

## Factors Associated with partographs Utilization in Jimma and Bedele Zones, Oromia Regional State, Ethiopia

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### Abstract

*Use of partographs during labor is a key intervention but it is not widely used due to various factors. This is one of the quality thematic areas incentivized by PBF. Hence the aim of our study was to determine these factors associated with utilization of partograph in Jimma and Buno-Bedelle zone. Our study adopted a cross-section design with independent control. The data collection was retrospective interview of 239 health workers who conducted deliveries in Q3 2021 (July – September 2021) in health facilities from both Buno-Bedele (control) and Jimma (intervention) zones. Bivariate analysis was performed using chi-squared tests. Multivariate analysis was performed using logistic regression analysis. All data analysis was conducted in STATA 15. The proportion of health workers using partographs was higher in Jimma (86.5%) compared to Bedele (64.4%), with a p-value less than 0.001. The finding of this study indicated that the major reasons for non-use of partographs were little/no knowledge, lack of training and shortage of staff and time consuming. Knowledge of partograph, availability of partograph and training on partograph have a positive impact on use of partographs as shown by the statistically significant adjusted odds ratios (AORs) in Table 4. Midwives were also found to be more likely to use partographs compared to nurses. This study revealed that PBF contributed to availability of partographs, improved knowledge score and training on partograph utilization in Jimma. PBF have also improved the use of partographs for monitoring labour and understanding of action lines in early diagnosis of complications during labour.*

**Keywords:** Factors, Partographs, Performance based financing, Utilization and Completeness.

### Introduction

In 2017, 295 000 maternal deaths occurred globally due to complications occurring during pregnancy or childbirth [1]. 196 000 (66%) deaths were specifically in Sub-Saharan Africa [1]. 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]. 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 and neonatal

mortality was 29 per 1000 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 a partograph which is a proven cost-effective and affordable intervention [10-13].

A partograph is a simple printed graphical paper tool on which labour, maternal and foetal observations are documented [9, 14-16]. The main use of a 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 [17, 18]. Friedman's concept was developed into a paper tool for monitoring labour progress by adding action and alert lines on the graph in 1972 [17].

The partograph was revised by WHO to ensure that it monitors more comprehensively progress of labour and equally importantly the condition of the woman and the foetus during labour [19]. It consists of four (4) main sections namely the maternal information, the foetal conditions record, the labour progress record, and the maternal conditions record [14, 15, 20]. The foetal condition record tracks foetal heart rate, amniotic liquor, and moulding of the foetal skull [4, 14, 16]. The labour progress record tracks cervical dilatation and descent of the foetus' descending part over time, comparing it to a pre-printed 'alert' and 'action' lines [4, 14, 16]. The maternal conditions record captures contractions, blood pressure, pulse, urine output, temperature, and drugs administered including drugs to help the uterus contract [9, 15, 17, 20-22]. These parameters should be monitored frequently by clinicians and plotted on a printed paper partograph [17, 22]. This monitoring data plotted on a partograph allow the clinicians to identify any possible early deviations make timely decisions regarding to appropriate intervention or referral [17, 22]. 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 [17, 22].

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 [22]. Partographs are referred to as an 'early warning system' that helps in early decisions on transfer,

intervention decisions in hospitals [13]. It also causes an impact on bettering the quality of intrapartum care, maternal health, and birth outcomes [23-25]. 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 [26]. In Ethiopia, there is no consistent utilization of the partograph during labour. According to study carried out in Addis Ababa, Ethiopia it was shown that 57.3% of the obstetric care providers at the public health facilities had used the partograph to monitor mothers in labour [27].

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% [22]. 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 [28] and these complications were preventable if partographs were used correctly [29]. 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, 16, 30, 31]. These challenges are usually the hindrance to the effective use of the partograph and lack of institutionalized policy to utilize partograph [9, 6, 30, 31]. 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.

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 [10-13]. Accordingly,

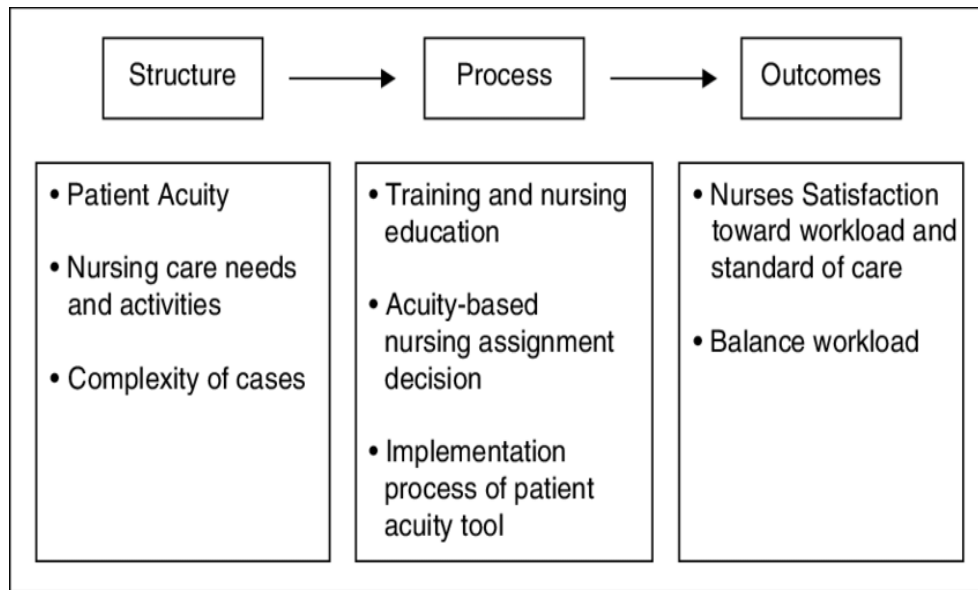
the utilization of partographs is poor in Ethiopia [21]. It is either inconsistent or used incorrectly across different settings regardless of WHO recommendations and well-known added value. For example, in Bangladesh the utilization rate of partographs was very high at 98 % of women in labor [32]. However, in Africa the rate of partograph utilization was less than 50 % [33-35]. 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 [30].

According to different studies done in Ethiopia the magnitude of the utilization of partograph shown to have a wide variation from region to region and across zones of the same region [14, 26, 27, 31, 36-41]. Studies conducted in the eastern and central zone of Tigray regional state reported the highest level of utilization from around 70 to 83 % [14, 36]. However, in contrast a study in the West Shoa zone of Oromia regional state reported the lowest utilization of partograph which was 31 % [26]. 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, 38, 39]. For the studies conducted in Addis Ababa, 57 to 69 % of obstetric caregivers utilized partograph routinely [27, 40]. The largest difference in the utilization of partograph is seen in different zones of Oromia region ranging from 31, to 71 % [26]. There are no similar studies which have been conducted specifically in Jimma zone. Thus, the Performance Based Financing (PBF) program in

Jimma sought to strengthen the use and completion of partographs through coaching and mentoring of health workers by PBF verifiers 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. PBF is a complex and multifaceted approach which incentivises health facilities based on predefined performance and that acknowledges the systemic nature of health systems [42]. PBF interventions are part of a broader health system reform that includes autonomy, supervision, monitoring, and community oversight or engagement in facility management [43; 44]. 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 [45-47]. PBF improves quality of care [48-57]. PBF also strengthens the regulatory function and improves supervision aspect [58].

The framework which guided this study was Donabedian's conceptual model on quality of care which focuses on evaluating a project. This model uses three factors, namely structure, process, and outcomes. According to this model the structure denotes attributes of the setting like training, availability of materials and experience, the process is the actual performance in-service, protocols, mentorship, training, supportive supervision on its use and outcome denotes correct recording, correct decision making and transfer tool [59].



**Figure 1.** Conceptual Framework

Source: Donabedian's Conceptual Model on Quality of Care (1988).

The aim of the study was to determine the factors associated with utilization of partograph in Jimma and Buno-Bedelle zone. Assessing the factors associated with 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. Therefore, the purpose of this study was to determine the factors associated with utilization and completeness of partographs 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 [60]. 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 [60].

Our study relied on a cross-section design with independent control (Buno-Bedelle zone). Health workers in the intervention sites were receiving regular performance-based subsidies coupled with rigorous regular mentoring and coaching by PBF verification teams and supervisors from woreda and zonal health office on proper partograph utilization. The control health facilities were not exposed to these activities. We interviewed 239 health workers who attended deliveries in Q3 2021 (July – September 2021) in health facilities from both Buno-Bedelle (control) and Jimma (intervention) zones. The health workers were only interviewed if they had attended to deliveries in the selected facilities and not elsewhere. This was to ensure that we capture partograph utilization in that facility and not distort the estimates by transfers of health workers.

We estimated partograph utilization rates as self-reported by the health workers and a chi-squared test was performed to evaluate statistical difference between partograph use in Jimma and Bedele. Bivariate analysis was performed using chi-squared tests. Multivariate analysis was performed using logistic regression analysis. All data analysis was conducted in STATA 15.

## Results

Table 1 shows a summary of the socio-demographic characteristics of the interviewed health care workers by zone. The average age of health care workers was 27.3 years, with no differences in the age distribution of respondents between Jimma and Bedele (Table 1). Consequently, the distribution of years of experience is also not significantly different between Jimma and Bedele (Table 1). This is because age and years of experience are

collinearly related. The proportion of female health workers is low (Table 1), with only 36% of respondents being female. Majority of health care workers in Jimma (82.2%) follow the Islam and Orthodox faith while 49.6% of health care workers in Bedele are protestants (Table 1). Marital status composition health care workers are not significantly different between Jimma and Bedele zones (Table 1). In terms of professional qualifications, Jimma has health care workers with higher qualifications than Bedele (Table 1).

**Table 1.** Socio-demographic Characteristics of Health Care Workers

Socio demographic characteristics		Jimma (n = 118)	Bedele (n = 121)	P -value
Age	Age (Mean)	27.1	28.4	0.051
Sex	Female	35.6%	36.4%	0.901
Religion	Orthodox	40.7%	26.4%	< 0.001
	Muslim	41.5%	24.0%	
	Protestant	16.1%	49.6%	
	African Traditional Religion	1.7%	0.0%	
Marital Status	Single	44.1%	39.7%	0.787
	Married	55.1%	59.5%	
	Widowed	0.8%	0.8%	
Professional Qualification	Diploma Nurse	28.8%	46.3%	0.004
	BSc Nurse	20.3%	11.6%	
	Diploma Midwife	16.1%	10.7%	
	BSc Midwife	15.3%	11.6%	
	Public Health (HO)	14.4%	19.8%	
	Medical Doctor/Specialist	5.1%	0.0%	
Experience (Years)	0 – 2	29.7%	19.8%	0.083
	3 – 5	40.7%	41.3%	
	5 – 10	24.6%	25.6%	
	10+	5.1%	13.2%	
Studied Partograph	Yes	87.3%	83.5%	0.404

The proportion of health care workers using partographs was higher in Jimma (86.5%) compared to Bedele (64.4%), with a p-value less than 0.001. The proportion of those reporting routine partograph use is more than double of those reporting using partographs sometimes in Jimma while in Bedele these two proportions are the same (Table 2).

The finding of this study indicated that being female had no significant association on partograph utilization between Jimma and Bedele. On completeness, health care workers were asked which components of a partograph they completed during the most recent delivery that they attended to in Q3 2022.

The completeness of partographs was not significantly different between Jimma and

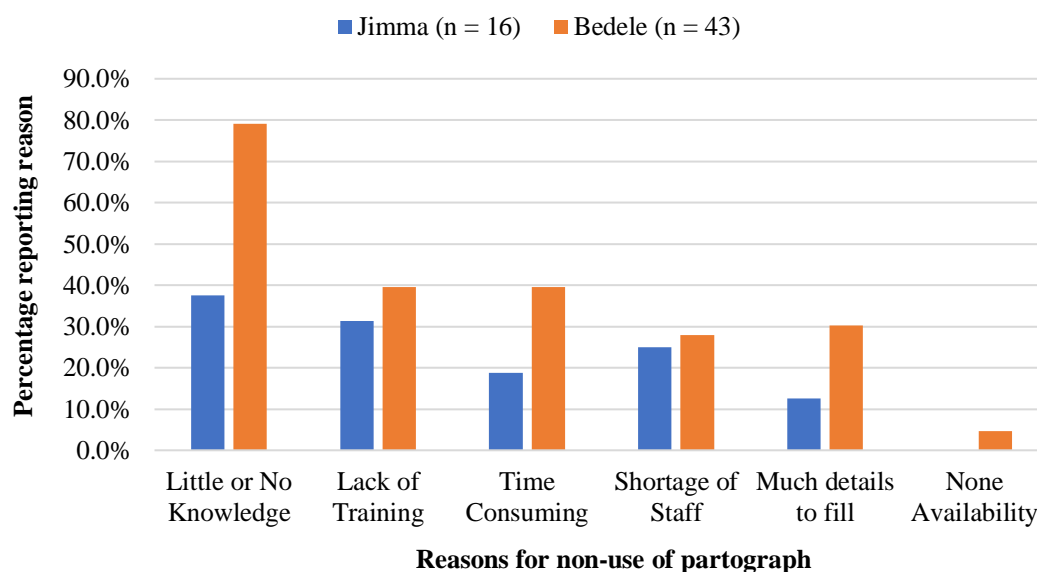
Bedele across all components except plotting of descent and recording of liquor colour (Table 2).

**Table 2.** Partograph Utilisation and Completeness by Health Care Workers

Partograph Utilization Assessment		Jimma	Bedele	P-value
Partograph Use Frequency	Routinely (Always)	118 (61.9%)	121 (32.2%)	< 0.001
	Sometimes	118 (24.6%)	121 (32.2%)	
	No	118 (13.6%)	121 (35.5%)	
Partograph completion by routine/sometimes users	Plot fetal heart rate	102 (92.2%)	78 (93.6%)	0.713
	Plot cervix initial dilation	102 (95.1%)	78 (97.4%)	0.421
	Plot cervical dilation	102 (98.0%)	78 (98.7%)	0.724
	Plot descent	102 (95.1%)	78 (82.1%)	0.005
	Plot uterine contraction	102 (95.1%)	78 (93.6%)	0.662
	Record membrane intact/ruptured	102 (97.1%)	78 (91.0%)	0.080
	Record colour of liquor	102 (93.1%)	78 (80.8%)	0.012
	Monitor maternal B/P	102 (98.0%)	78 (96.2%)	0.446
	Monitor maternal pulse	102 (98.0%)	78 (92.3%)	0.064

Those that reported non-use of partographs were asked to give reasons for not using partographs. The major reasons for non-use of partographs were little/no knowledge, lack of training and shortage of staff in Jimma while in Bedele the major reasons were little/no knowledge, lack of training and time consuming (Figure 1). It can be noted that Bedele reported a significantly higher proportion of health workers

who think that partographs are time consuming and have too many details to fill compared to Jimma (Figure 1). This is evidence that the PBF project, through coaching and mentorship of health workers as well as staff incentives, changed the perception that health workers have towards providing high quality service to their clients.



**Figure 2.** Reasons for Non-use of Partographs by Zone

Health workers were also assessed on their knowledge of the partograph – what it is, its importance and some of its main uses. Generally, the knowledge was high in both the zones, with Jimma having a significantly higher overall score than Bedele (Table 3). While the

definition, importance and line plotting scores were not significantly different between the two zones, knowledge of the functions of the action line, labour monitoring and diagnosis using partograph were statistically different between Jimma and Bedele (Table 3).

**Table 3.** Health Workers Knowledge of Partographs by Zone

Knowledge Scores	Maximum Score	Jimma Mean (SD)	Bedele Mean (SD)	P - value
Definition of Partograph	4	2.69 (0.83)	2.83 (0.98)	0.176
Why is partograph important	5	4.79 (0.87)	4.79 (0.82)	0.872
Normal labour plot interpretation	3	1.25 (0.67)	1.12 (0.87)	0.164
Functions of the action line	3	2.65 (0.73)	2.32 (1.10)	0.026
Labour monitoring	5	3.79 (0.79)	3.31 (1.30)	0.003
Diagnosis using partograph	10	8.92 (1.98)	7.88 (2.96)	0.001
Total Score	30	24.09 (3.53)	22.26 (5.90)	0.033

To determine the most significant factors that affect use of partographs, we fitted a logistic regression model with partograph use as the dependent variable. While most variable had bivariate association with partograph use, our multivariate logistic regression model shows that knowledge of partograph, availability of partograph and training on partograph have a positive impact on use of partographs as shown

by the statistically significant adjusted odds ratios (AORs) in Table 4. Midwives were also found to more likely to use partographs compared to nurses while there is no significant difference in partograph use between public health officers and doctors (Table 4). Exposure to PBF was considered as an independent variable but this was found to be collinearly related to professional qualification.

**Table 4.** Factors Affecting Partograph Use

Explanatory variables	Category	AOR	P-Value	95% Confidence Interval
Partograph Knowledge Score		1.250	0.000	[1.120 - 1.394]
Partograph Availability		9.515	0.002	[2.251 - 40.209]
Partograph Training		5.114	0.040	[1.079 - 24.230]
Professional Qualification	Midwife (Base)	1.000	-	-
	Nurse	0.288	0.041	[0.087 - 0.952]
	Public Health Officer	0.811	0.789	[0.176 - 3.749]
	Medical Doctor/Specialist	0.148	0.074	[0.018 - 1.205]
Cons		0.005	0.001	[0.000 - 0.134]
N		223	-	-
Pseudo R <sup>2</sup>		0.277	-	-

## Discussion

Midwives were also found to be more likely to use partographs compared to nurses while

there is no significant difference in partograph use between public health officers and doctors. This could be partly because midwives are specifically trained to provide midwifery

services, however the system allows other clinicians to also conduct deliveries hence there is need for strengthening BeMNOC services including use of partographs among other clinicians.

A recent study revealed that PBF program in Jimma zone 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 [60]. This study 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 [60]. Our study findings are in-line with these findings as routine use of partographs is confirmed in Jimma (61.9%) compared to Buno-Bedele (32.2%).

The proportion of partograph utilization among Midwife of Jimma zone was 16.1% for diploma and 15.3% for BSc Midwife which were too low comparing to the research conducted in Jigjiga Somalia region which was 66.7% of Midwives were utilizing partograph [60]. But this result is high compared to Bedele zone which were 10.7% and 11.6% for diploma and BSc midwife respectively [60]. The reason for this might be due to rigorous coaching and mentoring by verification officer during verification [60]. The utilization of partograph in a study by Dube 2022, was 18.2% higher than the study conducted in Addis Ababa 5 years ago which was 69% [27]. It can be said that the PBF project have a positive effect on partograph utilization which is evidenced by during the verification of quantity and quality assessment coaching and mentorship was provided intensively for obstetric care giver [60].

According to our findings main reasons which significantly different between intervention and control sites for not using partographs include knowledge of partograph, availability of partograph and training on partograph have a

positive impact on use of partographs. Other non-significant reasons include lack of training, shortage of staff, lot of details to fill in and time consuming. PBF contribute to knowledge through regular coaching, refresher training and mentorship of health workers on partographs. Since PBF quality assessment tools also includes assessing use of partographs, health facilities ensure that they prioritize their availability through making adequate photocopies using their subsidies.

Our study findings are in line with study by Bedada (2020) in West Shoa Zone, Ethiopia where the reasons reported by most of the study participants for not routinely using partograph were partograph chart not available, not trained about partograph, shortage of health care personnel, and the absence of obligation from hospital/health centre policy to perform [26]. The main reasons mentioned by participants who were aware of the partograph, but not using the partograph for monitoring women in labor were workload 61.8% and lack of supervision 53.4% [26].

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 [65, 66]. 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 in study designs and years of studies [13].

In 2020 the national estimated prevalence of partograph use among obstetric care providers in Ethiopia was 59.95% (95% CI 46.8–73.09,  $I^2 = 99.4\%$ ,  $P < 0.001$ ) [13]. Our study findings are in-line with this national prevalence and with prevalence in different regions [14, 26, 27, 31, 36–41]. 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, 14, 16, 27, 39, 69].

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 [60]. 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 [60]. During the assessment process the woreda health experts and PBF verifiers provide intensive coaching and mentoring on various sections of the partographs [60]. This explains the significant difference in the levels of understanding partographs between intervention sites where necessary coaching and mentorship on gaps identified on spot is provided and control sites [60].

According to our findings, the definition, importance, and line plotting scores were not significantly different between the two zones, knowledge of the functions of the action line, labour monitoring and diagnosis using partograph were statistically different between Jimma and Bedele. This shows that PBF challenges health workers in Jimma to apply their knowledge about partographs in labour

monitoring, timely diagnosis of complications by using action line.

The lack of well-designed and integrated programs, such as mentorship and supportive supervision, could be the cause of this difference in knowledge about partographs [70]. Other factors according to other studies 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 [70]. Other studies that indicate health workers do not always use the partographs due to several 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, 16, 30, 31]. These challenges are usually the hindrance to the effective use of the partograph and lack of institutionalized policy to utilize partograph [9, 16, 30, 31]. While our study has confirmed improved partograph utilization with PBF implementation, further studies are needed to understand which specific levers are adjusted by PBF.

## Conclusion

This study revealed that availability, knowledge score and training on partographs are statistically significant factors associated with partograph utilization. The percentage of reporting these factors associated with utilization of partographs were lower in PBF intervention sites as compared to control sites indicating that PBF is contributing to addressing those gaps (little or no knowledge, lack of training, time consuming, much detail to fill, staff shortage, non-availability of partographs). Incentivizing 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. PBF challenges business as usual approach and

encourage compliance to policies and guidelines including partographs to improve quality of care. Such compliance has been enforced to rigorous mentorship and coaching of health workers by the worada experts and PBF verifiers. While availability of partographs has improved in intervention sites, consistency still need to be emphasized. On-job mentorship still needs to continue. While PBF does not directly address shortage of staff, it triggers efficient use of the available staff as they are motivated and more productive. This study findings on factors associated with utilization and completeness of partograph by the health workers has a critical

value to inform the design of appropriate intervention strategies to improve quality maternity care.

## Conflict of Interest

The authors have no conflict of interest.

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