Willingness to Use Mobile based e-Partograph and Associated Factors among Care Providers in North Gondar Zone, Northwest Ethiopia

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Abstract

Background: The proper use of Partograph supports to capture key maternal and fetal data. Paper-based Partograph are prone to error, incompleteness, delayed decisions and loss of clients' information. Electronic (e-Partograph) enables to easily retain and retrieve client data to ensure quality of care. Mobile technologies found an opportunity for resource-limited countries to improve access and quality of health care. Evidences were lacking on end users' acceptance to e-Partograph.

Objective: This study aimed to assess obstetric care providers' willingness to use mobile based e-Partograph and its associated factors.

Methods: Institutional based cross-sectional study was conducted from December 30, 2016 to January 21, 2017. A total 466 obstetric care providers were selected using multistage sampling technique in North Gondar Zone, Northwest Ethiopia. A structured self-administered questionnaire was used to collect the data. The data were entered in to Epi info version 7 and analyzed by using SPSS version 20. Cronbach's Alpha test was calculated to evaluate the reliability of data. A multivariable logistic regression analysis were used to identify factors associated with dependent variable. Adjusted odds ratio with 95%CI was used to determine the presence of association.

Results: The study found that 460(99.6%) of care providers owned mobile phone. Smartphone owners accounted only 102(22%). Of them, 205(46%) were willing to use mobile-phone for e-Partograph. Care providers aged >30 years (AOR=2.85, 95% C.I: 1.34-6.05), medical doctors and higher level clinicians (AOR=8.35, 95% C.I: 2.07-33.63), Health Center (AOR=4.41, 95% C.I:0.10-9.26), favorable attitude towards Partograph (AOR=2.76, 95% C.I: 1.49-5.09) and related in-service trainings (AOR=7.63, 95% C.I: 3.96-14.69) were enabling factors for willingness to use mobile phone.

Conclusions: Almost all obstetric care providers had access to mobile phone, however; smartphone ownership is still low. Willingness to use mobile-phone for e-Partograph was low. Younger aged, lower

level clinicians, Hospital based workers, unfavorable attitude on Partograph and lack of in-service trainings were main factors for non-willingness. Hence awareness creation on partograph use and digital capacity building are crucial for effective e-partograph management.

Key words: e-Partograph, Ethiopia, Obstetric care provider

List of abbreviations: CPD: Cephalo Pelvic Disproportion, EDHS: Ethiopian Demographic Health Survey, FHR: Fetal Heart Rate, IEOS: Integrated Emergency Obstetrics and Surgery, OHCP: Obstetrics Health Care Providers

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Background

In the sub-Saharan Africa region, maternal mortality accounted for 62% (179,000)the global maternal deaths [1]. Maternal mortality ratio was 412 per 100,000 live births in Ethiopia [2]. The majority (70%) of deaths attributed to obstructed labor and ruptured uterus [3]. The ultimate concerns of delivery care are to achieve a healthy mother and baby with the least possible level of intervention, early detection and management of complications. Thus; prevention of prolonged and obstructed labor by using partograph during labor is a key intervention in the reduction of maternal and perinatal morbidity and mortality [4].

Partograph is one of the strongest and cost-effective tools to prevent unnecessary delay and serve as frontrunner for obstetric caregivers [5]. The World Health Organization (WHO) recommends using the Partograph to follow labour and delivery with the objective to reduce maternal and fetal morbidity and mortality [6]. Partograph is less expensive tool designed to offer a continuous pictorial view of labour progress and to analyze cervix dilation, uterine contraction and fetal heart rate in relation to time. It helps to predict deviation from normal progress of labour, and supports timely and proven intervention. Key measurements, including cervical dilation, fetal heart rate, duration of labour and vital signs are recorded on the Partograph in graph format. It also helps to facilitate responsibility to the person attending labour [7].

Evidences showed that Partograph is underutilized and misused in health facilities which reflect poor monitoring of mothers in labour and/or poor pregnancy outcome due to poor knowledge and attitude towards the tools [8-10]. Paper-based Partograph are prone to error, incompleteness, delay and loss of client information in the health care system [11]. Despite long years of trainings and investments on partograph in low-resource settings, the paper-based partograph is still underutilized [12,13]. To have an intended pregnancy outcome proper use of a Partograph to record

key maternal and fetal data is critical. A digital Partograph will make it easy to retain patient information and to access client data [14]. It also reduces bulk of paperwork and helps to improve timely decision [14]. High penetration of mobile technologies has become an opportunity for resource-limited countries to improve access and quality of health care delivery [15-18]. The use of e-partograph exhibits limitations due to unreliable connectivity, power sources, low levels of technical training, maintenance and scalability costs [19].

This study was intended to assess willingness of obstetric care providers' to use mobile phone as electronic (e-Partograph) and associated factors. Therefore, the findings of this was aimed to give insight for researchers in formulation of appropriate interventional studies to curb existed problems.

Methods

Study design and setting

Institutional based cross-sectional study was conducted from December 30, 2016 to January 21, 2017 in North Gondar zone. This Zone has a total population of 2,929,628, of whom 1,486,040 were men and 1,443,588 women [2]. In the zone, 23 Woredas (districts), around 1,107 obstetrics care providers in 9 hospitals and 126 health centers were serving the catchment population. In this study the source population was all obstetric care providers who were working in public hospitals and health centers in North Gondar Zone. Obstetric care providers were a certified midwife, nurse, Health Officers, Integrated Emergency Obstetrics and Surgery & Medical Doctors who provide care for the woman during labor and delivery. Considering unknown magnitude of willingness to use e-partograph(p=50%) and finite population correction formula and design effect of 1.5; a total of 466 participants were included in this study. Care providers who were working in delivery units either on regular basis, by rotation or at night duty time were included in the study. Four hospitals and 56 health centers were randomly selected from 9 hospitals and 126 Health centers. Finally, the study participants were proportionally selected from each selected facility using multistage sampling technique.

Data collection tools and techniques

The dependent variable of the study was willingness to use mobile phone for e-Partograph. Independent variable includes: socio-demographic characteristics (age, sex, marital status, religion and residence), Mobile phone access (accessibility, type of mobile phone); professional characteristics (type of profession, year of experience, qualification level, pre-service training, and in-service training on Partograph) and Facility related factors (type of facility and working unit). Providers' knowledge and attitude on partograph were also addressed as independent variables. Obstetric care providers who scored mean value and above to knowledge related to Partograph questions were determined to have good knowledge [20]. Obstetric care providers who scored mean value and above to attitude related to Partograph questions were also determined to have favorable attitude [21].

A self-administrated questionnaire was used to collect the data using a structured English questionnaire. The questionnaire was adopted from previously published articles. The questionnaire consists of sociodemographic characteristics, qualification, current working department, knowledge and attitude about Partograph, and previous obstetric care training.

Before the actual data collection, the questionnaire was pre-tested. Training was given for data collectors for two days.

Data processing and analysis

Data clean up and cross-checking was done before analysis. All the questionnaires were checked visually, coded and entered into Epi-info7 and exported to SPSS version 20 software package for analysis. Furthermore, the Cronbach's Alpha test was calculated to evaluate the reliability of the tool. Both bivariate and multivariable logistic regression were used to identify any association between the dependent and independent variables. Association and strength were presented using Crude and adjusted odd's ratios, 0.05 level of significance and 95% confidence intervals.

Results

Characteristics of study participants

A total of 462(258 male and 204 female) obstetric care providers were participated in the study, with the response rate of 99.14%. The mean age of the respondent was 29.1 years with a standard deviation of ± 5.74 years. More than half 302 (65.4%) of participants were single. About 368(79.7%) of respondents were from Health Centers. Regarding their profession, 205(44.55%) were nurses and 194(42.0%) were midwives. The study participants' experience ranged between 1 and 30 years. Half of, 232(50.2%) of obstetric care providers had a maximum of four years clinical experience. Two hundred three (43.9%) of the obstetric caregivers were working at delivery ward regularly. Among all, 223 (48.3%) of them received Partograph utilization training as shown in table1.

Table 1: Characteristics of study participants in North Gondar Zone, Northwest Ethiopia, 2017 (n=462).

Variable	Frequency	Percentage
Sex		
Male	258	55.8
Female	204	44.2
Age in years		
≤24	149	32.2
25-29	143	31.0
≥30	170	36.8

Marital status		
Single	302	65.4
Married	145	31.4
Divorced	9	1.9
Widowed	6	1.3
Health facility		
Health center	368	79.7
Hospital	94	20.3
Qualification level		
Diploma	258	55.8
BSc.	185	40.0
Medical doctor	6	1.3
MSc.	13	2.8
Profession		
Nurse	205	44.4
Midwife	194	42.0
Health officer	45	9.7
IEOS	12	2.6
Physician	6	1.3
Working department		
Delivery ward	203	43.9
ANC	91	19.7
PNC	49	10.6
Family planning	72	15.6
OPD	47	10.2
Year of experience		
≤4	232	50.2
5-9	114	24.7
≥10	116	25.1

Obstetric care providers' access to mobile phone

Almost all, 460(99.6%) of the participants have owned mobile phone. Based on the type of mobile phone, participants who owned smartphone accounted only 102(22%) and the rest 358 (78%) owned cellphone. younger aged 44(29.5%) and male care providers 62(24.0%) have better smart phone ownerships, as shown in table 2.

Table 2: Type of mobile phone owned by study participants in North Gondar Zone, Northwest Ethiopia, 2017 (n=460).

Variable		Type of mobile phone owned	
		Cellphone	**Smartphone**
Sex	Male	194(75.2%)	62(24.0%)
	Female	164(80.4%)	40(19.6%)
Age	<25 Years	105(70.5%)	44(29.5%)
	25-30 Years	115(80.4%)	27(18.9%)
	>30 Years	138(81.2%)	31(18.2%)
Years of experience	<5 Years	171(73.7%)	60(25.9%)
	5-9 Years	96(84.2%)	181(5.8%)
	>9 Years	91(78.4%)	24(20.7%)
Marital status	Single	229(75.8%)	71(23.5%)
	Married	114(78.6%)	31(21.4%)
	Divorced	9(100.0%)	0(.0%)
	Widowed	6(100.0%)	0(.0%)
Profession	Nurse	154(75.1%)	50(24.4%)
	Midwife	150(77.3%)	43(22.2%)
	Health officer	37(82.2%)	8(17.8%)
	MD and higher clinicians	17(94.4%)	1(5.6%)
Type of health facility	Health Center	280(76.1%)	86(23.4%)
	Hospital	78(83.0%)	16(17.0%)
Total		**358(77.5%)**	**102(22.1%)**

Willingness to use mobile phone for e-Partograph

Among all obstetric care providers, 205(44%) of them were willing but 257(56%) were not willing to use mobile-phone for e-Partograph, as shown in figure 1.

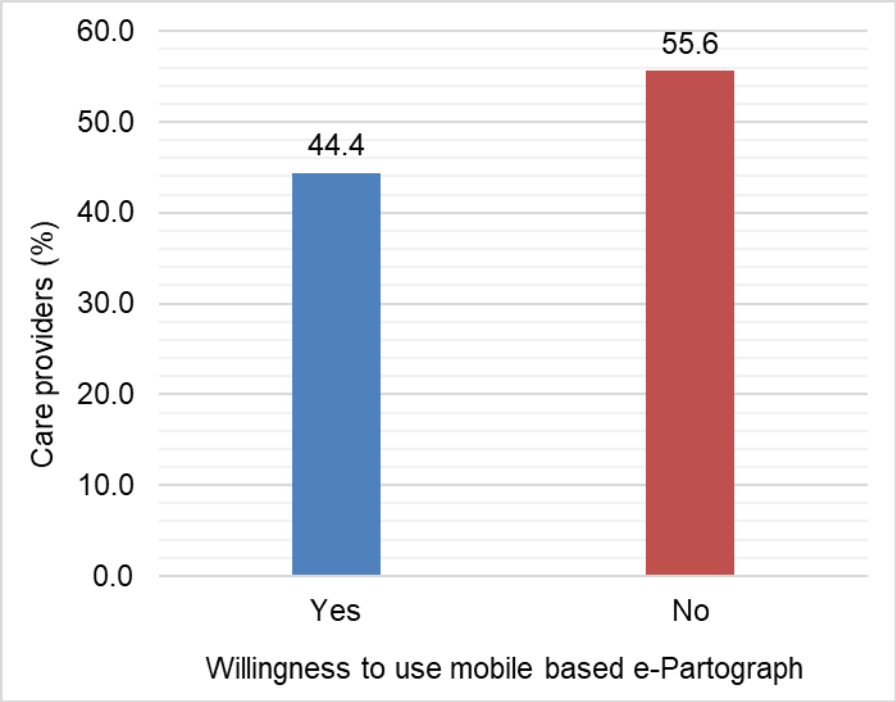

Figure 1: Willingness to use mobile phone for e-Partograph in North Gondar Zone, Northwest Ethiopia, 2017 (n=462).

Knowledge on Partograph

Regarding knowledge about Partograph, more than half, 258 (55.8%) [95% CI: 51.0-60.0], of the obstetric caregivers had good knowledge about Partograph. Two hundred sixty five (57.4%), of the obstetric providers knew the definition of Partograph and 305(66.0%) of them knew when to start plotting on the Partograph. Only 221(47.8%) and 203 (43.9%) of obstetric care providers knew about function of action line and satisfactory of progress of labor respectively. Half of participants 233 (50.3%) knew the correct function of the alert line on the Partograph, as indicated in figure 2.

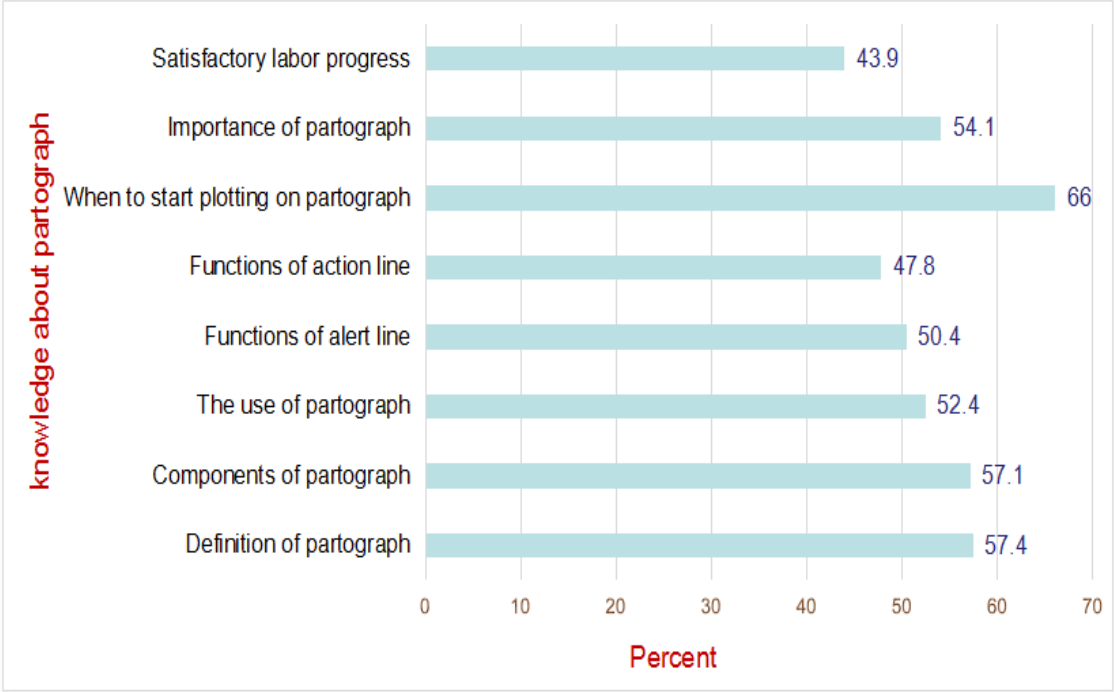

Figure 2: Knowledge of obstetric care providers on Partograph, North Gondar Zone, Northwest Ethiopia; October, 2017(n=462).

Attitude towards Partograph

About 272(58.9%) [95% CI: 53.9-63.3], of the obstetric providers in this study had favorable attitude towards Partograph. Majority 281 (62.1%) of the caregivers agreed to use Partograph and 245 (53.0%) of them agreed that they have difficulties in using Partograph. Meanwhile, 276(59.7%) agreed to received training on Partograph, as indicated in table 3.

Table 3: Attitude of obstetric caregivers on Partograph and its use, North Gondar Zone, Northwest Ethiopia, 2017 (n = 462).

Variables	Agreed (n)	%
1. Attitude related questions		
1.1 Like to use Partograph	287	62.1
1.2 Partograph should be used in all normal labor	270	58.4
1.3 Partograph reduces risk of maternal/ neonatal morbidity and mortality	267	57.8
1.4 Want to received training on Partograph	276	59.7

1.5 Wish to use Partograph routinely	304	65.8
1.6 Not all normal labors need Partograph	239	51.7
1.7 All team members must be trained on Partograph	328	71.0
1.8 Using Partograph is the responsibility of the physician only	151	32.7
1.9 Partograph is not effective to monitor laboring mother	128	27.7
1.10 Using Partograph is time consuming	212	45.9
1.11 Have difficulties in using Partograph	245	53.0
2. Overall attitude		
2.1 Favorable attitude	272	58.9
2.2 Unfavorable attitude	190	41.1

Factors associated with willingness to use mobile phone for e-partograph

Factors affecting willingness of obstetric care providers to use mobile phone for e-Partograph were assessed using bivariate and multivariable analysis. In bivariate analysis; age, marital status, profession, type of Mobile phone owned, knowledge, and attitude on Partograph and in-service trainings received on Partograph were found to be significantly associated with willingness to use mobile phone for electronic Partograph.

Based on multivariable logistic regression analysis, care provider's age of >30 years (AOR=2.85, 95% C.I: 1.34-6.05), type of profession of medical doctor and above (AOR=8.35, 95% C.I: 2.07-33.63), type of facility of health center (AOR=4.41, 95% C.I:.10-9.26), smart mobile phone owners (AOR=.39, 95% C.I:.21-.74), favorable attitude towards Partograph (AOR=2.76, 95% C. I: 1.49-5.09) and in-service trainings received on Partograph (AOR=7.63, 95% C.I: 3.96-14.69), as shown in table 4.

Table 4: Factors associated with willingness to use mobile phone for e-Partograph, North Gondar Zone, Northwest Ethiopia, 2017 (n = 462).

Variables	Willingness to use mobile based e-Partograph		COR (95%C.I)	AOR (95% C.I)
	No	Yes		
Age				
<24	128	21	1	1
25-29	81	62	**4.67(2.64-8.23)***	1.65 (.81-3.38)
>30	48	122	**15.49(8.77-27.38)***	**2.85(1.34-6.05)***
Sex				
Male	148	110	1	1
Female	109	95	1.17(.81-1.70)	1.17(.69-1.98)
Marital status				
Single	204	98	1	1
Married	51	94	**3.84(2.53-5.82)***	1.29(.73-2.26)
Divorced	2	7	**7.29(1.49-35.72)***	1.89(.29-12.24)
Widowed	0	6	.000	.000
Profession				
Nurse	147	58	1	1
Midwife	90	104	**2.93(1.94-4.43)***	.77(.42-1.43)
Health officer	16	29	**4.59(2.32-9.08)***	2.37(.97-5.80)
MD and above	4	14	**8.87(2.803-28.07)***	**8.35(2.07-33.63)***
Type of Facility				
Health center	199	169	1.36(.86-2.18)	**4.41(2.10-9.26)***
Hospital	58	36	1	**1**
Type of Mobile phone				
Cellphone	181	177	1	**1**
Smartphone	75	27	**.37(.23-.60)***	**.390(.206-.740)***

Knowledge on Partograph				
Poor	139	65	1	1
Good	118	140	**2.54(1.73-3.72)***	1.07(.60-1.90)
Attitude on Partograph				
Unfavorable	147	43	1	1
Favorable	110	162	**5.04(3.32_7.64)***	**2.76(1.49-5.09)***
In-service training on Partograph				
Not **received**	200	39	1	1
Received	57	166	**14.94(9.46-23.57)***	**7.63(3.96-14.69)***

*- p value < 0.05

Discussion

In low income settings, the ubiquity and penetration of mobile devices provided a potential opportunity for using m-Health applications in hard-to-reach areas. Access and type of mobile phone technology are precondition among other required infrastructures to enable use of m-Health technology in the health care delivery.

In this study, 460(99.6%) of the obstetric care providers in public health facilities were accessed to mobile phone. Evidences also showed that Mobile computing devices were increasingly being used by health care professionals and soon will become ubiquitous in clinical environments [22]. In this study, however, smartphone ownership was low which accounted only 102(22%) and the rest 358 (78%) were basic cellphone owners. This evidence couldn't be in line with the prospect of smartphone applications on massive development globally to be widely used by health professionals for health care services [23]. The growing penetration rate of the mobile technology still gives optimism to reach the envisaged visions.

Studies in health information technologies often focused on the design and implementations; little attention is payed for end users' acceptance and reaction to the technologies [24]. Evidences showed that underuse, resistance, and overrides, sabotage, and abandonment of the technologies were some of the scenarios [25,26]. This study tried to assess willingness of end users (obstetric care providers) to use mobile based e-Partograph in their routine care. The finding shown that 205(44%) of the participants were willing to use mobile based e-Partograph. It indicates that care providers' acceptance to e-Partograph were lower as of the envisioned penetration. It also known that in a hospital and clinical settings, the deployment of new digital data recording technologies often faces poor acceptance by clinicians [27].

The multivariable logistic regression analysis identified that age of care provider, level of profession, working place, type of mobile phone owned and received in-service training related to Partograph were main factors associated with willingness to use mobile phone for e-Partograph. Care providers aged >30 years were 3 times (AOR=2.85, 95% C.I: 1.34-6.05) higher likely to be willing to use mobile based e-Partograph than younger aged care providers. Medical Doctors and higher level clinicians were more (AOR=8.35, 95% C.I: 2.07-33.63) likely to be willing than Nurses. Those care providers working at Health Centers were more (AOR=4.41, 95% C.I:.10-9.26) likely willing than Hospital based workers. This finding seems inconsistent with general truth in which Hospitals consists of higher level care providers, better infrastructure and budget that would tend the care providers to be willing to use mobile, while the finding was inversely happened. Likewise, smartphone owners were 61% less (AOR=.39, 95% C.I: .21-.74) likely willing to use mobile based e-Partograph. This finding was also deviated from the general truth that smartphone owners tends to be willing for e-Partograph.

Provision of in-service training related to Partograph was enabling factor (AOR=7.63, 95% C.I: 3.96-14.69) for willingness to use mobile phone for e-Partograph. Similarly, studies conducted in low income countries showed that lack of training was a barriers to proper partograph use [10,28,29]. According to evidences, even primary health care workers with little or no formal education can be effectively trained to use the partograph [30]. Care providers with favorable attitude towards Partograph were more (AOR=2.76, 95% C.I: 1.49-5.09) likely willing to use mobile than the counter parts. The findings supported each other in which attitude is largely a result of extensive training.

Limitation

The study did not include obstetric care providers in private health facilities; so, this finding may not be generalizable to all obstetric care providers North Gondar zone.

Conclusion

Almost all obstetric care providers had access to mobile phone, however; smartphone ownership is still low. Willingness to use mobile-phone for e-Partograph was low. Younger aged, lower level clinicians, Hospital based workers, unfavorable attitude on Partograph and lack of in-service trainings were main factors for non-willingness. Hence awareness creation and providing in-service training on partograph use and digital capacity building are crucial for effective e-partograph management.

Ethics approval and consent to participate

Before commencement of the study, ethical clearance was obtained from the Institutional Ethical Review Board of University of Gondar. Communication with the respective official administrators was made through formal letter obtained from the University of Gondar. Verbal and written consent was obtained from each respondent after explaining the purpose and objectives of the study. Name, personal identifiers would not include in the study. The respondents may notify that they were the right to refuse to participate on the study.

Availability of data and material

All the required data have been presented in the study.

Competing interests

The authors declare that they have no competing interests.

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Source of fund for this study was covered by the authors.

Authors' contributions

Initiation of study and design was done by YT, AAG and KDG, analysis, interpretation and Write-up of data was done by YT, KDG, AAG, BT, BFE and ZAM. Verification of article was done by YT, KG, AG, BT, BE and ZM. All authors read and approved the final manuscript.

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