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Assessment of knowledge and utilization of the partograph among health professionals in Amhara region, Ethiopia

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Abstract: Labor and delivery are unpredictable events, which if not monitored properly can result in a disabled or a fatal state. The World Health Organization (WHO) promotes the use of the partograph to monitor and improve the management of labor and to support decision-making regarding interventions. However, little is known about the status of knowledge and utilization of the partograph in Amhara region, Ethiopia. Therefore, this study aimed to assess the level of knowledge of the partograph and its utilization. A facility based cross-sectional study was conducted from September 1 to 30, 2012 among 292 health professionals working in public health institutions of the region, using a structured interviewer administered questionnaires. The collected data were analyzed using SPSS version 16. Binary logistic regression analysis was used to identify factors associated with knowledge of the partograph and obstetric care. Utilization status of the partograph was assessed from 160 purposively selected delivery charts using structured checklists. More than half (53.4%) of the study participants had good knowledge of the partograph. Females were 2 times more likely to have good knowledge of the partograph than males (AOR=2.0, 95% CI= (1.2, 3.6). Similarly, those who had previous obstetric training were 2 time more likely to have good knowledge of the partograph than otherwise (AOR=2.1, 95% CI= (1.3, 3.7). However, participants' level of knowledge of components ofthe partograph was very poor. While only 26.6% of participants were able to mention 50%or more of componentsof the partograph; females, midwives, and those having prior obstetric training were found to have better knowledge of components of the partograph than their counter parts (AOR=3.3, 95% CI (1.9, 5.6), (AOR=4.9, 95% CI (2.4, 9.9)and (AOR=2.0, 95% CI (1.1, 3.6)) respectively. In this study, the level of knowledge of obstetric care was found to be poor. Although it wasrevealed that majority of the participants had favorable attitude towards the use of partograph, only 29% of the paragraph papers reviewed was properly filled to monitor the progress of labor. Despite significant number of study participants reported that the partograph is useful to monitor laborand make timely decision, their level of knowledge of the partograph and its components was generally poor. Presence of prior training, participants' sex and profession were the variables that had influenced the level of knowledge of the partograph and obstetric care. Favorable attitude by itself was inadequate to ensure use of the partograph. Periodic on-job training regarding to obstetric care and on the partograph should be provided to all obstetric care providersparticularly to males and nurses by profession in the region. Regular supportive supervision is also needed to motivate staffs to utilize the partograph and help them become dedicated to record and document their findings.

Keywords: Partograph, Alert Line, Action Line, Obstetric Care

1. Introduction

Globally, there were an estimated number of 287,000 maternal deaths in 2010. This means, every day, approximately 800 women die from preventable causes related to pregnancy and childbirth [1]. About 99% of maternal deaths occur in developing countries, while more than half of these deaths occur in sub-Saharan Africa, most could have been prevented [1]. The rate of maternal mortality in Ethiopia is

one of the highest in the world, 676/100,000 live births [2]. Several interventions have been designed to curb this alarming high rate of maternal mortality rate. Among these interventions, skilled attendance during pregnancy, labor and delivery have been identified as the most important factor in the short term reduction of maternal mortality and morbidity in the country [1]. Following hemorrhage, infection and pre-eclampsia/eclampsia; a significant cause of maternal mortality in our population is prolonged labor [3, 4].

Prolonged labor is a leading cause of death among mothers and newborns in the developing world. If her labor does not progress normally, the woman may experience serious complications such as obstructed labor, dehydration, exhaustion, or rupture of the uterus. Prolonged labor may also contribute to maternal infection or hemorrhage and to neonatal infection [5]. Obstructed labor results from a disproportion between the fetal presentation and the mother's pelvis. The most recent statistics from the World Health Organization (WHO) show that 8% or 42,000 of all maternal deaths are caused by obstructed labor [1].

The provision of quality care during child birth is believed to make a difference between life and death or lifelong maiming for millions of women during child birth [5, 6]. One of the major components of quality care is the presence of skilled attendants at birth. Access to and utilization of skilled care during child birth is, however, extremely limited in many developing African countries particularly in Ethiopia, where the rate of skilled birth attendance is 10 percent [1, 2]. The need to increase women's access to skilled birth attendance is highlighted by the fact that MDG 5 – to improve maternal health by decreasing the maternal mortality ratio by 75% by 2015 – includes as an indicator the proportion of births attended by skilled health personnel.

Skilled management of labor using a partograph, a simple chart for recording information about the progress of labor and the condition of a woman and her baby during labor, is a key to the appropriate prevention and treatment of prolonged labor and its complications [5].

The early detection of abnormal progress of labor by the use of partograph will prevent prolonged labor and its attendant risks of postpartum hemorrhage and sepsis, eliminate obstructed labor, uterine rupture and its squeal; all of which are the major causes of maternal mortality and morbidity in our environment [1, 5, 6].

Following the recommendation of the World Health Organization (WHO), the Maternal and Neonatal Health (MNH) Program promotes the use of the partograph to improve the management of labor and to support decision-making regarding interventions. When used appropriately, the partograph helps providers identify prolonged labor and know when to take appropriate actions [5-7]. Use of the partograph reduced the number of prolonged labors (those longer than 18 hours), the need for augmentation of labor with oxytocin, rates of cesarean section, and the incidence of infection [7, 8].

Competent use of the partograph can save lives by ensuring that labor is closely monitored and that life-threatening complications such as obstructed labor are identified and treated. Competency requires that a provider is capable of attending a normal labor and birth, performing abdominal examinations to determine fetal descent and vaginal examinations to determine cervical dilation, and plotting this information on a graph [9 -11].

However, most parameters on the partograph are not monitored and most health care workers do not document their findings on the partograph after reviewing a woman in labor. Hence the progress of labor may not be closely monitored or labor monitoring may not translate into actions required when need arise [12]. In addition, skilled providers often feel that completing the partograph is an additional time-consuming task, and they do not always understand how it can save women's lives [10, 12]. Without proper training the partograph cannot serve as a tool to guide decision making during labor [13-16].

Moreover, several recent studies in Kenya have reported a significant gap between knowledge and practice. One study from the University of Nairobi showed that while 88.2% of the 1057 evaluated patient records contained a partograph, only 23.8% of the forms had been used correctly [13]. A 1999 study of partograph use in Nigeria found that 94% of doctors thought the partograph was useful, although only 25% used it on a routine basis. In addition, only 35% of participants in this study could correctly explain the purpose of using the partograph [14]. Lack of training and continuing education, exacerbated by limited resources represent serious barriers to effective partograph use [12, 14-17].

A recently published study conducted in Addis Ababa, Ethiopia also revealed similar trends in knowledge and utilization of the partograph. The study indicated that 100% of the participants knew what the partograph is. However, knowledge about the function of both alert line and action line were poor. While only about fifty percent of the participants could correctly explain the function of alert line, considerable number of participants (82.6%) correctly explained about the function of action line. The result of this study has also shown that 96.6% of the participants could mention at least one components of the partograph. While more than half (52.3%) of the participants had fair knowledge, slightly higher than one third (39%) of them had good knowledge about the partograph. Nurses and those who didn't have training on the partograph were less likely to have knowledge about the partograph than their counter parts. Nevertheless, working in public health centers than hospital had shown significant association with good knowledge of the partograph. However; sex and being midwife or public health officer did not show any significant association with the level of knowledge about the partograph [19].

In this study the reported utilization rate of the partograph was relatively good, 57.4%. More participants from health centers than hospitals declared the use of the partograph. Trained participants were less likely to use the partograph than who did not.

Although our study was conducted before the above article [19] was released, we believe this would also provide valuable insights about the status of knowledge about the partograph in the region. In contrast to the above study, the study participants in this study were enrolled from all departments, taking into account that they are always expected to rotate and practice day and night among departments including the delivery unit every 2-3 months as the number of midwives in the region are very scarce. Moreover, we thought the picture may be different since we involve participant working from both urban and large proportion of rural health facilities. Additionally, this study tried to assess variables that were not addressed before.

The fact that the existence of variation between the study area, method of data collection [face to face interview and using observation checklist) and the difference in sample size and study departments would justify the relevance of our study.

Also, in the region little information is available regarding to the level of knowledge and status of utilization of the partograph. It is believed that there are different factors that operate at different level determining the knowledge and utilization of the partograph. This study was conducted with the aim of assessing knowledge and utilization of the partograph and factors related to knowledge of the partograph.

2. Methods and Materials

2.1. Study Design and Duration

A facility based cross-sectional survey was conducted in September 2012 among health professionals working in a randomly selected public health facilities in 3 Zones of Amhara region, Ethiopia.

2.2.Study Area & Setting

The study was conducted in Amhara region located in North West of Ethiopia. It is the second largest region in the country comprising 20% (20.2 million) of the total population. Females constitute 49.8% and 87.4% of the population were living in rural areas. The annual fertility rate and population growth rate of the region were 4.1% and 1.7% respectively [2].

The region is administratively divided in to 10 Zones, & 3 City administrations. The region has 167 Woredas (districts) and 3463 Kebeles[a], of which 3154 were rural Kebeles. With regard to health facility, there were 17 Government hospitals (5 referral, 2 Zonal and 10 district hospitals), 762 Health Centers (primary health care units), & 3200 Health posts[b]. There were also about 10 private hospitals, 49 higher clinics, 194 medium clinics and 734 lower clinics in the region. According to the 2012 Amhara Regional Health Bureau report, the number of health professionals working in public health facilities in the region was 304 medical doctors (general practitioners and specialists), 634 health officers, 4290 nurses, 549 midwives and 6650 health extension workers. Primary health care coverage of the region according to 2012 report is 98.4% [20]. Except the health posts, all other public and private health facilities would provide skilled delivery service. No difference was assumed among the study units (health centers Vs hospitals) with regard to the outcome of our interest.

The source population comprised of all health professionals working in public health institutions of Amhara region. Two zonal and one city administrations were randomly selected for the study (West Gojjam zone, South Gondar zone and Bahir Dar City administration). The study participants were health personnel enrolled from 32 randomly selected (3 hospitals and 29 health centers) facilities in the aforementioned administrations. These included midwives, nurses, doctors and public health officers that consented to participate in the study.

According to the regional health bureau report [20], ten to fifteen health service providers (Midwives, Nurses and Health Officers) were working in the public health centers, of which the midwives account a minimum of one in each health center. Unfortunately, however, only 10% of the health centers in the region satisfied the minimum standard (at least 2 midwives per health center). We therefore, included the aforementioned professionals from all departments in the sampled health centers taking into account that they are always rotate and practice among departments including the delivery unit every 2-3months as the number of midwives in the region is very low. In addition, as they are regularly assigned in night duty, they provide all types of services including delivery care.

Whereas, the number of professionals working in hospitals was 48 on average including medical doctors, from which the midwives account 12%. In hospitals we only involve providersonly from delivery, Antenatal care (ANC), Post Natal Care (PNC), Family Planning (F/P) and Gynecology units as the trend of rotation of providers among departments was not constant.

2.3.Sample size and Sampling Techniques

The required sample size of eligible participants for the study was determined using a single proportion formula $n_0 = (Z^2_{1-\alpha} * P (1-P)/ d^2)$. The following assumptions were taken while calculating the sample size. A 95% probability of obtaining the population proportion of health professionals who had good knowledge of the partograph, that is 32% [16], and a 5% margin of error. The minimum sample size required for the study was estimated to be 334 using the above formula, where n is the sample size, Z is the standard normal score set at 1.96, d is the margin of error to be tolerated and p is the estimate of the proportion of our target population.

Since, the source population was <10,000, we used correction factor to estimate the final sample size required.

Therefore, n= (n/1+ (n/N)) = 334/1+3374/5777= 316, when a non-response rate of 5% was added n= 332.

Participants from each sampled health facility were enrolled to the study after getting their confirmation to work in delivery units either on regular basis, by rotation or at

night duty. Those who never worked in delivery unit were excluded from the study. Based on this notion, eight to twelve (average of 10) participants from each sampled facility satisfy the inclusion criteria and totally enrolled to the study.

[a]The lowest administrative unit where 5000-12000 people dwell.

[b]The lowest level of health facility found at kebele (community) level and is staffed with health extension workers.

2.4. Data Collection Procedures

Data were collected on participants' sex, age, marital status, profession, service year, type of facility, current department and previous obstetric care training.

Structured and pre-tested questionnaire was prepared first in English and then translated into Amharic, the local language.Questions extracted from United States Agency for International Development(USAID) labor monitoring tool & other literatures served to prepare theinstrument [5-10]. The instrument was pretested on 30 health professionals who were working in other public health facilities. Findings from the pretest were used to modify the instrument.

Six BSc. midwives had conducted the face to face interviews and reviewed the delivery charts.

Training was given to the data collectors and field supervisors before the actual data collection regarding the aim of study, the data collection tool and procedures going through the interview question by question. In addition, the training also focused on the art of interviewing and clarifying questions that would unclear to the respondents. They also thoroughly look into and understood the observation checklists before use. Data collectors were peer interviewed. The principal investigators assisted the supervision process.

2.5. Data Processing and Analysis

The collected questionnaires were checked visually for completeness, coded and entered into Epi info version 3.5.1 statistical package. Once the entry was completed the data were exported to SPSS version 16.0 for analysis. Frequency run and double data entry on 10% of the questionnaires was performed to check data entry errors. Binary logistic regressions analysis was done to assess the putative associations of various factors with level of knowledge of the outcome variables and control confounding. P value <0.05 at 95% CI was considered statistically significant. The strength of association of predictor variables with the outcome variables was assessed using odds ratio. Backward stepwise multivariate logistic regression analysis was employed to assess the effects of explanatory variables and to control the effect of confounders. Variables that had a P value of 0.2 in the bivariate analysis were entered into the final model.

The model was tested with goodness of fit test yielding LR (chi square calculated = 76 and P-value = 0.000).

The data was summarized using tables. Composite scales were constructed for knowledge and attitudes variables and used different items for measurement. Knowledge of components of the partograph, knowledge of obstetric care and knowledge of the partograph were assessed using 14, 39 and 26 items respectively. Correct responses were given 1points and 0 point was given for incorrect answers. The final scores were computed to give a composite scale with categories (Mean score or more = Good or otherwise = poor) based on following cut off points "⩾50% = good", and "< 50% "poor").

Knowledge about the function of alert line and action line was scored based on the presence of correct explanation or not. Similarly, correct responses were given "1"point and "0" point was given for incorrect answers. Those who scored "1" were labeled as having good knowledge or poor otherwise.

Attitude of the study participants was measured using five attitude questions. The response of each participant was given. Finally the response was recoded into "1" if the participant has agreed for the question and "0" otherwise. The total score was dichotomized into favorable and unfavorable attitude taking the mean score as a cutoff point (Mean score or more = favorable attitude and less than the mean score unfavorable attitude).

Since all participants declared that they were using the partograph, five recent delivery charts from each facility that gave rise to a total of 160 charts were purposively selected for review. And the data collectors assessed the status of utilization and completeness of the partograph using a structured checklist. The findings of the assessment were analyzed using descriptive statistics. The results were presented in the form of text, tables, and summary statistics.

Ethical clearance was obtained from Institutional Review Board (IRB) of Bahir Dar University College of Medicine and Health Sciences. Permission to conduct the study was also obtained from the Regional Health Bureau, Zonal health Departments and District Health Offices. Permission was also obtained from the sampled health facilities. Informed consent was obtained from each study participant. Each respondent was informed about the purpose of the study that the findings of the study will inform policy makers and other concerned bodies. Any inclusion in the study was after their complete verbal consent. Participants were also informed that all data obtained from them would be kept confidential by using codes instead of any personal identifiers.

3.Result

This study represents participants that were working in a sampled 29 health centers (primary health care units) and 3 public hospitals found in Amhara region. Among a total of 332 participants sampled, 292 of the participants accepted the invitation to participate in the study making a response rate of 88%. Forty five (15.4%) participants were enrolled from hospitals, and 247 (84.6%) participants were enrolled from public health centers.

3.1. Socio-Demographic Characteristics of the Study Participants

As can be noted on table 1 below, the majority 187 (64%) of the participants were females. The mean and standard deviation of the participants' age were 29.2 and ±6.0 years respectively. Regarding to their profession, 187 (64%) were nurses followed by midwives 59 (20.2%). As shown also in table 1, the majority (61.6%) of the participants' age was laying between 20 and 29 years, [Table 1].While the minimum age was 20 years the maximum was 58 years.

Table 1.*Socio-demographic characteristics of study participants, Amhara Region, Ethiopia Sep. 2012.*

Variables	Number	%
Sex		
Male	105	36
Female	187	64
Total	292	100
Age		
20-29	180	61.6
30-39	47	30.5
40+	13	7.9
Total	292	100
Marital Status		
Single*	116	39.7
Married	176	60.3
Total	292	100
Profession		
General practitioner (MD)	6	2.1
Nurse (BSc. + Diploma)	187	64
Midwives (BSc. + Diploma)	59	20.2
Health Officers (HO)	40	13.7
Total	292	100
Currently working in		
Hospital	56	19.2
Health center	236	80.8
Total	292	100

3.2. Participants' Year of Service and History of Obstetric Training in the Health Care Delivery

With regard to participants' service year in the health care delivery, it was found to be ranging between 1 month and 32 years, the majority 239 (81.9%) had served for more than 2 years. Less than half 109 (40.2%) the participants received in-service training on obstetric care (labor, delivery and newborn care). Similarly, nearly one third (30%) of them had received in-service training on the partograph [Table 2].

Table 2.*Service year and training history of study participants, Amhara Region, Ethiopia Sep. 2012(n=292).*

Variables	Number	%
Total year of service		
Less than 2 years	53	18.2
2 to 5 years	117	40.1
More than 5 years	122	41.8
Type of facility currently working in		
Public hospital	56	19.2
Public health center	236	80.8
The department in current working		
Delivery room	46	15.8
ANC or PNC or F/P or Genecology[a]	48	16.4
Others[b]	198	67.8
Ever worked in delivery room		
Yes	271	92.8
No	21	7.2
Ever received training on obstetric Care (n=271)		
Yes	109	40.2
No	162	59.8
Received training on Partograph (n=109)		
Yes	89	81.7
No	20	18.3

3.3. Knowledge of the study participants' on Components of the Partograph

The result revealed that majority (99%) of the participants knew what partograph is. However, only 21.8% (63) of them indicated that utilization of partograph could reduce both maternal and newborn mortality.

With regard to knowledge about components of the partograph, nearly all (99%) participants mentioned at least one component of the partograph andclose to 20% (57) of the participants mentioned 75% or more of components of the partograph. However, only 77 (26.6%) participants had mean score or more on the knowledge questions used to measure knowledge of components of the partograph. Two hundred sixty participants (90%) mentioned at least one values of the partograph; and also they reported that utilization of the partograph would help making timely decision during labor. More participants from hospitals could explain at least fifty percent or more of the importance the partograph than participants enrolled from public health centers [Table 3].

When knowledge about conditions that could be detected/inferred from the partograph was explored, 96.8% of the participants were able to describe at least one abnormal condition. Perhaps, 87.2% (252) of the participants were

able describe at least fifty percent or more of abnormal obstetric conditions that could be detected on the partograph [Table 3].

Table 3. *Participants' level of knowledge of the partograph, Amhara Region, Ethiopia Sep. 2012 (n=289).*

Variables	Number	%
Knowledge of components of the partograph		
Good	77	26.6
Poor	212	73.4
Know about function of Alert line		
Yes	147	50.9
No	142	49.1
Know about function of Action line		
Yes	152	52.6
No	137	47.4
Explain the time when to plot the partograph		
Correct	210	71.9
Incorrect	82	28.1
Explain conditions that could be inferred from the partograph		
Good	252	87.2
Poor	37	12.8
Knowledge of values/importance of the partograph		
Good	64	22.1
Poor	225	77.9
General knowledge of the partograph		
Good	156	53.4
Poor	136	46.6

3.3.1. Factors Associated with Knowledge ofComponents of the Partograph in Bivariate and Multivariate Analysis

On bivariate analysis sex, marital status, profession, current department and prior in-service obstetric training were the variables found to significantly associate with knowledge of components of partograph [Table 4].

Participants' sex, profession and previous in-service obstetric training were the variables that maintained their significant relationship with knowledge of components of partograph in the multivariate analysis. Female were 3 times more likely to have better knowledge on components of partograph than males (AOR=3.3, 95% CI = (1.9, 5.6)). Moreover, midwives than nurses were found to have good knowledge of components of the partograph (AOR=4.9, 95% CI = (2.4, 9.9)). Prior training on obstetric care was associated with participants giving at least half of the correct responses of knowledge of components of partograph (AOR=2.0, 95% CI = (1.1, 3.6)) [Table 4].

Table 4. *Bivariate and Multivariate analysis of factors associated with knowledge of components of the partograph among participants in Amhara region, Ethiopia, September-2012.*

Variables	Knowledge of components of the partograph		Crude Odds ratio (95% CI)	Adjusted Odds ratio (95% CI)	*P* –value adjusted
	Good	Poor			
Sex					
Female	33	151	3.3 (1.9, 5.6)*	2.7 (1.5, 4.7)	0.001
Male	44	61	1	1	
Marital status					
Single	74	42	1	1	0.052
Married	82	94	2.0 (1.2, 3.2)*	1.6 (0.9, 2.8)	

Age in years					
20-29	51	127	1		
30-39	22	66	0.9 (0.4, 1.4)		
>=40	4	19	1.8 (0.1, 1.6)		
Profession					
MD + HO	16	30	2.9 (1.4, 6.1)*	2.0 (0.9, 4.4)	0.000
Midwives	33	26	7.0 (3.1,13.5)*	4.9 (2.4, 9.9)*	
Nurses	28	156	1	1	
Total service year					
1 month to 2 years	21	32	1	1	0.560
2 to 5 years	25	91	0.4 (0.2, 0.8)*	0.7 (0.3, 1.8)	
More than 5 years	31	89	0.5 (0.2, 1.0)	0.9 (0.3, 2.1)	
Department currently working in					
Delivery room	27	19	6.2 (3.1, 12.5)*	2.1 (0.6, 6.5)	0.613
ANC, PNC, F/P and Genecology	14	34	1.8 (0.8, 3.7)	0.8 (0.3, 2.0)	
Others*	36	159	1	1	
Training on obstetric care (n=268)					
Yes	44	65	2.8 (1.6, 4.9)*	2 (1.1, 3.6)*	0.024
No	31	130	1	1	
Training on partograph (n=109)					
Yes	37	52	1.3 (0.4, 3.6)		
No	7	13	1		

*Note: * Statistically significant at P-value <0.05, 95% CI; 1= reference category.*

3.4. Knowledge of Alert and Action lines

As can be noted on table 3 above, about 187 (64%) study participants said that they knew about both alert and action lines. However, only about an average number of participants could correctly explain the function of alert and action lines. While 51% of the participants could correctly explain the function of alert line, a little bit more than half (52%) of the participants could explain the function of action line. Among participants who knew about action and/or alert line, 71.9% of them correctly describe the time when to begin plotting of the graph.

3.4.1. Factors Associated with Correct Explanation of the Function of Alert Line in the Bivariate and Multivariate Analysis

Sex, profession, current department and in-service obstetric care training were variables that had significant association with knowledge of alert line in the bivariate analysis.

While variables such as sex and current department lost their significance in the multivariate analysis; profession and prior training on obstetric care were the variables that maintained their significance in the multivariate analysis. Midwives were more likely to correctly explain the function of alert line than nurses (AOR=2.1, 95% CI = (1.1, 4.2)). Surprisingly, however being health officer or general practitioner that didn't have significant association in the bivariate analysis, became significantly associated with the outcome variable in multivariate analysis (AOR=3.3, 95% CI = (1.5, 6.9)). Similarly, previous training on obstetric training was also significantly associated with knowledge of the function of alert line AOR=2.3, 95% CI = (1.3, 4.1)) [Table 5].

Table 5. *Bivariate and Multivariate analysis of factors associated with knowledge of function of alert line among participants in Amhara region, Ethiopia, September-2012.*

Variables	**Knowledge of function of Alert line**		**Crude Odds ratio (95% CI)**	**Adjusted Odds ratio (95% CI)**	***P* value Adjusted**
	Good	**Poor**			
Sex					
Female	83	101	1.9 (1.2, 3.0)*	1.3 (0.7, 2.2)	0.316
Male	64	41	1	1	

Age in years					
20-29	94	84	1		
30-39	44	44	0.9 (0.5, 1.4)		
>=40	9	14	0.5 (0.2,1.3)		
Marital status					
Single	50	65	1		
Married	86	88	0.7 (0.4, 1.1)		
Profession					
MD + HO	33	13	0.8 (0.3, 1.9)	3.3 (1.5, 6.9)*	
Midwives	40	19	2.6 (1.3, 5.3)*	2.1 (1.1, 4.2)*	0.001
Nurses	74	110	1	1	
Total service year					
Less than 2 years	32	21	1		
2 to 5 years	56	60	0.6 (0.3,1.1)		
More than 5 years	59	61	0.6 (0.3, 1.2)		
Department currently working in					
Delivery room	30	16	2.0 (1.0, 4.0)*	0.9 (0.3, 2.9)	
ANC, PNC, F/P and Genecology	25	23	1.2 (0.6, 2.2)	0.8 (0.3, 1.9)	0.927
Others*	92	103	1	1	
Training on obstetric care					
Yes	73	36	2.5 (1.5, 4.2)*	2.3 (1.3, 4.1)*	0.002
No	71	90	1	1	
Training on partograph (n=109)					
Yes	30	59	0.8 (0.2, 2.4)		
No	14	6	1		

*Note: * Statistically significant at P-value <0.05, 95% CI; 1= reference category.*

3.4.2. Factors Associated with Correct Explanation of the Function of Action Line in the Bivariate and Multivariate Analysis

Sex, profession, and previous training on obstetric care were variables found to be significantly associated with good knowledge of function of action line in the bivariate analysis.

Profession; being health officer or general practitioner ((AOR=2.5, 95% CI = (1.2, 5.3)), and previous training on obstetric care (AOR=2.4, 95% CI = (1.4, 4.2)) were the variables that had maintained their significant association with knowledge of the function of action line after adjustment for possible confounding factors in the multivariate analysis. However, being midwife lost its significance in the multivariate analysis [Table 6].

Table 6. *Bivariate and Multivariate analysis of factors associated with knowledge of function of Action line among study participants in Amhara region, Ethiopia, September-2012.*

Variables	**Knowledge of function of Action line**		**Crude Odds ratio (95% CI)**	**Adjusted Odds ratio (95% CI)**	***P* value Adjusted**
	Good	**Poor**			
Sex					

Female	86	98	1.9 (1.1, 3.1)*	1.4 (0.8 ,2.4)	0.177
Male	66	39	1	1	
Age in years					
20-29	95	83	1		
30-39	46	42	0.9 (0.5, 1.5)		
>=40	11	12	0.8 (0.3, 1.9)		
Marital status					
Single	66	49	1		
Married	86	88	0.7 (0.4, 1.1)		
Profession					
MD + HO	32	14	2.8 (1.4, 5.6)*	2.5 (1.2, 5.3)*	
Midwives	38	21	2.2 (1.2, 4.1)*	1.7 (0.8, 3.3)	0.012
Nurses	82	102	1	1	
Total service year					
1 month to 2 years	31	22			
2 to 5 years	56	60	0.6 (0.3, 1.2)		
More than 5 years	65	55	0.8 (0.4, 1.6)		
Department currently working in					
Delivery room	29	17	1.6 (0.8 ,3.2)		
ANC, PNC, F/P and Genecology	24	24	0.9 (0.5, 1.8)		
Others*	99	96	1		
Training on obstetric care (n=268)					
Yes	74	35	2.4 (1.4, 4.1)*	2.4 (1.4, 4.2)*	0.001
No	74	87	1	1	
Training on partograph (n=109)					
Yes	60	29	0.8 (0.3, 2.5)		
No	14	6	1		

*Note: * Statistically significant at P-value <0.05, 95% CI; 1= reference category.*

3.5. Knowledge of Obstetric Care

As far as knowledge on obstetric care is concerned, several findings can be noted in this study. While the majority (86%) of the participants described at least 2 characteristics of true labor, only 188 (64.4%) participants could describe at least half of the features of normal labor. As can be noted on table 7, only about 46.2% percent of the participants correctly explained the normal values of essential obstetric parameters. Moreover, the majority (73.3%) were not able to know the timing when recording these parameters could be made during the first and second stages of labor. When knowledge about average duration of labor was assessed, only 78 (26.7%) participants could correctly explain about the normal duration of at least two stage of labor. While knowledge about sign of fatal distress was explored, more than half 160 (54.8%) of the participants mentioned at least two sign of fetal distress. Participants overall knowledge of obstetric care was found to be poor, about only one third of the participants had a mean score or more on the knowledge question used to assess knowledge of obstetric care [Table7].

Table 7. *Participants' knowledge obstetric care (labor and delivery) Amhara Region, Ethiopia Sep. 2012 (n=292).*

Variables	**Number**	**%**
Knowledge of features of true labor		

Good	251	86
Poor	41	14
Knowledge of features of normal labor		
Good	188	64.4
Poor	104	35.6
Knowledge about normal values of parameters		
Good	157	53.8
Poor	135	46.2
Knowledge about recording time of obstetric parameters during the first and second stage of labor		
Good	96	32.9
Poor	196	67.1
Knowledge about duration of each stage of labor		
Good	78	26.7
Poor	214	73.3
Describe at two signs of fetal distress		
Yes	160	54.8
No	132	45.2
Overall obstetric knowledge		
Good	101	34.6
Poor	191	65.4

3.5.1. Factors Associated with Knowledge of Obstetric Care in the Bivariate and Multivariate Analysis

Variables such as sex, profession, current department and in-service training had significant association with obstetric knowledge in bivariate analysis.

However, only profession; being midwife and health officer or general practitioner (AOR=2.5, 95% CI = (1.2, 5.2), AOR=3.8, 95% CI= (2.0, 7.5)) and previous training on obstetric care (AOR=2.4, 95% CI = (1.4, 4.2)) were variables that had maintained their statistically significant association with overall knowledge of obstetric care in the multivariate analysis [Table 8].

A close look at the findings on table 9 shows the existence of statically significant association between participants' sex and general knowledge of the partograph. Females were 2 times more likely to have good knowledge of partograph than males (AOR=2.0, 95% CI= (1.2, 3.6). Similarly, those received previous obstetric training were 2 time more likely to have general knowledge of the partograph than otherwise (AOR=2.1, 95% CI= (1.3, 3.7).While being health officer or general practitioner was significantly associated with general of knowledge of partograph (AOR=2.9, 95% CI= (1.3, 6.9), being midwife lost its significance when adjusted in the multivariate analysis (AOR=1.8, 95% CI= (0.9, 3.7). Similarly, marital status, type of facility and current department lost their significance when adjusted to control confounding variables [Table 9].

As can be noted on tables below, presence of in-service training specifically on the partograph did not show any significant association with all of the outcome variables both in the bivariate and multivariate analysis.

Table 8. *Bivariate and Multivariate analysis of factors associated with knowledge of obstetric care among participants in Amhara region, Ethiopia, September-2012.*

Variables	**General Knowledge about Obstetric care**		**Crude Odds ratio (95% CI)**	**Adjusted Odds ratio (95% CI)**	***P* value Adjusted**
	Good	**Poor**			
Sex					

Female	131	56	1.6 (1.0, 2.7)*	1.0 (0.6 ,1.9)	0.814
Male	55	50	1	1	
Age in years					
20-29	119	66	1		
30-39	55	34	0.9 (0.57, 1.6)		
>=40	17	6	0.26 (0.17, 1.9)		
Marital status					
Single	51	65	1	1	0.054
Married	56	120	1.9 (1.2, 3.2)*	0.5 (0.3, 1.0)	
Profession					
MD + HO	24	22	2.7 (1.4, 5.3)*	2.5 (1.2 ,5.2)*	
Midwives	35	24	5.0 (2.7, 9.4)*	3.8 (2.0, 7.5)*	0.009
Nurses	47	140	1	1	
Total service year					
1 month to 2 years	25	28	1		
2 to 5 years	38	79	0.6 (0.3, 1.1)		
More than 5 years	43	79	0.5 (0.3, 1.1)		
Department currently working in					
Delivery room	27	19	3.5 (1.8, 6.9)*	1.1 (0.3, 3.5)	
ANC, PNC, F/P and Genecology	20	28	2.3 (1.2, 4.4)*	1.2 (0.5, 2.8)	0.661
Others*	59	139	1	1	
Training on obstetric care (n=268)					
Yes	57	52	3.0 (1.8, 5.0)*	2.4 (1.4, 4.2)*	0.002
No	45	117	1	1	
Training on partograph (n=109)					
Yes	46	43	1.0 (0.3, 2.6)		
No	11	9	1		

*Note: * Statistically significant at P-value <0.05, 95% CI; 1= reference category.*

Table 9. *Bivariate and Multivariate analysis of factors associated with general knowledge of the Partograph among participants in Amhara region, Ethiopia, September-2012.*

Variables	**Overall Knowledge on the Partograph**		**Crude Odds ratio (95% CI)**	**Adjusted Odds ratio (95% CI)**	***P* value Adjusted**
	Good	**Poor**			
Sex					
Female	83	104	2.8 (1.7, 4.7)*	2.0 (1.2, 3.6)*	0.009
Male	73	32	1	1	
Age in years					
20-29	97	83	1		
30-39	48	41	1.0 (0.6, 1.6)		
>=40	11	12	0.7 (0.3, 1.8)		
Marital status					

Single	74	42	1	1	0.052
Married	82	94	2.0 (1.2 ,3.2)*	1.7 (0.9, 2.8)	
Profession					
MD + HO	34	12	3.7 (1.8, 7.6)*	2.9 (1.3, 6.3)*	
Midwives	41	18	2.9 (1.6, 5.5)*	1.8 (0.9, 3.7)	0.005
Nurses	81	106	1	1	
Total service year					
1 month to 2 years	33	20	1		
2 to 5 years	57	60	0.5 (0.2, 1.1)		
More than 5 years	66	56	0.7 (0.3, 1.3)		
Facility working in					
Hospital	38	18	2.1 (1.1, 3.9)*	1.6 (0.7, 3.6)	0.198
Health centers	118	118	1		
Department currently working in					
Delivery room	34	12	2.9 (1.4, 6.0)*	2.1 (0.6, 6.5)	
ANC, PNC, F/P and Genecology	25	25	1.1 (0.6, 2.1)		0.199
Others*	97	101	1		
Training on obstetric care (n=268)					
Yes	76	33	2.6 (1.5 ,4.3)*	2.1 (1.3, 3.7)*	0.006
No	76	86	1	1	
Training on partograph (n=109)					
Yes	63	26	1.3 (0.4, 3.6)		
No	13	7	1		

*Note: * Statistically significant at P-value <0.05, 95% CI; 1= reference category.*

3.6. Assessment of Participants' Attitude towards the use of Partograph

While 282 (97.6%) participants agreed on the need for all women in labor to be assisted using the partograph, 15.6% (55) of the participants disagree with the notion that all skilled birth attendants must know about the partograph. While their overall attitude was assessed, two hundred thirty four participants (81%) were found to have a favorable attitude towards the utilization of the partograph and believe utilization of the partograph would help making timely decision and facilitate early referral to better health care.

None of the explanatory variables were found to have significant association with attitude of the participants both in bivariate and multivariate analysis.

3.7. The Result of Partograph Utilization

The investigators also tried to assess utilization of the partograph in the sampled health facilities. The result revealed that among the total 160 charts reviewed, 128 (80%) of them were having the partograph paper attached. From which, however, only 58 (45.3%) charts were filled to assess the progress of labor. The remaining partograph papers had never been filled and hence we excluded them from the assessment. Among those filled (58) partograph charts, only seventeen (29.3%) of them were properly filled. Whereas, the majority 41 (70.7%) of them were partially filled.

The observation showed that plotting of fetal heart beat (FHB), initial cervical dilatation, 4 hourly cervical dilatation, descent of the fetus, uterine contraction, nature of the membrane, monitoring of maternal B/P, plotting of the graph across the alert or action line etc. was made for 79.3, 87.9, 60.3, 41.4, 60.3, 63.8, 36.2, and 39.3 percent respectively of the charts reviewed during the study.

Although majority of the components of the partograph were plotted correctly. A significant number of the charts did not contain complete information about important events such as early referral or presence of expedited delivery. That is why some data indicated under not applicable or not recorded sections were not clear [Table 10].

Table 10. *Patterns of plotting of components of the partograph among sampled health facilities, Amhara Ethiopia, 2012 (N=58).*

Components of the partograph plotted	Frequency	Percent
Fetal heart rate plotted correctly		
Yes	46	79.3
No	12	20.7
Cervix initial dilation plotted correctly		
Yes	51	87.9
No	7	12.1
Cervical dilation plotted 4 hourly		
Yes	35	60.3
Partially	6	10.3
No	7	12.1
Not applicable*	10	17.2
Descent plotted correctly		
Yes	24	41.4
Partially	12	20.7
No	22	37.9
Components of the partograph plotted	Frequency	Percent
Uterine contraction plotted correctly		
Yes	35	60.3
Partially	14	24.1
No	9	15.5
Membrane intact or ruptured recorded		
Yes	37	63.8
No	21	36.2
Color of liquor recorded correctly		
Yes	30	51.7
Partially	21	36.2
No	7	12.2
Maternal B/P monitoring at least 4 hourly		
Yes	21	36.2
Partially	22	37.9
No	10	17.2
Not applicable*	5	8.6
Maternal pulse monitored at least every 30 minutes		
Yes	19	32.8
Partially	24	41.4
No	15	25.9
Correctly plotting across alert line		
Yes	17	29.3
No	41	70.7
Correctly plotting across action line		
Yes	12	20.7
No*	46	79.3

*Note: *May be due to either the laboring women had delivered right after admission or referred early to higher setups or the data were not recorded totally.*

As can be noted on table 11, thirty eight charts had the mode of delivery recorded, of which 35 were spontaneous vaginal delivery, 2 assisted vacuum/ forceps delivery and 1cesarean section delivery. Presence of active management of third stage of labor was recorded on 60.3% of the charts. Moreover, the outcomes of the newborns were also indicated in 62.1% of the charts; while 56.9% of them were alive, 5.1% were dead,whereas,the remaining charts did not contain any information about the outcomes of the newborns. Forty (70%) of the newborns were their weight measured. The average weight of the newborns was 2981.25grams and SD of ±401grams. The minimum was 2000 grams and the maximum weight was 4000grams.The majority (95%) had a birth weight of 2500 grams or more [Table 11].

Table 11. *Patterns of recorded post natal characteristics among sampled health facilities, Amhara Ethiopia, 2012 (N=58).*

Components of the outcome of delivery recorded	Frequency	Percent
Mode of delivery		
SVD	35	60.3
Assisted vacuum or forceps delivery	2	3.4
C/S	1	1.7
Note recorded*	20	34.5
Fetal outcome		
Alive	33	56.9
Dead	3	5.2
Not recorded*	22	37.9
Active third stage management done		
Yes	35	60.3
No*	23	39.7
Sex of the newborn in recorded		
Male	16	27.6
Female	24	41.4
Nor recorded*	18	31
Weight of the newborn		
Recorded	40	68.9
Not recorded*	18	31.1

*Note: *May be due to either the laboring women had delivered right after admission or referred early to higher setups or the data were not recorded totally.*

4.Discussion

This study attempted to assess the level of several outcome variables with regard to the partograph and obstetric care in the region. In this study, we tried to find out the level of knowledge of the participants about components the partograph, functions of both alert and action lines, knowledge of obstetric care and their comprehensive knowledge of the partograph. Participants' attitude towards the importance of partograph and utilization status of the partograph was also assessed.

Although the majority of the participants knew what partograph is and believe utilization of partograph would reduce maternal and newborn death, their knowledge about components of the partograph was poor. As shown above, only about one fourth (26.6%) of the participants had a mean score or more on the knowledge questions used to assess knowledge of components of the partograph. This finding is not in agreement with the study done in Addis Ababa, Ethiopia [19] in which nearly forty percent of the participants had good knowledge of it. This discrepancy may be due the fact that our study participants were enrolled also from rural health centers and all functional departments that might have low training opportunity or supportive supervision.

The result revealed existence of significant association between sex and level of knowledge of components of the partograph. The odds of having good knowledge about components of the partograph were higher among females than males. This observation could be explained by the fact that for one thing, female are closer to obstetric information as they have a tendency to become midwives than males and perhaps may be because of the number of female participants was higher in this study. This finding is consistent with a previous study done in India [21]. As males are equally assigned to delivery units, this finding may be used as an evidence to focus on male care providers while planning for in-service training. However, the result is not in agreement with others studies [19, 22] in which sex has shown no difference with knowledge of components of the partograph.

Our study also showed the existence of significant association between profession and knowledge of components of the partograph. Midwives were more likely to have good knowledge of components of the partograph than nurses, health officers or general practitioners. The fact that for one thing, midwives might be frequently assigned in delivery unit and even use the partograph daily; secondly, they might have also better chance of getting in-service obstetric training and thirdly, as obstetric care is their major subject in the pre-service education, they might have better understanding than other study participants. This finding is in agreement with the studies done in Nigeria [14-17] in which midwives had better knowledge of components of partograph than nurses.

Another predictor of knowledge of components of the partograph was presence of previous training on obstetric care. Those received training were able to explain components of the partograph better than those who did not. This finding may support the idea that training improves the status of existing knowledge. Still this finding is consistent with previous studies done in Malawi, Nigeria and Ethiopia [12, 15, 19, 22]. This finding points to the need that obstetric care givers should get periodic on-job refresher trainings on the obstetric care.

In this study it was also revealed that considerable number of study participants knew about alert and action lines. However, their knowledge about the functions both alert and action lines was marginally poor. Only about half of them were able to correctly mention the function both lines. Midwives than nurses were able to correctly explain the function of alert line. Similarly, those who had previous training on obstetric care were more likely to correctly explain the function of alert line than their counterparts. As midwives would have better knowledge acquired during pre-service or in-service trainings, they explained the function of alert line better than other professionals. Moreover, their exposure to obstetric care (as they are usually assigned in delivery units) is also believed to help them have better knowledge than otherwise. This finding is in agreement with previous studies [12-19, 22] which signify presence of previous obstetric training would help better understand the function of alert line.

In this study, the participants' overall knowledge of obstetric care was found to be poor. Only about one third of the participants had a mean score or more on the knowledge questions used to assess the level of obstetric knowledge. Midwives, health officers or general practitioners were more likely to have good obstetric knowledge than nurses. This might be explained by the fact that they might have better chance of exposure to obstetric training and practice than nurses. Even they might have a higher chance of getting advanced pre-service education than nurses. This finding is consistent with the study done in Nigeria and Ethiopia [17-19], in which nurse were less likely to know about the partograph than midwives and public health officers. This finding emphasizes the need for nurses to be considered equally to receive in-service obstetric training.

When we see our findings with regard to the status of general knowledge of the partograph, it was shown that 46.6% of the participants had mean score or more of the knowledge question used to assess the level of knowledge of the partograph. Females were more like to have good overall knowledge of the partograph than males. However, sex of the participants did not show a significant association with level of knowledge of the partograph in other study [19]. Presence of previous in-service training on obstetric care had also significant association with good level knowledge of the partograph. This finding is in agreement with studies done in Kenya, Nigeria and Ethiopia [13, 16, 19, 22]. This may be possibly explained by the fact that training would improve the status of knowledge about the area of interest.

The result of a statistical analysis between profession and comprehensive knowledge of partograph or function of action line seems controversial. It was observed that health

officers or general practitioners were more likely to have good comprehensive knowledge of partograph than midwives. This observation may be partly explained by the fact that health officers and general practitioners might have better chance of being consulted on obstetric conditions; this may help them manage difficult labor using the partograph and subsequently would have better knowledge than midwives. Moreover, while being health officer or general practitioner that did not have significant association in the bivariate analysis became significantly associated with knowledge on function of action line, being midwife, however, lost its significance in the multivariate analysis. Presence of confounding variables or quality of the data to fit to the model may also be considered to explain this observation. The use of relatively small sample size might also contribute to this finding. Further study may clarify this observation.

In contrary to previous studies [15-17, 19, 22], presence of previous training specifically on the partograph has never shown any significant association with any of the outcome variable in this study. This observation may be explained by the fact the number of participants who had training the partograph (89) was relatively small that would compromise its distribution in the logistic regression model, or may be the training they received was not effective to enable them know well about the partograph. However, we did not find any evidence to support our finding in this regard. It may be wise to assess and evaluate the quality of partograph training programs in the region.

With regard to participants attitude towards the importance of the partograph, majorly (81%) of the participants agreed that utilization of the partograph would help making timely decision and facilitate early referral to better health care. This is in agreement with the studies done in Nigeria and Ethiopia [15-19], that support the idea that partograph to be an efficacious tool for monitoring labor and identify women requiring further interventions.

The habit of using the partograph among the sampled health facilities however, was very low. Although it is recommended that all facilities providing skilled delivery service should utilize partograph to assess the progress of labor, only 58 (36.2%) of the reviewed delivery charts had the partograph papers attached and plotted. Furthermore, the trend of plotting components of the partograph properlywas very low (17 out of 58). In fact, no significant difference was observed between the type of facility (whether hospital or health center) and utilization of the partograph. This finding is not in line with the study done in Addis Ababa [19] where more participants from health centers than hospitals use the partograph. This difference may be due to the fact that we used direct observation of the formats than seeking verbal report. We believe this would improve validity our data.

The reasons cited for not using the partograph by the representative from sampled health facilities were lack of knowledge, lack of time to plot and negligence of delivery attendants. This finding points to the need that obstetric care givers should get periodic on-job refresher trainings and motivated to use the partograph. This finding is in agreement with studies done in Nigeria [15, 16, 22] in which proper utilization of the partograph is related to prior training and motivation of staffs.Few of them also mentioned that the partograph chart is not commonly available in their facilities.

The extent of recording and documentation of essential outcomes of obstetric care in the study area was unacceptably low. This is really a challenge for all of us to monitor and appreciate the progress of our efforts to meet the MDGs targets.

5. Conclusion

Participants' knowledge of the partograph and obstetric care was generally poor. Presence of in-service obstetric care training, sex and profession were the variables that had influenced knowledge of all outcome variables. The quality of in-service training being provided onthe partograph is questionable. Favorable attitude by itself was inadequate to ensure use of the partograph or proper plotting. Lack of motivation of staffs and scarcity of partograph formats in some facilities would also contribute for its poor utilization. The habit of recording and documentation of birth outcomes in the study area was quite low.

Limitation of the study

The limitations of this study may include the following. Relatively small sample size plus a non-response rate of 12% may affect estimate of a parameter and power of the test. This cross sectional study by its very nature cannot establish cause and effect relationship. Inclusion of private health care providers would have given comprehensive picture and make generalization possible. However, findings from this study can be regarded as a snapshot of current knowledge and practice of partograph utilization within the study area.

Recommendation

Based on the findings of this study, periodic on-job training regarding to obstetric care and on the use of the partograph should be provided to all types of health cadres particularly to males and nurses by profession in the region. Regular supportive supervision is also needed to motivate staffs to utilize the partograph and record their findings accordingly.Sustainable distribution of partograph papers is also recommended for the safety of mothers in labor and their fetusesin the region.To have a complete picture of the situation, it is recommended to involve private health care providers. Increasing the sample size and employing other methods may furnish better results and complement our findings.

Abbreviations

ANC, Antenatal Care; AOR, Adjusted Odds ratio; BSc, Batcher of Science; C/S, Cesarean Section; CI, Confidence

Interval; COR, Crude Odds Ratio; F/P, Family Planning; FHB, Fetal Heart Beat; HO, Health Officer; IRB, Institutional Review Board; GP, General Practitioner; MD, Medical Doctor; MDGs, Millennium Development Goals; MNH, Maternal and Neonatal Health; PNC, Post Natal Care; SPSS, Statistical Package for Social Studies; SVD, Spontaneous Vaginal Delivery; USAID, United States Agency for International Development; WHO, World Health Organization

Competing interests

The authors declare that they have no competinginterests.

Authors' contributions

FA contributed to the design of the study. FA and DB performed the analysis and interpretation of the data and drafted the manuscript. DB, WA, and TE contributed to data collection and data entry. All authors critically revised the manuscript and have approved the final manuscript.

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