventions and strategies in enforcing partograph utilization [65; 66]. For example, in Ghana, obstetric care providers received specific training in the use of partograph, while 83.8% trained in South Africa [66; 65]. Our study findings are in-line with a study in Uganda where partograph use was enhanced through training, coaching, and

mentoring [67]. In Burkina Faso, PBF also contributed in better partograph utilization in the intervention sites compared to control sites [68]. Other reason for variation of results could be differences is study designs and years of studies [69].

In 2020 the national estimated prevalence of partograph use among obstetric care providers in Ethiopia was 59.95% (95% CI 46.8–73.09, $I^2$ = 99.4%, $P$ < 0.001) (69). Our study findings are in-line with this national prevalence and with prevalence in different regions [20-29]. In Ethiopia, there is no consistent use of the partograph during labour; Studies done in Asella referral and teaching hospital, Sidama zone, Bale zone, East Gojjam zone, Addis Ababa city administration; showed that 26%, 50.7%, 70.2%, 53.85% and 69% of the participants used partograph to monitor progress of labour respectively [8, 22, 23, 27, 30, 70].

During PBF quality assessments the teams check if partographs are used to monitor every delivery and scores awarded accordingly. For those women who were monitored using partographs, a randomly selected sample of partographs are checked for completeness. All paragraph components are thoroughly checked, and health facilities get scores which translate to monetary incentives only when all the necessary fetal and maternal well-being follow-up sections are filled in properly. During the assessment process the woreda health experts and PBF verifiers provide intensive coaching and mentoring on various sections of the partographs. This explains the significant difference in the utilization and completeness levels between intervention sites where necessary coaching and mentorship on gaps identified on spot is provided and control sites.

Further research in Jimma is needed to understand the factors associated with utilization of partographs. The lack of well-designed and integrated programs, such as mentorship and supportive supervision, could be the cause of this difference [71]. Other factors that may contribute to lower partograph utilization include a lack of expertise, a lack of understanding, insufficient partograph training, and a negative attitude among study participants [71]. Other studies indicate that health workers do not always use the partographs due to various reasons including but not limited to lack of human resources, time of admission, knowledge and training, attitude, sex, low competence, lack of on-going facilitative supervision, acceptability of the tool and lack of functioning referral mechanisms [9, 30, 41, 42]. These challenges are usually the hindrance to the effective use of the partograph and lack of institutionalized policy to utilize partograph [9, 30, 41, 42]. While our study has confirmed improved partograph utilization and completeness with PBF implementation, further studies are needed to understand which specific levers are adjusted by PBF.

## Conclusion

Incentivizing health facilities to improve quality of care coupled with coaching and mentorship of health workers by woreda experts and PBF verifiers is effective in improving quality of service for pregnant women in labor and delivery. This study revealed that the partograph utilization was significantly better in PBF intervention sites as compared to control sites. PBF challenges business as usual approach and encourage compliance to policies and guidelines to improve quality of care. Such compliance has been enforced to rigorous mentorship and coaching of health workers by the woreda experts and PBF verifiers. While utilization and completeness has improved in intervention sites, consistency still need to be emphasized. This study findings on utilization and completeness of partograph by the health workers has a critical value to inform the design of appropriate intervention strategies to improve provide quality maternity care.

## Conflict of Interest

The author has no conflict of interest.


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