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The Effectiveness and Usability of Electronic Partograph for Obstetric Care: A Systematic Review

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The Effectiveness and Usability of E-partograf for Obstetric Care: A Systematic Review

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ABSTRACT

Introduction: Partographs are tools used in monitoring and prevention in childbirth complications. Unfortunately, labor monitoring is still poor in many places due to some of the problems associated with the use of monitoring tools during childbirth such as partographs. one of the efforts made was to develop partographs in the form of applications (electronic partographs). Moreover, this study intends to identify evidence on the use of electronic partograph for point-of-care decision support and improved quality of care by health care workers.

Method: This study carried out a systematic review of journals using four academic databases (Science Direct, PubMed, Google Scholar and grey literature) with a publication range from 2016 to 2022. Furthermore, the subjects in this study were Skills Birth Attendants (SBAs) dan Obstetric care Provider. Therefore, these variables include Effectiveness and Usability of E-partograf. Inclusion criteria in the literature study were: use electronic-based partographs in monitoring. Thus, the keywords used are Partograph AND electronic AND obstetric and the guidelines for reviewing journals using PRISMA.

Result: Results from 13 studies exploring e partograph in the last six years (201 6-2022). Alarge part of the results of the review (13 studies) the effectiveness of the use of e partograh compared to paper partographs. In addition, e partograph has another advantage, namely that there is a reminder system when filling in data by the SBA, so that it can identify the delivery process to run normally or require further treatment. The use of e partograph can save time and is easy to use, SBA is easy to accept and apply.

Discussion and Conclusion:

The use of an e partograph gives a better finish than a paper partograph. E partograph is able to maintain normal delivery, lowering the incidence of participular section and prolonged labor. E partograh which is designed to provide benefits for its users, namely there is an audio and visual reminder system that can be used to detect difficulties during childbirth. From the results of the article, it describes the SBA's acceptance of e partographs very well as evidenced by the higher rate of use of epartographs compared to paper partographs.

Keywords: Partograph, Electronic, Obstetric

1. INTRODUCTION

In 2015, an estimated 303,000 women died from complications during childbirth such as bleeding during labor, prolonged labor, and infections(Graham et al., 2016; Say et al., 2014). Prolonged labor directly contributes to 6-10% of the occurrence of death and pain in the mother and baby (Balikuddembe et al., n.d.; Ollerhead & Osrin, 2014). One of the efforts to be able to prevent the occurrence of pain and death in the mother and baby during childbirth is to carry out a fast and appropriate monitoring of the delivery and handling of actions (Ogwang et al., 2009; Windrim et al., 2007). The World Health Organization (WHO) recommends monitoring during childbirth using partographs. .

Partographs are used by skilled birth attendants to document important developments during the labor process. This partograph sheet is prepared to collect and record all the important information over a 12-hour period starting with the onset of contractions until the baby is born. The partograph ini acts as a decision-making aid because it indicates when the delivery is proceeding at a normal level and when the officer should prepare to intervene.(L. E. Litwin et al., 2018a)

However, currently the effectiveness of the use of partographs in monitoring childbirth is not optimal. This is related to the attitude of health workers who are still low in the use of paper partographs To overcome this challenge, many researchers have made improvements to partographs(Rahman et al., 2019a), one of the efforts made is to develop partographs in the form of applications (electronic partographs). The e-partograph is an electronic prototype of the paper-based partograph that automatically plots the vita; trends in labour and childbirth. It is fitted alarm systems to alert Provider Health Care workers about the next examination schedule also in case of danger. The development of this partograph is based on android tablets with reference to partographs issued by WHO with the aim of making it easier for officers to monitor and document during childbirth. Therefore, the e-partograph intervenes to improve efficiency in filling patients' information during labour and childbirth, allows PHC workers to seek and receive real-time professional support and reduce time to accessing lifesaving care, even after normal work hours.(Okokon et al., 2014; Weerasekara, 2014)

As new innovations of electronic partograph are increasingly being tested and adopted in resource-poor settings, it is necessary to comprehensively assess what has been achieved in order to inform implementers and policy makers on the effectiveness of technology in

evidence-based practice.

2. METHOD

2.1 Design

This Systematic Review follows the guidelines of the Statement of Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA). (David Moher1 et al., 2015) Data has been completed a review on the journal using four academic data bases (PubMed, Science Direct and Google Scholar) and grey literature from the Journal Conference Series.

2.1 Inclusion & Exclusion Criteria

Selection of the inclusion criteria that have been determined for this systematic review, using PICOS (population, intervention, comparison, outcomes, and study design). The population in this study were Skill birth attendant and obstetric care provider who provide childbirth services and use electronic-based partographs in monitoring them. The exclusion criteria such as labor monitoring using paper partographs.

2.3 Search strategy

This literature search used articles in English from Pubmed, Science Direct, Google Scholar and grey literature from 2016 to 2022. The literature search used the keywords "partograph", "electronic", and "obstetric". The literature search found there were 182 articles filtered using the keywords above. The articles were then narrowed down and identified based on the PICOS and obtained as many as 109 articles that could be included in the article screening process. At the article screening stage according to the suitability of the article based on the abstract, there were 148 articles. Then a feasibility selection was carried out based on the essence and scope of the discussion in the article as a whole, it was found that 14 articles could be made for further selection, namely as many as 13 articles that were included in the inclusion and 1 article were excluded.

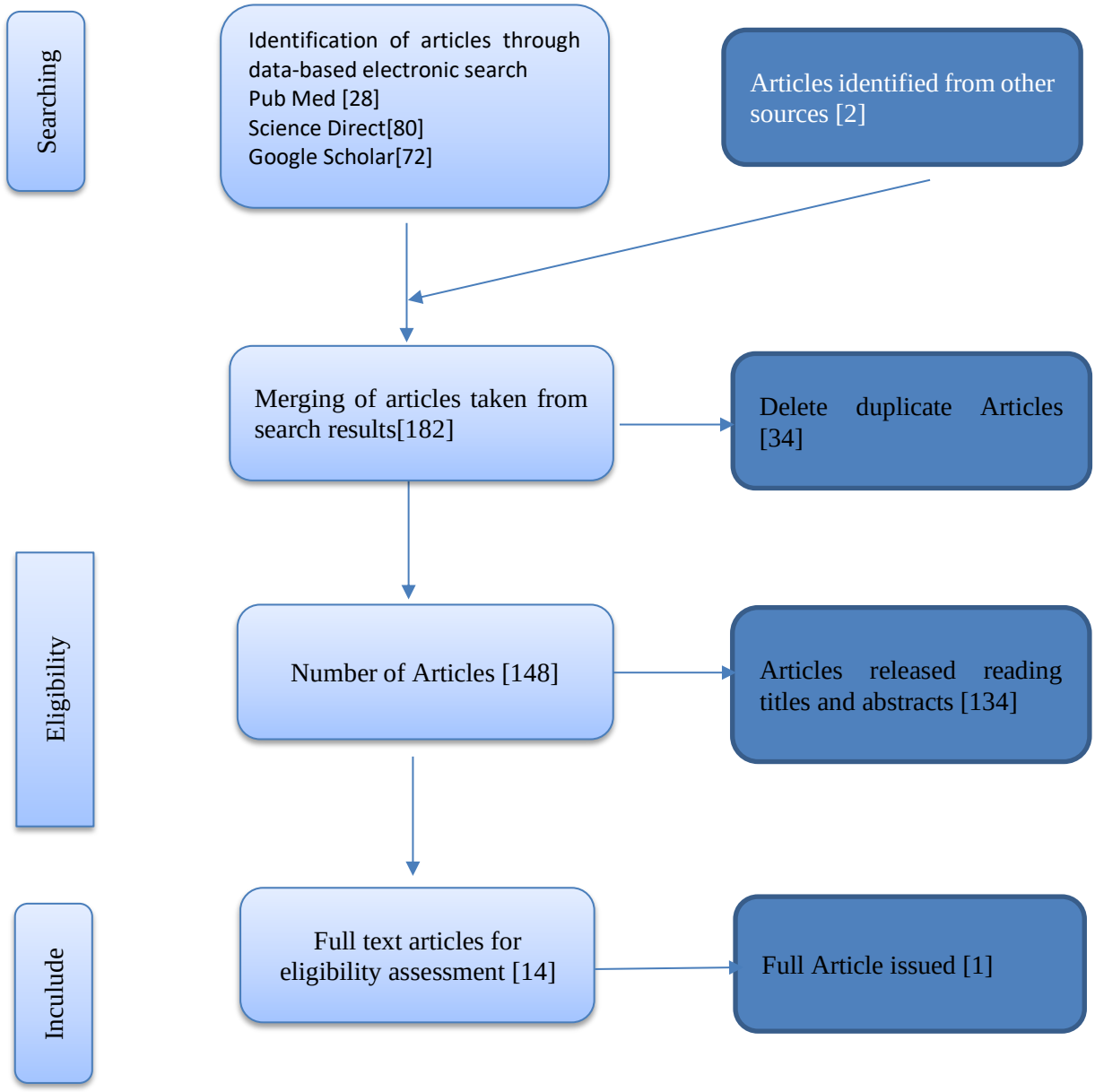

Figure 1 The article selection steps are depicted in the PRISMA flow chart.

2.4 Quality assessment

After collecting the results identify the articles through electronic search the data based articles are exported to a Microsoft Excel spreadsheet. Three authors (WMN, YB and RBU) independently extracted the data and reviewed the filtered and qualified articles. Any disagreements over the results of the 3 reviewers (WMN, YB and RBU) were consensus between the three authors through discussion. The methodological quality of each study (sampling strategy, response rate, and research representation), comparability, and results were

examined using the JBI tool. JBI for cross-sectional, quasi-experimental, and qualitative studies is used to assess the methodological quality of a study and to determine the extent to which a study has addressed possible biases in its design and analysis. All articles that are given a JBI score of 50% or more can be considered "good" studies with low risk.

3. RESULT

3.1 Overview of included studies

Of the 13 studies reviewed, all labor monitoring used application-based partographs. The name used is different. "Life Curve" [1], mLabour [4], PrasavGraph [5], DAKSH [12] is an android-based Mobile applications (Begum et al., 2020a; Schweers et al., 2016a; M. Singh et al., 2019; S. Singh et al., n.d.-a), electronic partograph (e partograph) [2,3,7,8,10] are some of the names of tools used for childbirth monitoring with different devices that can be accessed using a smartphone or tablet PC or computer device , digital partograph [11,13] is some of the names of tools used based on android and Word Electric Browser (WEB); and some other names such as Web-Based Partograph, and midwifery documentation use Web Based. No. 5.9] (L. E. Litwin et al., 2018b; Rahman et al., 2019b; Sanghvi et al., 2019a; States & States, 2022; Tadesse et al., n.d.)(Ahmad et al., 2019; Tandiallo et al., 2019) . These studies were conducted in 5 countries namely India [1,3,4,5,7,12], Indonesia [6,9,11,13] Kenya [2], Tanzania [8], and Northwest Ethiopia [10]. Judging from the results of the article, it shows that users of this application-based partograph are varied. In Indonesia the users of partograph application are midwives [6,9,13], midwifery students [11], and researcher [9]; in contrast to other countries for the life Curve [India] application, m labour [India] used by doctors during childbirth monitoring [1,4], DAKSH [India] used by nurses [12]; e partogram [Kenya] used by Skill Birth Attandent (SBA): Doctor, Nurse, Midwife. e partograph [India] is used by SBA (doctors, midwives, nurses) [3] and Staff nurses and medical officers [7]. e partograph [Northwest Ethiopia] used by Obstetric care providers (a certified midwife, nurse, Health Officers, Integrated Emergency Obstetrics and Surgery & Medical Doctors who provide care for the woman during labor and delivery) [10]. To aid ease of understanding, we took the studies as the unit of analysis and different articles in which they are reported. Results are presented in a narrative format.

Table 1. Overview of included studies

No	Authors	Years	Countries	Name Aplication	usser	Study Design	Score JBI %
1	Begum et al	2017	India	Life Curve	Docthete	*Cross-sectional*	75
2	Sanghvi et al	2017	Kenya	e partogram	Skill Birth Attandent (SBA): Doctor, Nurse, Midwife	Mixed-method, quasi-experimental	89
3	Rahman et al	2019	India	e partograph	SBA (doctor, midwife, nurse)	Quasi-experimental	100
4	Schweers et al l	2016	India	m labour	Doctor	Qualitative	50
5	Singh et al	2016	India	PrasavGraph	a resident doctor	Qualitative	50
6	Juwita et al	2019	Indonesian	Midwifery Documentation Use Web Based	Midwives	*Cross-sectional*	50
7	Singh et al	2021	India	e partograph	Staff nurses and medical officers	Cross-sectional	75
8	Litwin et al	2018	Tanzania	e partograph	SBA	Qualitative	50
9	Tandiallo et al	2019	Indonesian	Web-Based Partograph	researcher	Quasi-experimental	100
10	Tadesse et al	2019	Northwest Ethiopia	e partograph	Obstetric care providers (a certified midwife, nurse, Health Officers, Integrated Emergency Obstetrics and Surgery & Medical Doctors who provide care for the woman during labor and delivery)	Cross-sectional	100
11	Ulfa et al	2020	Indonesian	Digital Partograph	Midwife students	Cross-sectional	50
12	Singh et al	2019	India	DAKSH	nurses	Cross-sectional	88
13	Ningrum et al	2019	Indonesian	Digital Partograph	Midwife	Qualitative	70

3.2 Comparing The Efficacy of e Partograph and paper Partograph [1,2,3,6,8,9]

The use of partographs is one of the important steps to ensure that the care provided to mothers and newborns during childbirth is of high quality. The development of application-based partographs aims to improve upcare during childbirth by overcoming the challenges of low use of paper partographs. (Begum et al., n.d.; L. Litwin et al., n.d.; Schweers et al., 2016b). From the results of the article analysis carried out, there was an increase in labor outcomes based on monitoring using application-based partographs (e partographs) compared to paper partographs. In monitoring childbirth using the Life Curve Mobile application by measuring the performancep arameter which is assessed on a scale of 1-5 with a total score of 45. The results showed that the Life Curve had a score of 42.7 compared to the paper partograph with a score of 19.52. This shows that the difference is very significant (p=.001). The average score±SD life curve (4.74±.52) is statistically much higher than that of paper partographs (2.17±1.18): p<.0002. These results showed an increase in SBA performance in childbirth care using a life curve mobile application. (Begum et al., 2020b). In line with the results of other studies that show that using an e partograph is easier to maintain normal labor and take action. The results of the analysis of the article can be seen for the use of e partographs can be complications in the mother and janis during childbirth. The use of e Partograms was lower in the likelihood of fetal outcomes with complications than paper partographs, with a yield of 56% (95% CI= 27%-73%), lowering the trend of cesarean section rates [43% to 37% at Jessore Hospital and from 36% to 25% at Kushtia Hospital] and a reduction in long labor [identified 42% of long labor with paper partographs ,monitoring by using e partographs of old labor dropped to 29%], (Rahman et al., 2019a; Sanghvi et al., 2019b).

From the results of the analysis of the article, it explains the reasons for the development of this application-based partograph to solve various problems that arise when using paper partographs, one of which is the use of very low paper partographs. From the results that can be seen, the use of e partographs shows that (Ningrum et al., 2019)the recording frequency appears higher in web-based partographs, namely by 26 (86.7%) compared to the speed of recording using conventional methods, which is 25 (83.3%), the majority of SBA (87-91%) complete the filling of ePartograms, WEB-based partographs are faster in recording contractions, oxytocin, and the process of giving birth to a p-value of 0.000 (<0.05). (Ahmad et al., 2019)(L. E. Litwin et al., 2018b)(Tandiallo et al., 2019). These results show that e partographs are more effective in maintaining normal delivery, preventing the occurrence of

difficulties during childbirth and increasing use during labor monitoring.

3.3 Advantages of e Partograph with paper Partograph [1,2,5]

Partographs are tools for recording the progress of childbirth. The key parameters in the partograph are the progress of childbirth (opening of the cervix, the lowest decrease in parts, contractions), the condition of the mother (blood pressure, pulse and temperature) and the condition of the fetus (the soluble pulsation of the fetus, amniotic water and moulage). On the monitoring of the partograph paper filling and interplay depends on the person who fills. In the e partograph there are several advantages that can be felt when using it. Partograph application (e partograph) developed in the form of a mobile phone or tablet based on android [1,2,3,4,5,7,8,10,12,13], with a web-based computer device [6,9,11], with advantages made by each developer. One of the benefits of using partographs is that it can make decisions when carrying out childbirth, whether this delivery can be helped or needs an action(Ayenew & Zewdu, 2020; Ningrum et al., 2019). In e partographs there are several advantages compared to paper partographs. In some system applications, it is contained by adding a notification feature in the form of an audio or visual alert, which shows the charging time, and the difficulties that occur in mothers and babies [1,2,3,7,8,12,13]. This notificationsystemis very helpful for users to determine what decisions and actions should be taken.

In some applications there is another advantage, namely being able to save the data that has been filled in, a graph appears according to the data filled with varying display results [2,3,12,13]. This partograph application uses a "delay-tolerant framework", which allows it to be used even in poor internet network conditions(S. Singh et al., 2016), and some can even be used by not using the internet network(Ningrum et al., 2019). This shows that e partographs have other benefits compared to paper partrographs. Several developers have focused on low-cost digital applications to address deficiencies in the paper partograph, improve recordkeeping, support decision making, and enhance quality of care during labor and delivery(Adepoju et al., 2017)

3.4 Acceptance of e Partograph di Among Health Workers

The development of applications on partographs aims to make it easier for users to fill in partographs. Most SBA agree that e partographs make it easier to fill and increase their use, but it needs to be a concern for obstetric services with a high rate of maternity cases. It takes a lot of SBA to be trained to be more optimal in its utilization. (Sanghvi et al., 2019b). Almost all SBA (93%) show confidence and comfort in using e Partogram, SBA gives a positive impression and feels efficient and easy to use. The SBA expressed confidence in their ability to interpret and act on the reminders and warnings contained in the e partograph. By using e partograh there is a change in behavior from the SBA related to the filling of partograph(L. Litwin et al., n.d.; Ningrum et al., 2019)

Table.2 Summary of Selected Studies

No.	App Name	Description of partograph applications	Outcome	Result
1	Life Curve	mobile application, android based, This app will analyze all the entered data and draw the pictogram of the corresponding color. This pictogram shows the condition of the mother and baby by three colors: red, yellow and green: where red indicates 'critical', yellow 'need for close observation' and green 'safe condition'. Any critical condition of the mother and or baby will generate an automatic SMS	utilization of life Curve Mobile application in childbirth	The average age of the subjects was 25.9±5.7 years, the average gestational age was 39.6±.9 months, and 83% had vaginal delivery. The application is easy to fill, automatically generates graphs, pulls to work on, provides automatic timely reminders for evaluating childbirth, generates digital color-coded alert numbers, sends automatic text messages to supervisors in abnormal situations. Performance parameters are assessed on a scale of 1-5. To compare the advantages of using these two partographs, nine features were compared with a total score of 45. The total score for the Live Curve has 42.7 and for the paper partograph is 19.52 the difference is very significant (p=.001). The average score±SD of the life curve (4.74±.52) is statistically much higher than that of paper partographs (2.17±1.18): p<.0002.
2	e partogram	android tablet based, there is an audio and visual reminder system when it comes to doing the next check and in case of complications. The application is made efficient when data entry automatically graphs appear, and the data is stored in the application. In addition to filling in the past data can not be done	utilization of e Partogram to maintain normal delivery	The results showed a comparison of data from 842 active phase maternity clients using ePartograms with data from 1,042 clients monitored using paper partographs. SBA using ePartograms was easier to take action and maintain normal delivery compared to SBA using paper partographs, such as ambulation, feeding, and fluid intake, and to address abnormal measurements of fetal well-being (14.7% versus 5.3%, adjusted relative risk =4.00, 95% confidence interval [CI]=1.95–8.19). The use of ePartograms was associated with 56% (95% CI= 27%-73%) lower likelihood of fetal outcomes with complications than paper partographs. Users of ePartograms are more likely to adhere to routine labor observations. The SBA states that the technology is easy to use but raises concerns about its use in locations with high amounts of childbirth. More research is needed to evaluate the costs and benefits and to include the recent WHO guidance on labor management .

No.	App Name	Description of partograph applications	Outcome	Result
3	e partograph	E partographs can be accessed via a smart phone or tablet pc or computer device. There is a system in the e-partograph software to give a red signal for any abnormalities of the mother or fetus during the active phase of labor. The application has the option to store data both in local storage and in remote central database storage at the same time. Local storage contains data for a while; the remote server contains data permanently which makes partograph information searchable anytime and anywhere. The app allows partograph data to be monitored remotely	testing the feasibility and effectiveness of partograph applications	In total 2,918 deliveries were performed in Jessore DH and 2,312 in Kushtia DH during the one-year study period. Of these, 1012 (506 in each facility) childbirth was monitored using partographs (paper or electronic). The trend of facility-based cesarean section rates is declining in both hospitals; 43% to 37% in Jessore and from 36% to 25% in Kushtia Hospital. There is a significant reduction in cases of prolonged childbirth with the use of e-partographs. In Kushtia DH, labor monitoring was carried out with paper partographs identified 42% of long labor, monitoring using e partographs of long labor dropped to 29% during phase-2. Similar results were observed in Jessore DH where the rate of long labor was reduced to 7% with paper partographs from 30% of long labors reported with e-partographs. The user rate of e-partographs was higher than that of paper partographs during both phases (phase 1: 3.31, CI: 2.04–5.38, $p < .001$ and in phase 2: 15.20 CI: 6.36–36.33, $p < .001$) after adjusting for maternal age, parity, gestational age, religion, maternal education, husband education, and fetal sex
4	m labour	a mobile application	the use of ml labour in documenting partographs	m Labour helps physicians detect long and obstructed labor quickly, while avoiding usability difficulties that reduce paper partographs. mLabour combines a reminder system, decision support for emergencies, and support for the full patient lifecycle, from admission to referral
5	PrasavGraph	The application is made based on android, made using the delay-tolerant framework", which allows it to be used even in poor internet network conditions	PrasavGraph application for childbirth monitoring	It is easy to use on a smartphone, so it is hoped that the partograph will be easier to use in the delivery process of health workers in the peripheral area which until now is still very low
6	Midwifery Documentation Use Web Based	The application web based	Recording Speed	The results showed that the frequency of recording appeared to be higher on web-based partographs, namely 26 (86.7%) compared to the speed of recording using conventional methods, which was 25 (83.3%)
7	e partograph	The tablet-based partograph application used is named DAKSH. The app allows the integration of	Use and Acceptance	The results showed that nursing staff and medics concluded that tablet-based partographs were better than paper-based partographs because

No.	App Name	Description of partograph applications	Outcome	Result
		several features such as alerts and alarms to improve the user experience.		they save time and were easy to use. It is useful for healthcare workers as it has a reminder feature
8	e partograph	Android Tablet partograph app, with special attention to improving the ease and efficiency of real-time documentation	feasibility and use of e partograph	Observations of 23 SBA using an ePartogram to monitor 103 deliveries of 84 shifts showed that the majority of SBA (87-91%) completed the filling of the e Partogram: registering the client, first and subsequent observations, and using the screen easily on the first shift; this increases to 100% on the fifth shift. Almost all SBA (93%) showed confidence and comfort in using the ePartogram on the fifth shift. SBA expresses a positive impression of the ePartogram and feels efficient and easy to use, starting with the use of the first client. The SBA records the usefulness of auditory reminders (indicating that measurements are due) and visual alerts (indicating abnormal measurements). The SBA expresses confidence in their ability to interpret and act on these reminders and warnings.
9	Web-Based Partograph	computer-based partographs with the use of internet networks	utilization of web-based partographs	The results showed that the use of WEB-based partographs was faster in recording contractions, oxytocin, and childbirth processes compared to the use of conventional partographs. In addition, the accuracy of WEB-based partographs in early detection has a p-value of 0.000 (<0.05) and the p-value in emergency detection is 0.014 (<0.05) which means that there is a difference between the use of WEB-based partographs and conventional partographs. Meanwhile, the p-value of the referral process is 1,000 (>0.05) which means there is no difference in the use of WEB-based partographs and conventional partographs.
10	e partograph	partograph in mobile phone	Mobile phone usage for e-Partograph	The study found that 460 (99.6%) care providers had cell phones. Smartphone owners accounted for only 102 (22%). Of them, 205(46%) are willing to use mobile phones for e-Partograph. Care providers aged >30 years (AOR = 2.85, 95% C.I: 1.34-6.05), medical doctors and higher level doctors (AOR = 8.35.95% C.I: 2.07-33.63), Health Centers (AOR = 4.41, 95% C.I: 0.10-9.26), favorable attitude towards Partgrapho (AOR = 2.76.95% C.I: 1.49-5.09) and training in related services (AOR = 7.63.95% C.I: 3.96-14.69) are supporting factors for willingness to use mobile phones

No.	App Name	Description of partograph applications	Outcome	Result
11	Digital Partograph	web-based partograph design	the use of digital partographs as a learning media	the median pretest score is 71.09 from these data which can be concluded that the knowledge of the respondents was put into a sufficient category, after conducting learning using digital partograph media, the skill of filling partography in students has increased to 85.95 with an excellent category. Meanwhile, the significance of the p-value is 0,000 < 0.05, meaning that digital partographs as a learning medium are very effective for developing partographic filling skills
12	DAKSH	DAKSH is a tablet-based application. The app is designed to provide real-time labor monitoring, basic decision-making support with better alerts and logging	utilization of DAKSH	A total of 10 staff nurses from these healthcare centers used the application to monitor 424 pregnancies for a period of 10-months. During this period the hospital observed around 463 childbirths and out of which 91.56% (n=424) were recorded into the application
13	Digital Partograph	Android-based partographs, real-time recording, there is a notification system in case of labor difficulties, can be accessed on the playstore	use of digital partographs, behavior change, stakeholder support	Research shows that the information systems contained in digital partographs have met the aspects of system quality, information quality and user satisfaction. The application of digital partographs has met the use in clinical decision making, monitoring of labor progress, documentation, monitoring of maternal and fetal conditions, digital partographs, and support from stakeholders for the application of digital partographs. Based on the results of the study, it was concluded that the digital partograph application can already be used as a tool to monitor the development of births and can already be accessed on Google Playstore. With the existence of digital partographs, there is a change in the behavior of midwives in their use.

DISCUSSION

Digital partographs are designed to solve various problems that arise when using paper partographs. Many researchers have developed partograph applications in different countries of the world, but all of them have varying effectiveness, advantages and acceptance rates.(Ningrum et al., 2019)

Based on Sanghvi et al. (2017), the use of e-partograph applications has a higher effectiveness than using paper partographs. This is shown by the use of e-partographs associated with 56% (95% CI= 27%-73%) lower likelihood of fetal outcomes with complications than paper partographs. Users of ePartograms are more likely to adhere to routine labor observations. Similarly, Rahman et al. (2019), explained that the trend of facility-based cesarean section rates is declining in both hospitals; 43% to 37% in Jessore and from 36% to 25% in Kushtia Hospital, Bangladesh. Similar results were observed in Jessore, Banglasdesh, where the rate of long labor was reduced to 7% with paper partographs from 30% of long labors reported with e-partographs. Litwin et al (2018) stated that the use of e Partogram to monitor 103 deliveries of 84 shifts showed that the majority of health workers completed the filling of the e Partogram: registering the client, first and subsequent observations, and using the screen easily on the first shift; this increases to 100% on the fifth shift. In terms of recording, the use of e-partographs is reported to be more effective when compared to paper partographs, as stated by Juwita et al (2019) that the results showed that the frequency of recording appeared to be higher in web-based partographs, namely 26 (86.7%) compared to the speed of recording using conventional methods of 25 (83.3%). Research byTandiallo et al (2019) shows that the use of WEB-based partographs is faster in recording contractions, oxytocin, and childbirth processes than the use of conventional partographs. In addition, the accuracy of WEB-based partographs in early detection has a p-value of 0.000 (<0.05) and the p-value in emergency detection is 0.014 (<0.05) which means that there is a difference between the use of WEB-based partographs and conventional partographs. Meanwhile, the p-value of the referral process is 1,000 (>0.05) which means there is no difference in the use of WEB-based partographs and conventional partographs. The research developed by Ulfa et al (2020) is the effectiveness of e-partographs as student learning media, from the results of this research, digital partographs as a learning medium are very effective for developing partographic filling skills

Based on Begum et al. (2017), e-partograph applications have the advantage of being easier to fill, automatically generating graphs, more interesting to work with, providing timely automatic reminders to evaluate childbirth, generating digital color-coded warning numbers, and sending

automatic text messages to supervisors in abnormal situations. Singh et al (2016) also showed that e-partographs are easy to use on smartphones, so it is hoped that partographs will be easier to use in the delivery process of health workers in peripheral areas which until now are still very low. Research on the advantages of e-partographs is also by Ningrum et al (2019), which shows that the information systems contained in digital partographs have met the aspects of system quality, information quality and user satisfaction. The application of digital partographs has met the use in clinical decision making, monitoring of labor progress, documentation, monitoring of maternal and fetal conditions, digital partographs, and support from stakeholders for the application of digital partographs.

Some studies also assess the level of acceptance of e-partographs by health workers. Based on Singh et al (2021) showed that nursing staff and medics concluded that tablet-based partographs are better than paper-based partographs because they save time and are easy to use. Research by Litwin et al. (2018) showed that almost all health workers (93%) showed confidence and comfort in using the ePartogram on the fifth shift, health workers expressed a positive impression of the ePartogram and felt efficient and easy to use it, health workers expressed confidence in their ability to interpret and act on reminders from this e-partograph. Tadesse et al (2019) assessed the level of acceptance of e-partographs in terms of cellphone ownership for application installation, from the survey results obtained as many as 205 (46%) were willing to use mobile phones for e-Partograph.

CONCLUSION

Most studies have shown that the development of application-based partographs aims to facilitate the process of monitoring childbirth. With e partograph the end result of childbirth is better than with paper partographs. E partograph is able to maintain normal delivery, lowering the incidence of participular section and prolonged labor. In addition, e partograh has the advantage that there is an audio and visual reminder system that can be used to detect difficulties during childbirth, all data is stored and can be accessed again so that the documenting system is easier. And the SBA acceptance rate of e partograph is very well proven by the higher rate of use of e partigraph compared to paper partograph.

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CONFLICT OF INTEREST

None

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The Effectiveness and Usability of E-partograf for Obstetric Care: A Systematic Review

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ABSTRACT

Introduction: Partographs are tools used in monitoring and prevention in childbirth complications. Unfortunately, labor monitoring is still poor in many places due to some of the problems associated with the use of monitoring tools during childbirth such as partographs. one of the efforts made was to develop partographs in the form of applications (electronic partographs). Moreover, this study intends to identify evidence on the use of electronic partograph for point-of-care decision support and improved quality of care by health care workers.

Method: This study carried out a systematic review of journals using four academic databases (Science Direct, PubMed, Google Scholar and grey literature) with a publication range from 2016 to 2022. Furthermore, the subjects in this study were Skills Birth Attendants (SBAs) dan Obstetric care Provider. Therefore, these variables include Effectiveness and Usability of E-partograf. Inclusion criteria in the literature study were: use electronic-based partographs in monitoring. Thus, the keywords used are Partograph AND electronic AND obstetric and the guidelines for reviewing journals using PRISMA.

Result: Results from 13 studies exploring e partograph in the last six years (201 6-2022). Alarge part of the results of the review (13 studies) the effectiveness of the use of e partograh compared to paper partographs. In addition, e partograph has another advantage, namely that there is a reminder system when filling in data by the SBA, so that it can identify the delivery process to run normally or require further treatment. The use of e partograph can save time and is easy to use, SBA is easy to accept and apply.

Discussion and Conclusion:

The use of an e partograph gives a better finish than a paper partograph. E partograph is able to maintain normal delivery, lowering the incidence of participular section and prolonged labor. E partograh which is designed to provide benefits for its users, namely there is an audio and visual reminder system that can be used to detect difficulties during childbirth. From the results of the article, it describes the SBA's acceptance of e partographs very well as evidenced by the higher rate of use of epartographs compared to paper partographs.

Keywords: Partograph, Electronic, Obstetric

1. INTRODUCTION

In 2015, an estimated 303,000 women died from complications during childbirth such as bleeding during labor, prolonged labor, and infections(Graham et al., 2016; Say et al., 2014). Prolonged labor directly contributes to 6-10% of the occurrence of death and pain in the mother and baby (Balikuddembe et al., n.d.; Ollerhead & Osrin, 2014). One of the efforts to be able to prevent the occurrence of pain and death in the mother and baby during childbirth is to carry out a fast and appropriate monitoring of the delivery and handling of actions (Ogwang et al., 2009; Windrim et al., 2007). The World Health Organization (WHO) recommends monitoring during childbirth using partographs. .

Partographs are used by skilled birth attendants to document important developments during the labor process. This partograph sheet is prepared to collect and record all the important information over a 12-hour period starting with the onset of contractions until the baby is born. The partograph in acts as a decision-making aid because it indicates when the delivery is proceeding at a normal level and when the officer should prepare to intervene.(L. E. Litwin et al., 2018a)

However, currently the effectiveness of the use of partographs in monitoring childbirth is not optimal. This is related to the attitude of health workers who are still low in the use of paper partographs To overcome this challenge, many researchers have made improvements to partographs(Rahman et al., 2019a), one of the efforts made is to develop partographs in the form of applications (electronic partographs). The e-partograph is an electronic prototype of the paper-based partograph that automatically plots the vita; trends in labour and childbirth. It is fitted alarm systems to alert Provider Health Care workers about the next examination schedule also in case of danger. The development of this partograph is based on android tablets with reference to partographs issued by WHO with the aim of making it easier for officers to monitor and document during childbirth. Therefore, the e-partograph intervenes to improve efficiency in filling patients' information during labour and childbirth, allows PHC workers to seek and receive real-time professional support and reduce time to accessing lifesaving care, even after normal work hours.(Okokon et al., 2014; Weerasekara, 2014)

As new innovations of electronic partograph are increasingly being tested and adopted in resource-poor settings, it is necessary to comprehensively assess what has been achieved in order to inform implementers and policy makers on the effectiveness of technology in

evidence-based practice.

2. METHOD

2.1 Design

This Systematic Review follows the guidelines of the Statement of Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA). (David Moher1 et al., 2015) Data has been completed a review on the journal using four academic data bases (PubMed, Science Direct and Google Scholar) and grey literature from the Journal Conference Series.

2.1 Inclusion & Exclusion Criteria

Selection of the inclusion criteria that have been determined for this systematic review, using PICOS (population, intervention, comparison, outcomes, and study design). The population in this study were Skill birth attendant and obstetric care provider who provide childbirth services and use electronic-based partographs in monitoring them. The exclusion criteria such as labor monitoring using paper partographs.

2.3 Search strategy

This literature search used articles in English from Pubmed, Science Direct, Google Scholar and grey literature from 2016 to 2022. The literature search used the keywords "partograph", "electronic", and "obstetric". The literature search found there were 182 articles filtered using the keywords above. The articles were then narrowed down and identified based on the PICOS and obtained as many as 109 articles that could be included in the article screening process. At the article screening stage according to the suitability of the article based on the abstract, there were 148 articles. Then a feasibility selection was carried out based on the essence and scope of the discussion in the article as a whole, it was found that 14 articles could be made for further selection, namely as many as 13 articles that were included in the inclusion and 1 article were excluded.

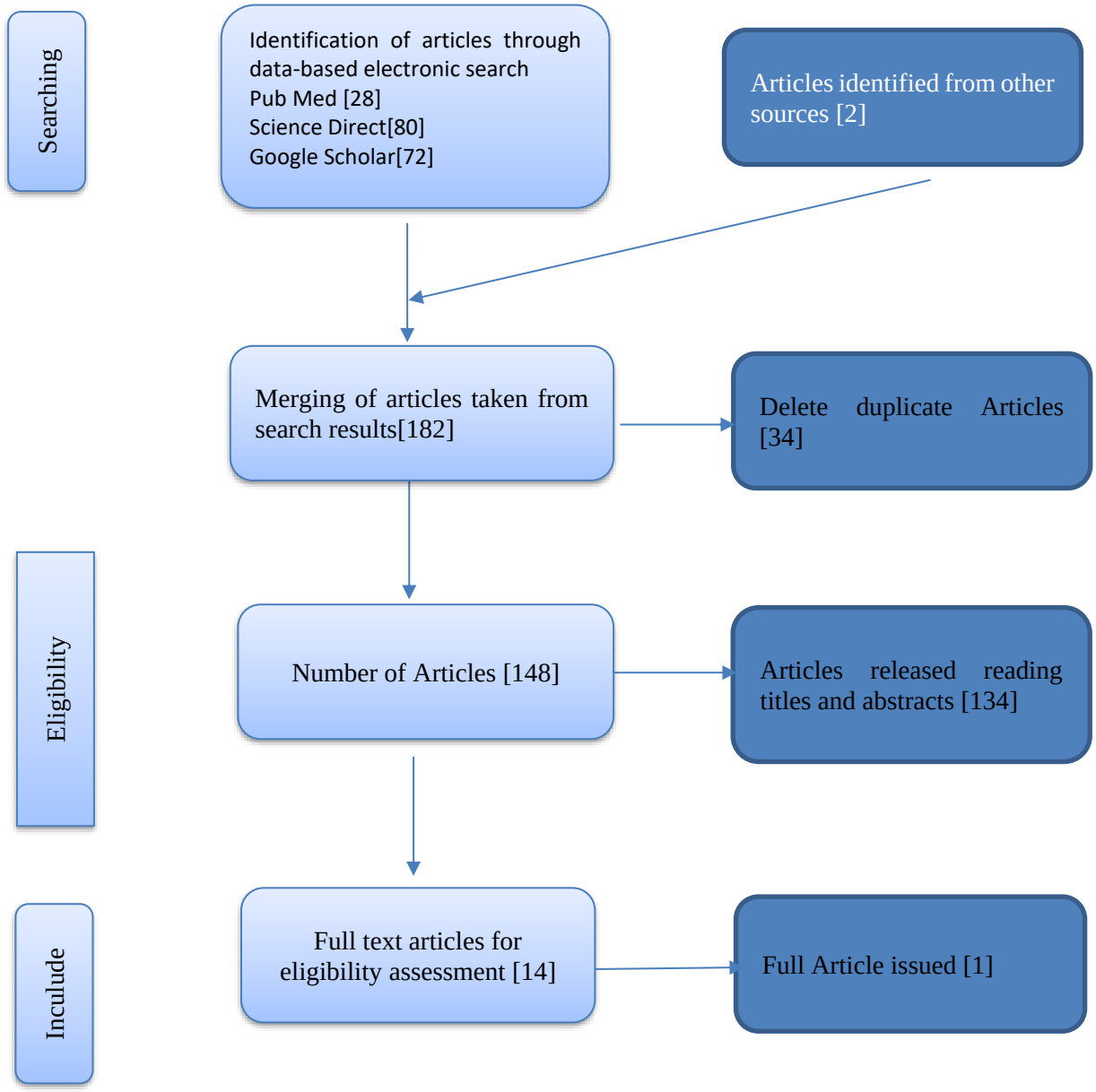

Figure 1 The article selection steps are depicted in the PRISMA flow chart.

2.4 Quality assessment

After collecting the results identify the articles through electronic search the data based articles are exported to a Microsoft Excel spreadsheet. Three authors (WMN, YB and RBU) independently extracted the data and reviewed the filtered and qualified articles. Any disagreements over the results of the 3 reviewers (WMN, YB and RBU) were consensus between the three authors through discussion. The methodological quality of each study (sampling strategy, response rate, and research representation), comparability, and results were

examined using the JBI tool. JBI for cross-sectional, quasi-experimental, and qualitative studies is used to assess the methodological quality of a study and to determine the extent to which a study has addressed possible biases in its design and analysis. All articles that are given a JBI score of 50% or more can be considered "good" studies with low risk.

3. RESULT

3.1 Overview of included studies

Of the 13 studies reviewed, all labor monitoring used application-based partographs. The name used is different. "Life Curve" [1], mLabour [4], PrasavGraph [5], DAKSH [12] is an android-based Mobile applications (Begum et al., 2020a; Schweers et al., 2016a; M. Singh et al., 2019; S. Singh et al., n.d.-a), electronic partograph (e partograph) [2,3,7,8,10] are some of the names of tools used for childbirth monitoring with different devices that can be accessed using a smartphone or tablet PC or computer device , digital partograph [11,13] is some of the names of tools used based on android and Word Electric Browser (WEB); and some other names such as Web-Based Partograph, and midwifery documentation use Web Based. No. 5.9] (L. E. Litwin et al., 2018b; Rahman et al., 2019b; Sanghvi et al., 2019a; States & States, 2022; Tadesse et al., n.d.)(Ahmad et al., 2019; Tandiallo et al., 2019) . These studies were conducted in 5 countries namely India [1,3,4,5,7,12], Indonesia [6,9,11,13] Kenya [2], Tanzania [8], and Northwest Ethiopia [10]. Judging from the results of the article, it shows that users of this application-based partograph are varied. In Indonesia the users of partograph application are midwives [6,9,13], midwifery students [11], and researcher [9]; in contrast to other countries for the life Curve [India] application, m labour [India] used by doctors during childbirth monitoring [1,4], DAKSH [India] used by nurses [12]; e partogram [Kenya] used by Skill Birth Attandent (SBA): Doctor, Nurse, Midwife. e partograph [India] is used by SBA (doctors, midwives, nurses) [3] and Staff nurses and medical officers [7]. e partograph [Northwest Ethiopia] used by Obstetric care providers (a certified midwife, nurse, Health Officers, Integrated Emergency Obstetrics and Surgery & Medical Doctors who provide care for the woman during labor and delivery) [10]. To aid ease of understanding, we took the studies as the unit of analysis and different articles in which they are reported. Results are presented in a narrative format.

Table 1. Overview of included studies

No	Authors	Years	Countries	Name Aplication	usser	Study Design	Score JBI %
1	Begum et al	2017	India	Life Curve	Docthete	*Cross-sectional*	75
2	Sanghvi et al	2017	Kenya	e partogram	Skill Birth Attandent (SBA): Doctor, Nurse, Midwife	Mixed-method, quasi-experimental	89
3	Rahman et al	2019	India	e partograph	SBA (doctor, midwife, nurse)	Quasi-experimental	100
4	Schweers et al l	2016	India	m labour	Doctor	Qualitative	50
5	Singh et al	2016	India	PrasavGraph	a resident doctor	Qualitative	50
6	Juwita et al	2019	Indonesian	Midwifery Documentation Use Web Based	Midwives	*Cross-sectional*	50
7	Singh et al	2021	India	e partograph	Staff nurses and medical officers	Cross-sectional	75
8	Litwin et al	2018	Tanzania	e partograph	SBA	Qualitative	50
9	Tandiallo et al	2019	Indonesian	Web-Based Partograph	researcher	Quasi-experimental	100
10	Tadesse et al	2019	Northwest Ethiopia	e partograph	Obstetric care providers (a certified midwife, nurse, Health Officers, Integrated Emergency Obstetrics and Surgery & Medical Doctors who provide care for the woman during labor and delivery)	Cross-sectional	100
11	Ulfa et al	2020	Indonesian	Digital Partograph	Midwife students	Cross-sectional	50
12	Singh et al	2019	India	DAKSH	nurses	Cross-sectional	88
13	Ningrum et al	2019	Indonesian	Digital Partograph	Midwife	Qualitative	70

3.2 Comparing The Efficacy of e Partograph and paper Partograph [1,2,3,6,8,9]

The use of partographs is one of the important steps to ensure that the care provided to mothers and newborns during childbirth is of high quality. The development of application-based partographs aims to improve upcare during childbirth by overcoming the challenges of low use of paper partographs. (Begum et al., n.d.; L. Litwin et al., n.d.; Schweers et al., 2016b). From the results of the article analysis carried out, there was an increase in labor outcomes based on monitoring using application-based partographs (e partographs) compared to paper partographs. In monitoring childbirth using the Life Curve Mobile application by measuring the performancep arameter which is assessed on a scale of 1-5 with a total score of 45. The results showed that the Life Curve had a score of 42.7 compared to the paper partograph with a score of 19.52. This shows that the difference is very significant (p=.001). The average score±SD life curve (4.74±.52) is statistically much higher than that of paper partographs (2.17±1.18): p<.0002. These results showed an increase in SBA performance in childbirth care using a life curve mobile application. (Begum et al., 2020b). In line with the results of other studies that show that using an e partograph is easier to maintain normal labor and take action. The results of the analysis of the article can be seen for the use of e partographs can be complications in the mother and janis during childbirth. The use of e Partograms was lower in the likelihood of fetal outcomes with complications than paper partographs, with a yield of 56% (95% CI= 27%-73%), lowering the trend of cesarean section rates [43% to 37% at Jessore Hospital and from 36% to 25% at Kushtia Hospital] and a reduction in long labor [identified 42% of long labor with paper partographs ,monitoring by using e partographs of old labor dropped to 29%], (Rahman et al., 2019a; Sanghvi et al., 2019b).

From the results of the analysis of the article, it explains the reasons for the development of this application-based partograph to solve various problems that arise when using paper partographs, one of which is the use of very low paper partographs. From the results that can be seen, the use of e partographs shows that (Ningrum et al., 2019)the recording frequency appears higher in web-based partographs, namely by 26 (86.7%) compared to the speed of recording using conventional methods, which is 25 (83.3%), the majority of SBA (87-91%) complete the filling of ePartograms, WEB-based partographs are faster in recording contractions, oxytocin, and the process of giving birth to a p-value of 0.000 (<0.05). (Ahmad et al., 2019)(L. E. Litwin et al., 2018b)(Tandiallo et al., 2019). These results show that e partographs are more effective in maintaining normal delivery, preventing the occurrence of

difficulties during childbirth and increasing use during labor monitoring.

3.3 Advantages of e Partograph with paper Partograph [1,2,5]

Partographs are tools for recording the progress of childbirth. The key parameters in the partograph are the progress of childbirth (opening of the cervix, the lowest decrease in parts, contractions), the condition of the mother (blood pressure, pulse and temperature) and the condition of the fetus (the soluble pulsation of the fetus, amniotic water and moulage). On the monitoring of the partograph paper filling and interplay depends on the person who fills. In the e partograph there are several advantages that can be felt when using it. Partograph application (e partograph) developed in the form of a mobile phone or tablet based on android [1,2,3,4,5,7,8,10,12,13], with a web-based computer device [6,9,11], with advantages made by each developer. One of the benefits of using partographs is that it can make decisions when carrying out childbirth, whether this delivery can be helped or needs an action(Ayenew & Zewdu, 2020; Ningrum et al., 2019). In e partographs there are several advantages compared to paper partographs. In some system applications, it is contained by adding a notification feature in the form of an audio or visual alert, which shows the charging time, and the difficulties that occur in mothers and babies [1,2,3,7,8,12,13]. This notificationsystemis very helpful for users to determine what decisions and actions should be taken.

In some applications there is another advantage, namely being able to save the data that has been filled in, a graph appears according to the data filled with varying display results [2,3,12,13]. This partograph application uses a "delay-tolerant framework", which allows it to be used even in poor internet network conditions(S. Singh et al., 2016), and some can even be used by not using the internet network(Ningrum et al., 2019). This shows that e partographs have other benefits compared to paper partrographs. Several developers have focused on low-cost digital applications to address deficiencies in the paper partograph, improve recordkeeping, support decision making, and enhance quality of care during labor and delivery(Adepoju et al., 2017)

3.4 Acceptance of e Partograph di Among Health Workers

The development of applications on partographs aims to make it easier for users to fill in partographs. Most SBA agree that e partographs make it easier to fill and increase their use, but it needs to be a concern for obstetric services with a high rate of maternity cases. It takes a lot of SBA to be trained to be more optimal in its utilization. (Sanghvi et al., 2019b). Almost all SBA (93%) show confidence and comfort in using e Partogram, SBA gives a positive impression and feels efficient and easy to use. The SBA expressed confidence in their ability to interpret and act on the reminders and warnings contained in the e partograph. By using e partograh there is a change in behavior from the SBA related to the filling of partograph(L. Litwin et al., n.d.; Ningrum et al., 2019)

Table.2 Summary of Selected Studies

No.	App Name	Description of partograph applications	Outcome	Result
1	Life Curve	mobile application, android based, This app will analyze all the entered data and draw the pictogram of the corresponding color. This pictogram shows the condition of the mother and baby by three colors: red, yellow and green: where red indicates 'critical', yellow 'need for close observation' and green 'safe condition'. Any critical condition of the mother and or baby will generate an automatic SMS	utilization of life Curve Mobile application in childbirth	The average age of the subjects was 25.9±5.7 years, the average gestational age was 39.6±.9 months, and 83% had vaginal delivery. The application is easy to fill, automatically generates graphs, pulls to work on, provides automatic timely reminders for evaluating childbirth, generates digital color-coded alert numbers, sends automatic text messages to supervisors in abnormal situations. Performance parameters are assessed on a scale of 1-5. To compare the advantages of using these two partographs, nine features were compared with a total score of 45. The total score for the Live Curve has 42.7 and for the paper partograph is 19.52 the difference is very significant (p=.001). The average score±SD of the life curve (4.74±.52) is statistically much higher than that of paper partographs (2.17±1.18): p<.0002.
2	e partogram	android tablet based, there is an audio and visual reminder system when it comes to doing the next check and in case of complications. The application is made efficient when data entry automatically graphs appear, and the data is stored in the application. In addition to filling in the past data can not be done	utilization of e Partogram to maintain normal delivery	The results showed a comparison of data from 842 active phase maternity clients using ePartograms with data from 1,042 clients monitored using paper partographs. SBA using ePartograms was easier to take action and maintain normal delivery compared to SBA using paper partographs, such as ambulation, feeding, and fluid intake, and to address abnormal measurements of fetal well-being (14.7% versus 5.3%, adjusted relative risk =4.00, 95% confidence interval [CI]=1.95–8.19). The use of ePartograms was associated with 56% (95% CI= 27%-73%) lower likelihood of fetal outcomes with complications than paper partographs. Users of ePartograms are more likely to adhere to routine labor observations. The SBA states that the technology is easy to use but raises concerns about its use in locations with high amounts of childbirth. More research is needed to evaluate the costs and benefits and to include the recent WHO guidance on labor management .

No.	App Name	Description of partograph applications	Outcome	Result
3	e partograph	E partographs can be accessed via a smart phone or tablet pc or computer device. There is a system in the e-partograph software to give a red signal for any abnormalities of the mother or fetus during the active phase of labor. The application has the option to store data both in local storage and in remote central database storage at the same time. Local storage contains data for a while; the remote server contains data permanently which makes partograph information searchable anytime and anywhere. The app allows partograph data to be monitored remotely	testing the feasibility and effectiveness of partograph applications	In total 2,918 deliveries were performed in Jessore DH and 2,312 in Kushtia DH during the one-year study period. Of these, 1012 (506 in each facility) childbirth was monitored using partographs (paper or electronic). The trend of facility-based cesarean section rates is declining in both hospitals; 43% to 37% in Jessore and from 36% to 25% in Kushtia Hospital. There is a significant reduction in cases of prolonged childbirth with the use of e-partographs. In Kushtia DH, labor monitoring was carried out with paper partographs identified 42% of long labor, monitoring using e partographs of long labor dropped to 29% during phase-2. Similar results were observed in Jessore DH where the rate of long labor was reduced to 7% with paper partographs from 30% of long labors reported with e-partographs. The user rate of e-partographs was higher than that of paper partographs during both phases (phase 1: 3.31, CI: 2.04–5.38, p < .001 and in phase 2: 15.20 CI: 6.36–36.33, p < .001) after adjusting for maternal age, parity, gestational age, religion, maternal education, husband education, and fetal sex
4	m labour	a mobile application	the use of ml labour in documenting partographs	m Labour helps physicians detect long and obstructed labor quickly, while avoiding usability difficulties that reduce paper partographs. mLabour combines a reminder system, decision support for emergencies, and support for the full patient lifecycle, from admission to referral
5	PrasavGraph	The application is made based on android, made using the "delay-tolerant framework", which allows it to be used even in poor internet network conditions	PrasavGraph application for childbirth monitoring	It is easy to use on a smartphone, so it is hoped that the partograph will be easier to use in the delivery process of health workers in the peripheral area which until now is still very low
6	Midwifery Documentation Use Web Based	The application web based	Recording Speed	The results showed that the frequency of recording appeared to be higher on web-based partographs, namely 26 (86.7%) compared to the speed of recording using conventional methods, which was 25 (83.3%)
7	e partograph	The tablet-based partograph application used is named DAKSH. The app allows the integration of	Use and Acceptance	The results showed that nursing staff and medics concluded that tablet-based partographs were better than paper-based partographs because

No.	App Name	Description of partograph applications	Outcome	Result
		several features such as alerts and alarms to improve the user experience.		they save time and were easy to use. It is useful for healthcare workers as it has a reminder feature
8	e partograph	Android Tablet partograph app, with special attention to improving the ease and efficiency of real-time documentation	feasibility and use of e partograph	Observations of 23 SBA using an ePartogram to monitor 103 deliveries of 84 shifts showed that the majority of SBA (87-91%) completed the filling of the e Partogram: registering the client, first and subsequent observations, and using the screen easily on the first shift; this increases to 100% on the fifth shift. Almost all SBA (93%) showed confidence and comfort in using the ePartogram on the fifth shift. SBA expresses a positive impression of the ePartogram and feels efficient and easy to use, starting with the use of the first client. The SBA records the usefulness of auditory reminders (indicating that measurements are due) and visual alerts (indicating abnormal measurements). The SBA expresses confidence in their ability to interpret and act on these reminders and warnings.
9	Web-Based Partograph	computer-based partographs with the use of internet networks	utilization of web-based partographs	The results showed that the use of WEB-based partographs was faster in recording contractions, oxytocin, and childbirth processes compared to the use of conventional partographs. In addition, the accuracy of WEB-based partographs in early detection has a p-value of 0.000 (<0.05) and the p-value in emergency detection is 0.014 (<0.05) which means that there is a difference between the use of WEB-based partographs and conventional partographs. Meanwhile, the p-value of the referral process is 1,000 (>0.05) which means there is no difference in the use of WEB-based partographs and conventional partographs.
10	e partograph	partograph in mobile phone	Mobile phone usage for e-Partograph	The study found that 460 (99.6%) care providers had cell phones. Smartphone owners accounted for only 102 (22%). Of them, 205(46%) are willing to use mobile phones for e-Partograph. Care providers aged >30 years (AOR = 2.85, 95% C.I: 1.34-6.05), medical doctors and higher level doctors (AOR = 8.35.95% C.I: 2.07-33.63), Health Centers (AOR = 4.41, 95% C.I: 0.10-9.26), favorable attitude towards Partgrapho (AOR = 2.76.95% C.I: 1.49-5.09) and training in related services (AOR = 7.63.95% C.I: 3.96-14.69) are supporting factors for willingness to use mobile phones

No.	App Name	Description of partograph applications	Outcome	Result
11	Digital Partograph	web-based partograph design	the use of digital partographs as a learning media	the median pretest score is 71.09 from these data which can be concluded that the knowledge of the respondents was put into a sufficient category, after conducting learning using digital partograph media, the skill of filling partography in students has increased to 85.95 with an excellent category. Meanwhile, the significance of the p-value is 0,000 < 0.05, meaning that digital partographs as a learning medium are very effective for developing partographic filling skills
12	DAKSH	DAKSH is a tablet-based application. The app is designed to provide real-time labor monitoring, basic decision-making support with better alerts and logging	utilization of DAKSH	A total of 10 staff nurses from these healthcare centers used the application to monitor 424 pregnancies for a period of 10-months. During this period the hospital observed around 463 childbirths and out of which 91.56% (n=424) were recorded into the application
13	Digital Partograph	Android-based partographs, real-time recording, there is a notification system in case of labor difficulties, can be accessed on the playstore	use of digital partographs, behavior change, stakeholder support	Research shows that the information systems contained in digital partographs have met the aspects of system quality, information quality and user satisfaction. The application of digital partographs has met the use in clinical decision making, monitoring of labor progress, documentation, monitoring of maternal and fetal conditions, digital partographs, and support from stakeholders for the application of digital partographs. Based on the results of the study, it was concluded that the digital partograph application can already be used as a tool to monitor the development of births and can already be accessed on Google Playstore. With the existence of digital partographs, there is a change in the behavior of midwives in their use.

DISCUSSION

Digital partographs are designed to solve various problems that arise when using paper partographs. Many researchers have developed partograph applications in different countries of the world, but all of them have varying effectiveness, advantages and acceptance rates.(Ningrum et al., 2019)

Based on Sanghvi et al. (2017), the use of e-partograph applications has a higher effectiveness than using paper partographs. This is shown by the use of e-partographs associated with 56% (95% CI= 27%-73%) lower likelihood of fetal outcomes with complications than paper partographs. Users of ePartograms are more likely to adhere to routine labor observations. Similarly, Rahman et al. (2019), explained that the trend of facility-based cesarean section rates is declining in both hospitals; 43% to 37% in Jessore and from 36% to 25% in Kushtia Hospital, Bangladesh. Similar results were observed in Jessore, Banglasdesh, where the rate of long labor was reduced to 7% with paper partographs from 30% of long labors reported with e-partographs. Litwin et al (2018) stated that the use of e Partogram to monitor 103 deliveries of 84 shifts showed that the majority of health workers completed the filling of the e Partogram: registering the client, first and subsequent observations, and using the screen easily on the first shift; this increases to 100% on the fifth shift. In terms of recording, the use of e-partographs is reported to be more effective when compared to paper partographs, as stated by Juwita et al (2019) that the results showed that the frequency of recording appeared to be higher in web-based partographs, namely 26 (86.7%) compared to the speed of recording using conventional methods of 25 (83.3%). Research byTandiallo et al (2019) shows that the use of WEB-based partographs is faster in recording contractions, oxytocin, and childbirth processes than the use of conventional partographs. In addition, the accuracy of WEB-based partographs in early detection has a p-value of 0.000 (<0.05) and the p-value in emergency detection is 0.014 (<0.05) which means that there is a difference between the use of WEB-based partographs and conventional partographs. Meanwhile, the p-value of the referral process is 1,000 (>0.05) which means there is no difference in the use of WEB-based partographs and conventional partographs. The research developed by Ulfa et al (2020) is the effectiveness of e-partographs as student learning media, from the results of this research, digital partographs as a learning medium are very effective for developing partographic filling skills

Based on Begum et al. (2017), e-partograph applications have the advantage of being easier to fill, automatically generating graphs, more interesting to work with, providing timely automatic reminders to evaluate childbirth, generating digital color-coded warning numbers, and sending

automatic text messages to supervisors in abnormal situations. Singh et al (2016) also showed that e-partographs are easy to use on smartphones, so it is hoped that partographs will be easier to use in the delivery process of health workers in peripheral areas which until now are still very low. Research on the advantages of e-partographs is also by Ningrum et al (2019), which shows that the information systems contained in digital partographs have met the aspects of system quality, information quality and user satisfaction. The application of digital partographs has met the use in clinical decision making, monitoring of labor progress, documentation, monitoring of maternal and fetal conditions, digital partographs, and support from stakeholders for the application of digital partographs.

Some studies also assess the level of acceptance of e-partographs by health workers. Based on Singh et al (2021) showed that nursing staff and medics concluded that tablet-based partographs are better than paper-based partographs because they save time and are easy to use. Research by Litwin et al. (2018) showed that almost all health workers (93%) showed confidence and comfort in using the ePartogram on the fifth shift, health workers expressed a positive impression of the ePartogram and felt efficient and easy to use it, health workers expressed confidence in their ability to interpret and act on reminders from this e-partograph. Tadesse et al (2019) assessed the level of acceptance of e-partographs in terms of cellphone ownership for application installation, from the survey results obtained as many as 205 (46%) were willing to use mobile phones for e-Partograph.

CONCLUSION

Most studies have shown that the development of application-based partographs aims to facilitate the process of monitoring childbirth. With e partograph the end result of childbirth is better than with paper partographs. E partograph is able to maintain normal delivery, lowering the incidence of participular section and prolonged labor. In addition, e partograh has the advantage that there is an audio and visual reminder system that can be used to detect difficulties during childbirth, all data is stored and can be accessed again so that the documenting system is easier. And the SBA acceptance rate of e partograph is very well proven by the higher rate of use of e partigraph compared to paper partograph.

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CONFLICT OF INTEREST

None

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Enrique Santiago López-Loyo <lopezloyoe@gmail.com> **01 September 2022 at 10:02**
To: widyamayaningrum@unigal.ac.id

Dear Mrs. Widya Maya Ningrum:

Thank you for sending your manuscript, ID 25058, entitled "The effectiveness and usability of electronic partograph for obstetric care: A systematic review" to Gaceta Médica de Caracas. Your manuscript has been peer-reviewed and may be considered for publication after the necessary revisions are completed to the Editors satisfaction.

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The Effectiveness and Usability of Electronic Partograph for Obstetric Care: A Systematic Review

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ABSTRACT

Introduction: Partograph is an instrument used in monitoring and prevention of labor complications. Unfortunately, a large number of situations where there is limited awareness of how to use a partograph as a labor monitoring tool. One of the efforts made is to develop partographs in the form of electronic partograph (e-partograph) applications. The systematic purpose of this review is to look at the Effectiveness and Usability of Electronic Partograph for Obstetric Care

Methods: This study carried out a systematic review of journals using three academic databases (Science Direct, PubMed, Google Scholar) with a publication range from 2016 to 2022. Furthermore, the subjects in this study were skilled birth attendants (SBAs) and obstetric care providers. Inclusion criteria in the literature study were use electronic-based partographs in monitoring. The guidelines for reviewing journals used Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA).

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Results: The results of 13 studies exploring the e-partograph in the last six years (2016-2022). Most of the results reviewed the effectiveness of using e-partographs compared to paper partographs. In addition, the e-partograph has shown another advantage, there was a reminder system when filling in data by the SBA. It could identify if the labor process was normal or required further treatment. The use of an e-partograph could effectively save time and was easy to use, SBA was easy to accept and apply.

Conclusion: The use of e-partograph gives better final results than paper partograph. E-partograph is able to maintain normal delivery, reduce the incidence of cesarean section and prolonged labor. The e-partograph was designed to provide benefits for its users, there was an audio and visual reminder system that could be used to detect complications during childbirth.

Keywords: Electronic, Health Care, Obstetric, Partograph

INTRODUCTION

Infections, prolonged labor, bleeding, and other complications after childbirth are thought to have perished 303,000 women in 2015 (Graham et al.(Patabendige et al., 2021), 2016; Say et al., 2014). Moreover, long labor directly comes uopp with 6-10% of maternal and infant mortality and morbidity (Balikuddembe et al., 2014). One of the efforts to prevent the occurrence of morbidity and mortality in mothers and babies during childbirth is by monitoring labor and handling fast and appropriate actions (Ogwang et al., 2009; Windrim et al., 2007). The World Health Organization (WHO) advocates a partograph to observe during labor. (Patabendige et al., 2021)

Skilled birth attendants utilize partographs to record significant developments during labor. This partograph sheet was created to gather and record all pertinent data over a 12-hour period, beginning with the start of contractions and ending with the delivery of the baby. This partograph helps staff members make decisions by indicating when labor is moving normally and when they should be equipped to step in. (LE Litwin et al., 2018a)

However, the effectiveness of using partograph in monitoring labor is not optimal currently. This is related to the attitude of health workers who still lack knowledge in the use of paper partographs. Furthermore, to overcome this challenge, many researchers have made improvements to partographs (Rahman et al., 2019a), one of the efforts made is to develop partographs in the form of applications (electronic partographs). An electronic version of the paper-based partograph that automatically plots labor and delivery trends is called a "e-

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partograph." It has alarm systems installed to notify Provider Health Care staff of the upcoming examination schedule in case of danger. In addition, the development of this partograph is based on an android tablet with reference to the partograph issued by WHO with the aim of making it easier for officers to monitor and document during childbirth (Okokon et al., 2014; Weerasekara, 2014). Therefore, the e-partograph intervenes to improve efficiency in filling patients' information during labor and childbirth, allows Primary health care (PHC) workers to seek and receive real-time professional support and reduces time to accessing lifesaving care, even after normal work hours.

On the other hand, seeing as new electronic partograph innovations are increasingly being tested and implemented in situations with limited capacity, it is critical to carefully assess what has been accomplished in order to inform implementers and policy makers on the effectiveness of technology in evidence-based practice.

METHODS

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Study Design

This Systematic Review follows the guidelines of the Statement of Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) (David Moher1 et al., 2015). The data has completed a review on the journal using three academic databases including PubMed, Science Direct, and Google Scholar.

Inclusion and Exclusion Criteria

Selection of the inclusion criteria that have been determined for this systematic review, using population, intervention, comparison, outcomes, and study design (PICOS). Furthermore, population in this study were skilled birth attendants and obstetric care providers who provide childbirth services and use electronic-based partographs in monitoring them. This study was also including grey literature. Moreover, the exclusion criteria such as labor monitoring using paper partographs.

Search Strategy

This literature search used articles in English from Pubmed, Science Direct, and Google Scholar from 2016 to 2022. The literature used the keywords "partograph", "electronic", and "obstetric". The literature found there were 182 articles filtered using the keywords above. The articles were then narrowed down and identified based on the PICOS and obtained as many as

109 articles that could be included in the article screening process. In the meantime, at the article screening stage according to the suitability of the article based on the abstract, there were 150 articles. Then a feasibility selection was carried out based on the essence and scope of the discussion in the article as a whole, it was found that 16 articles could be made for further selection, namely as many as 13 articles that were included in the inclusion and 3 article were excluded.

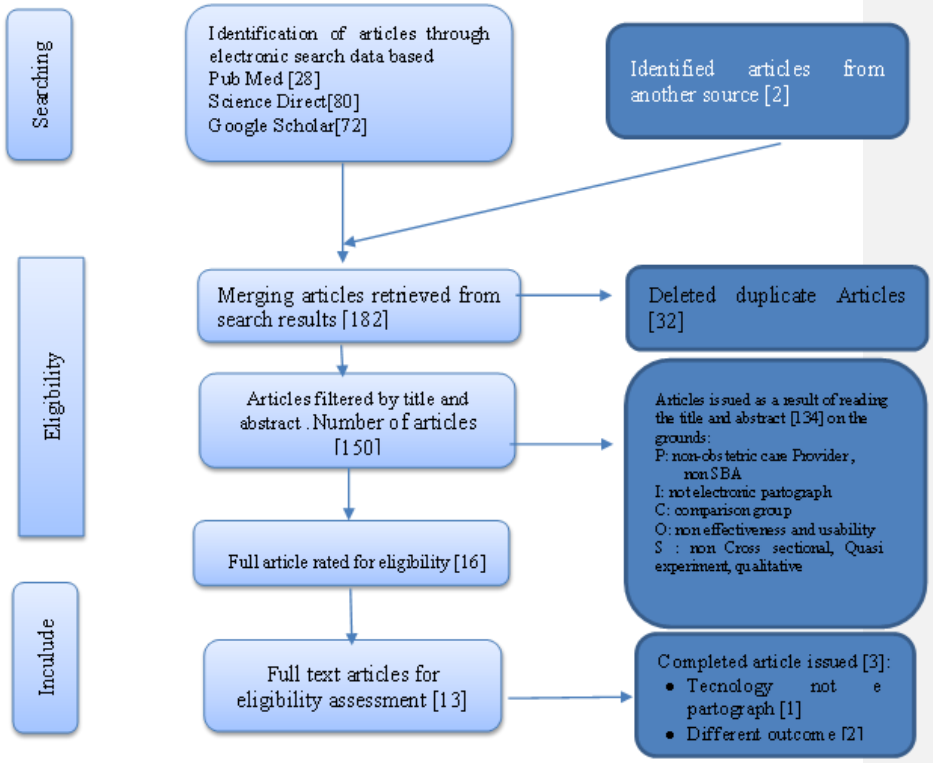

Figure 1

Steps for selecting articles are illustrated in the PRISMA flowchart

Quality Assessment

The outcomes from the electronic search data-based articles were gathered, identified, and then exported to a Microsoft Excel spreadsheet. The filtered and qualified publications were evaluated and data were independently extracted by three writers (WMN, YB, and RBU). Additionally, any differences of opinion among the three authors (WMN, YB, and RBU) about the findings of the three reviewers were resolved through discussion and consensus. Additionally, each study's comparability, methodology (including sampling approach, response rate, and study representativeness), and outcomes were analyzed using JBI tools. For cross-sectional, quasi-experimental, and qualitative investigations, the JBI was used to rate the methodological soundness of a study and assess the degree to which potential biases in its design and analysis had been addressed. Therefore, all articles assigned a JBI score of 50% or more could be considered a "good" low-risk study.

RESULTS

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Overview of Included Studies

The thirdteen studies have been reviewed and all labor monitoring used application-based partographs. The use of the term was different from one another. "Life Curve" [1], mLabour [4], PrasavGraph [5], DAKSH [12] are android-based Mobile applications (Begum et al., 2020a; Schweers et al., 2016a; M. Singh et al. , 2019; S. Singh et al., nd-a), one of the terms for the tools used for childbirth monitoring with various gadgets that may be accessed using a smartphone or tablet or other devices (e partograph) [2,3,7,8,10]. (LE Litwin et al., 2018b; Rahman et al., 2019b; Sanghvi et al., 2019a; States & States, 2022; Tadesse et al., nd), digital partograph [11 ,13] is some of the names of tools used based on android and Word Electric Browser (WEB); and some other names such as Web-Based Partograph, and midwifery documentation use Web Based.[5,9] (Ahmad et al., 2019; Tandiallo et al., 2019).

Furthermore, these studies were conducted in 5 countries as follows: India [1,3,4,5,7,12], Indonesia [6,9,11,13] Kenya [2], Tanzania [8], and Northwest Ethiopia [10]. As a consequence of concluding the results of the articles, it showed that users of this application-based partograph were varied. In Indonesia the users of partograph application were midwives [6,9,13], midwifery students [11], and researcher [9]; in contrast to other countries for the life Curve [India] application, m labor [India] used by doctors during childbirth monitoring [1,4], DAKSH [India] used by nurses [12]; e partogram [Kenya] used by Skilled Birth Attendant (SBA): Doctor, Nurse, Midwife. e partograph [India] was used by SBA (doctors, midwives,

nurses) [3] and Staff nurses and medical officers [7]. e partograph [Northwest Ethiopia] used by Obstetric care providers (a certified midwife, nurse, Health Officers, Integrated Emergency Obstetrics and Surgery & Medical Doctors who tend to the woman's needs throughout birth and delivery) [10]. Accordingly, in an attempt to make the analysis more comprehensible, we used the research and the numerous publications in which they were reported. As a result, the findings were presented in a narrative form.

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Table 1

Overview of Included Studies

No	Authors	Years	Countries	Name Application	User	Study Design	Score of JBI (%)
1	Begum et al	2017	India	Life curve	Doctor	Cross-sectional	75
2	Sanghvi et al	2017	Kenya	E-partogram	Skill birth attandent (SBA): doctor, nurse, midwife	Mixed-method, quasi-experimental	89
3	Rahman et al	2019	India	E-partograph	SBA (doctor, nurse, midwife)	Quasi-experimental	100
4	Schweers et al	2016	India	M-labour	Doctor	Qualitative	50
5	Singh et al	2016	India	Prasav graph	Doctor	Qualitative	50
6	Juwita et al	2019	Indonesia	Midwifery documentation use web based	Midwives	Cross-sectional	50
7	Singh et al	2021	India	E-partograph	Staff nurses and medical officers	Cross-sectional	75
8	Litwin et al	2018	Tanzania	E-partograph	SBA	Qualitative	50
9	Tandiallo et al	2019	Indonesia	Web-based partograph	researcher	Quasi-experimental	100
10	Tadesse et al	2019	Northwest Ethiopia	E-partograph	Prenatal care providers	Cross-sectional	100

No	Authors	Years	Countries	Name Application	User	Study Design	Score of JBI (%)
					(midwife, nurse, health officers, doctor)		
11	Ulfa et al	2020	Indonesia	Digital partograph	Midwife students	Cross-sectional	50
12	Singh et al	2019	India	DAKSH	Nurses	Cross-sectional	88
13	Ningrum et al	2019	Indonesia	Digital partograph	Midwife	Qualitative	70

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Comparing The Efficacy of e Partograph and paper Partograph

The use of the partograph is an important step to ensure the care provided high quality to mothers and newborns during labor. As a further matter, the development of an application-based partograph aims to improve care during labor by overcoming the challenge of the low use of paper partographs.(Begum et al., 2020) (L. E. Litwin et al., 2018) (Schweers et al., 2016) Additionally, from the results of the analysis of the articles carried out, there was an increase in labor outcomes based on monitoring using an application-based partograph (e partograph) compared to a paper partograph. Thus, in labor monitoring using the Life Curve Mobile application, measuring performance parameters are assessed on a scale of 1-5 with a total score of 45. Therefore, the results revealed that the Life Curve has displayed a score of 42.7 compared to the paper partograph with a score of 19.52. This demonstrates that the difference (p =.001) is highly significant. The paper partograph (2.17±1.18) was statistically significantly lower than the average-SD life curve (4.74±.52): p.0002. These findings showed that the use of a life curve mobile application improved SBA's efficiency in providing delivery care. (Begum et al., 2020b). In addition, this is in line with the results of other studies which showed that using an e-partograph was easier to maintain normal labor and take action. On the other hand, the e-partograph usage during delivery could complicate things for the mother and fetus, according to the examination of the article's data. In turn, the use of the e Partograph results in a result of 56 % (95 % CI = 27 % -73 %), a tendency away from caesarean sections [43 %to 37 % at Jessore Hospital and from 36 percent to 25 % in Kushtia Hospital] and away from preterm labor [42 % recognized extended labor using paper partographs, monitoring using an ePartograph] compared to the use of the paper partograph. (Rahman et al., 2019a; Sanghvi et al., 2019b).

The results of the article analysis explained the reasons for developing this application-based partograph to solve various problems that arise when using paper partographs, one of which was the very low use of paper partographs (Ningrum et al., 2019). From the results that could be seen the use of e-partographs revealed that the frequency of recording appears to be higher on web-based partographs, which is 26 (86.7%) compared to the speed of recording using conventional methods, which is 25 (83.3%) (Ahmad et al., 2019), the majority of SBA (87-91%) completed Partograph filling (LE Litwin et al., 2018b), WEB-based partographs were faster in recording contractions, oxytocin, and delivery p-value 0.000 (<0.05). (Tandialo et al., 2019). Therefore, these results indicated that the e-partograph was more effective in maintaining normal delivery, preventing complications during labor and increasing use during labor monitoring.

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Advantages of e Partograph with paper Partograph

Partograph is an instrument to track record the progression of labor. The key parameters in the partograph are the progression of labor (cervical dilating, contractions, and descent of the bottom portion), maternal health (systolic pressure, pulse and temperature) and fetal condition (fetal heart rate, amniotic fluid and moulage). In monitoring the paper partograph, the filling and interpretation depends on the person filling it out. In e partograph there are several advantages that could be felt when using it. Moreover, the partograph application (e partograph) developed in the form of a mobile phone or tablet based on android [1,2,3,4,5,7,8,10,12,13], with a web-based computer device [6,9,11], with the advantages made by each developer. One of the benefits of using a partograph is being able to make decisions when monitoring labor, whether this delivery can be assisted or an action is needed (Ayenew & Zewdu, 2020; Ningrum et al., 2019). The e-partograph has several advantages over the paper partograph. In some system applications, which are made by adding notification features in the form of audio and visual warnings, which show the charging time, and complications that occur in mothers and babies [1,2,3,7,8,12,13]. This notification system really helps users to determine what decisions and actions to take.

In some applications, there are other advantages, such being able to store data that has been filled in, graphs appear according to the data filled in with varying display results [2,3,12,13]. This partograph program has made use of a "delay-tolerant framework," making it usable even in unfavorable internet network circumstances. (S. Singh et al., 2016), and some can even be used without using the internet network (Ningrum et al., 2019). This shows that the e-partograph has other benefits compared to the paper partograph. Throughout the labor and delivery process, several inventors have concentrated on low-cost digital solutions to address problems with the paper partograph, improve care quality, enhance documentation, and facilitate decision-making. (Adepoju et al., 2017)

Acceptance of e Partograph at Among Health Workers

Application development on partographs aims to make it easier for users to fill in partographs. Most of the SBAs agree that the e-partograph greatly simplifies filling and increases its use, but it should be a concern for obstetric services with a high rate of delivery cases. It takes a lot of SBA who are trained in order to be more optimal in their utilization. (Sanghvi et al., 2019b). Almost all SBA (93%) showed confidence and comfort in using e Partograph, SBA gave a positive impression and felt efficient and easy to use. The SBA expresses faith in their capacity to comprehend and take action on the reminders and cautions

provided in the e-partograph. The SBA's behavior in relation to filling out the partograph changes while using the e-partograph. (L. Litwin et al., n.d.) (Ningrum et al., 2019)

Tabel 2

Summary of Selected Studies

No	App Name	Description	Outcome	Result
1	Life Curve	Aplikasi berbasis android, dilengkapi dengan warna yang muncul di layar untuk menggambarkan kondisi ibu dan anak	The utilization of life curve	The tool is simple to use, automatically creates graphs, collects data for work, prompts users to evaluate childbirth, generates digital color-coded alarm numbers, and automatically texts managers in unusual circumstances. The evaluation of performance metrics is done on a scale of 1 to 5. Nine features with a combined score of 45 were examined in order to compare the benefits of employing these two partographs. The overall results for the paper partograph (19.52) and the Live Curve (42.7) are significantly different from one another (p.001). The average scoreSD for the life curve is exactly remarkably higher (4.74±.52) than for paper partographs (2.17±1.18): p.0002.
2	e partogram	Aplikasi Berbasis tablet android, terdapat sistem pengingat audio dan visual ketika datang untuk melakukan pemeriksaan berikutnya dan jika terjadi komplikasi.	The utilization of e Partogram to maintain normal delivery	The findings showed a comparison between data from 842 active phase maternity customers using ePartograms and data from 1,042 clients observed using paper partograms. It was easier to take action, maintain a normal birth, and treat abnormal assessments of fetal well-being when comparing SBA using paper partographs to SBA using ePartograms (14.7% versus 5.3 percent, modified relative risk =4.00, 95 percent confidence

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No	App Name	Description	Outcome	Result
				interval [CI]=1.95-8.19). The ePartograms usage was allied a 56 percent (95 %t CI= 27 % -73 percent) fewer chances of problems with fetal outcomes than with paper partographs. The ePartogram users are more probable to follow regular labor observations. Although the technology is simple to use, the SBA expresses concern regarding its application in areas with a high rate of delivery. To assess the costs and advantages and take into account the most recent WHO labor management advice, more research is required.
3	e partograph	Aplikasi berbasis tablet, smartphone, atau komputer. Terdapat sistem yang memancarkan sinyal merah jika menunjukan penyulit saat persalinan. Aplikasi ini memiliki kapasitas untuk menyimpan data baik secara lokal maupun jarak jauh di database pusat.	The evaluation of partograph applications' viability and efficiency	Throughout the 12-month trial period, 2,918 births in all were delivered in Jessore DH and 2,312 in Kushtia DH. Partographs were used to track 1012 of these births (506 in each facility) (paper or electronic). In both hospitals, the facility-based cesarean section rate is trending downward, falling from 43% in Jessore to 37% and from 36% in Kushtia Hospital to 25%. With the use of e-partographs, protracted births are far less common. Labor monitoring in Kushtia DH used paper partographs to identify 42% of long hours worked; during phase 2, monitoring with e-partographs showed just 29% of long hours worked.

No	App Name	Description	Outcome	Result
				Similar outcomes were seen at Jessore DH, where the use of paper partographs lowered lengthy labor rates from 30% to 7%.
4	m labour	a mobile application mengacu kepada partograf WHO, tampilan di layar tidak membosankan dan meminimalisisr kesalahan pengisian.	The use of ml labour in documenting partographs	m Labour lets professionals easily identify prolonged, obstructed labor while avoiding usability issues that decrease paper partographs. A reminder system, emergency decision support, and assistance for the entire patient lifecycle, from admission to referral, are all included in mLabour.
5	PrasavGraph	The program is built on Android and was created using a delay-tolerant architecture, allowing it to function even in unreliable internet connections.	PrasavGraph application for childbirth monitoring	It is easy to use on a smartphone, so it is hoped that the partograph will be easier to use in the delivery process of health workers in the peripheral area which until now is still very low
6	Midwifery Documentation Use Web Based	The application web based.	Recording Speed	The results showed that the frequency of recording appeared to be higher on web-based partographs, namely 26 (86.7%) compared to the speed of recording using conventional methods, which was 25 (83.3%)
7	e partograph	The tablet-based partograph application used is named DAKSH. The app allows the	The use and Acceptance	According to the findings, nurses and doctors felt that tablet-based partographs were preferable to paper-based ones since they

No	App Name	Description	Outcome	Result
		integration of several features such as alerts and alarms to improve the user experience.		saved time and were simple to use. It offers a reminder option, which is helpful for healthcare professionals.
8	e partograph	Partograph app for Android tablets, with a focus on enhancing the simplicity and effectiveness of real-time documentation	The feasibility and use of e partograph	23 SBA were observed tracking 103 deliveries over 84 shifts using an ePartogram. It was found that most SBA (87–91%) completed the ePartogram by registering the client, making the first and subsequent observations, and using the screen on the first shift. • Starting with the use of the first customer, SBA expresses a positive impression of the ePartogram and feels that it is effective and straightforward to use. On the fifth shift, 93% of SBA demonstrated assurance and comfort while utilizing the ePartogram. The SBA monitors the efficiency of audible and visual alerts that notify users when measurements are necessary (indicating abnormal measurements). • The SBA expresses faith in their capacity to understand and respond to these recommendations and cautions.
9	Web-Based Partograph	computer-based partographs with the use of internet networks	The utilization of web-based partographs	The findings demonstrated that using WEB-based partographs was quicker for documenting contractions, oxytocin levels, and delivery processes. The accuracy of internet-based partographs in earlier detection, which showed a p-value of 0.000 (0.05), and

No	App Name	Description	Outcome	Result
				emergency detection, which has a p-value of 0.014, can be used to compare their use to that of conventional partographs (0.05). However, the p-value for the referral procedure is 1,000 (>0.05), demonstrating that the use of WEB-based partographs and traditional partographs are same.
10	e partograph	partograph in mobile phone	Mobile phone usage for e-Partograph	460 caregivers, or 99.6% of them, possessed cell phones, according to the poll. There were only 102 smartphone owners (22 %). With regard to employing cellphones for e-Partograph, 205 of them (or 46% of them) are willing to do so. Doctors of healthcare and some other groups of doctors (AOR = 8.35.95% C.I: 2.07-33.63), health centers (AOR = 4.41% C.I: 0.10-9.26), care providers older than 30 (AOR = 2.85 % C.I: 1.34-6.05), healthcare with a positive attitude toward Partograph (AOR = 2.76.95% C.I: 1.49-5.09) and education in linked fields (AOR = 7.63.95% C.)
11	Digital Partograph	web-based partograph design	utilizing digital partographs as a teaching tool	the median pretest score is 71.09 from these data which can be concluded that the knowledge of the respondents was put into a sufficient category, after conducting learning using digital partograph media, the skill of filling partography in students has increased to 85.95 with an excellent category. Meanwhile, the

No	App Name	Description	Outcome	Result
				signification of the p-value displayed 0,000 < 0.05, meaning that electronic partographs as a medium education are very effective for developing partographic filling skills
12	DAKSH	The tablet-based DAKSH application. Real-time labor monitoring, fundamental decision-making help with better warnings, and logging are all features of the app.	The utilization of DAKSH	The tool was utilized by a total of 10 staff nurses from these healthcare facilities to track 424 pregnancies over the course of 10 months. Around 463 births were observed at the hospital during this time, of which 91.56 % (n=424) were registered in the application.
13	Digital Partograph	Android-based partographs, real-time recording, there is a notification system in case of labor difficulties, can be accessed on the playstore	The use of digital partographs, behavior change, stakeholder support	Research has demonstrated that the information systems found in digital partographs meet requirements for system quality, information quality, and user satisfaction. Digital partographs have proven useful for clinical decision-making, monitoring the course of labor, recordkeeping, and fetal and mother health. They have also been well-received by stakeholders. The results of the study show that the Google Playstore's digital partograph application can already be used as a tool to track the progress of births. Midwives are behaving differently when using digital partographs as a result of its accessibility.

DISCUSSION

Digital partographs are designed to solve various problems that arise when using paper partographs (Ningrum, 2019). Many researchers are developing partograph applications in various countries in the world, but all of them have different effectiveness, advantages and levels of acceptance.

Based on Sanghvi et al. (2017), the usage of e-partograph application has a higher effectiveness than using the paper partograph. It was determined that using an electronic partograph reduced the likelihood of a complicated fetal outcome by 56% (95% CI = 27% - 73%) compared to using a conventional partograph. The practitioner using partographs to a much greater extent to adhere to typical labor observations. Rahman et al. (2019) made the same claim, explaining that the facility-based caesarean section rate is trending downward in both institutions, dropping from 43 % in Jessore to 37 % and from 36 percent to 25 % at Kushtia Hospital in Bangladesh. Similar outcomes were shown in Jessore, Bangladesh, where the percentage of protracted labor was lowered from 30% of long labors recorded by e-partograph to 7% with paper partographs. Litwin et al (2018) stated that the majority of health professionals finished filling out the e Partogram: registering clients, first and subsequent observations, and utilizing screens easily on the first shift; the usage of the e Partogram to monitor 103 births in 84 shifts; the fifth shift reported a rise to 100%. In terms of recording, the use of e-partographs is reported to be more effective when compared to paper partographs, as stated by Juwita et al (2019) that the study results revealed that the frequency of recording appears to be higher on web-based partographs, which was 26 (86.7%) compared to recording speed using conventional methods that is equal to 25 (83.3%). The research of Tandiallo et al (2019) revealed that for recording contractions, oxytocin, and births, an internet-based partograph was easier to use than a traditional partograph.

Additionally, the early detection precision of the WEB-based partograph has a p-value of 0.000 (0.05), and its accuracy in emergency detection is 0.014 (0.05), indicating that it differs from the use of conventional partographs. The referral process' p-value, however, is 1,000 (>0.05), indicating that there is no distinction between the use of WEB-based partographs and traditional partographs. Ulfa et al(2020)'s study on the digital partograph is a highly effective learning tool for acquiring partographic knowledge, according to research on the effectiveness of the e-partograph as a teaching aid for students. Based on Begum et al. (2017), the e-partograph application has the advantages of being easier to fill out, automatically generating graphs, more interesting to work with, providing timely automatic reminders to evaluate

mothers in labor, generating digital color coded warning numbers, and sending automatic text messages to supervisors in situations abnormal. Singh et al (2016) also showed that e-partographs are easy to use on smartphones, so it is hoped that partographs will be easier to use in the delivery process by health workers in the periphery which is still very low. Research on the advantages of the e-partograph was also carried out by Ningrum et al (2019), it demonstrated that the digital partograph's information system had complied with the demands for system excellence, information excellence, and user satisfaction. Digital partographs have been useful for clinical decision-making, tracking the course of labor, documenting, keeping tabs on the health of the mother and fetus, and gaining support from involved people for such applications.Several studies have also assessed the level of acceptance of e-partographs by health workers. Singh et al (2021) demonstrated that nursing and medical professionals came to the conclusion that tablet-based partographs are superior to paper-based partographs because they are quicker and simpler to use. Research by Litwin et al. (2018) showed that almost all health workers (93%) Health professionals reported a positive opinion of the ePartogram and believed that it was effective and simple to use. Additionally, they showed trust in their ability to understand and respond to this e-reminders partograph's throughout the fifth shift. Tadesse et al (2019) assessed the level of acceptance of e-partographs in terms of cellphone ownership for application installation, from the survey results, it was found that 205 (46%) were eager to use cellphones for e-Partographs.

CONCLUSION

Most studies showed that the development of an application-based partograph aimed to facilitate the process of monitoring labor. With the e-partograph, the end result of delivery was better than with the paper partograph. E partograph was able to maintain normal delivery, reduce the incidence of cesarean section and prolonged labor. In addition, the e-partograph provided the advantage that there was an audio and visual reminder system that could be used to detect complications during childbirth, all data was stored and could be accessed again so that the documentation system was easier. And the level of SBA acceptance of the e partograph was very good as evidenced by the higher level of use of the e partograph compared to the paper partograph.

ACKNOWLEDGMENT

Special thanks to Universitas Sebelas Maret, Surakarta, Indonesia for supporting this research, and all parties involved.

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Revised Manuscript Submission for Consideration Gacetta

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Widya Maya Ningrum <widyamayaningrum@unigal.ac.id> 05 September 2022 pukul 18.40
Kepada: Enrique Santiago López-Loyo <lopezloyoe@gmail.com>

Dear Editor,
I hope this message finds you well.

I am writing to submit the revised version of our manuscript titled "The effectiveness and usability of electronic partograph for obstetric care: A systematic review" to Gaceta Médica de Caracas, ID 25058. We have carefully addressed all the comments and suggestions provided by the reviewers and have made the necessary revisions to improve the manuscript.

Please find the revised manuscript attached along with a detailed response to the reviewers' comments. The changes made in the revised version are highlighted for your convenience.

Thank you for the opportunity to revise and resubmit our work. We look forward to your feedback and hope that the revisions meet the expectations of the reviewers.

Please do not hesitate to contact me if you need any further information.

Best regards,

Widya Maya Ningrum
Galuh University

widyamayaningrum@unigal.ac.id

Gmail **Widya Maya Ningrum <widyamayaningrum@unigal.ac.id>**

[GMC] Manuscript for revision

Enrique Santiago López-Loyo <lopezloyoe@gmail.com> 14 September 2022 at 11.30
To: widyamayaningrum@unigal.ac.id

Dear Mrs. Widya Maya Ningrum:
Thank you for sending your manuscript, ID 25058, entitled "The effectiveness and usability of electronic partograph for obstetric care: A systematic review" to Gaceta Médica de Caracas. Your manuscript has been peer-reviewed and may be considered for publication after the necessary revisions are completed to the Editors satisfaction.

Please visit the instructions to authors for consideration of publication. You may contact the Editorial Office if you have further questions.

In order to get article to publish please revise the following:
1.•Abstract:
The abstract is clear and concise. However, consider including the number of studies reviewed in the methods section of the abstract for better clarity.
2.•Introduction:
The introduction provides a strong rationale for the study. However, the sentence on page [4], line [8] could be rephrased for clarity. I suggest rewording it to improve the flow.
3.•Methods:
The methods section is well-detailed. However, the description of the inclusion and exclusion criteria could be slightly expanded to clarify why certain studies were excluded. A brief justification would suffice.
4.•Results:
The results are presented clearly, with appropriate use of tables and figures. However, in Table [7], there seems to be a formatting issue with the alignment of the columns. Please adjust this for better readability.
5.•Discussion:
The discussion is thorough and well-balanced. However, it would be beneficial to briefly mention any potential biases in the included studies that could affect the overall findings.
6.•Conclusion:
The conclusion is well-drawn and reflects the findings accurately. Consider adding a sentence that emphasizes the implications of these findings for future research or clinical practice.
7.•References:
The references are generally well-formatted. However, there is a missing page number in reference [2]. Please check and correct this.

Sincerely,
Enrique Santiago López-Loyo
Gaceta Médica de Caracas

The Effectiveness and Usability of Electronic Partograph for Obstetric Care: A Systematic Review

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ABSTRACT

Introduction: Partograph is an instrument used in monitoring and prevention of labor complications. Unfortunately, a large number of situations where there is limited awareness of how to use a partograph as a labor monitoring tool. One of the efforts made is to develop partographs in the form of electronic partograph (e-partograph) applications. The purpose of this review was to analize at the effectiveness and usability of electronic partograph for obstetric care.

Methods: This study carried out a systematic review of journals using three academic databases (Science Direct, PubMed, Google Scholar) with a publication range from 2016 to 2022. Furthermore, the subjects in this study were skilled birth attendants (SBAs) and obstetric care providers. Inclusion criteria in the literature study were use electronic-based partographs in monitoring. The guidelines for reviewing journals used Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA).

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Results: The results of 13 studies exploring the e-partograph in the last six years (2016-2022). Most of the results reviewed the effectiveness of using e-partographs compared to paper partographs. In addition, the e-partograph has shown another advantage, there was a reminder system when filling in data by the SBA. It could identify if the labor process was normal or required further treatment. The use of an e-partograph could effectively save time and was easy to use, SBA was easy to accept and apply.

Conclusion: The use of e-partograph gives better final results than paper partograph. E-partograph is able to maintain normal delivery, reduce the incidence of cesarean section and prolonged labor. The e-partograph was designed to provide benefits for its users, there was an audio and visual reminder system that could be used to detect complications during childbirth.

Keywords: Electronic, Health Care, Obstetric, Partograph

INTRODUCTION

Infections, prolonged labor, bleeding, and other complications after childbirth are thought to have perished 303,000 women in 2015 (Graham et al.(Patabendige et al., 2021), 2016; Say et al., 2014). Moreover, long labor directly comes uopp with 6-10% of maternal and infant mortality and morbidity (Balikuddembe et al., 2014). One of the efforts to prevent the occurrence of morbidity and mortality in mothers and babies during childbirth is by monitoring labor and handling fast and appropriate actions (Ogwang et al., 2009; Windrim et al., 2007). The World Health Organization (WHO) advocates a partograph to observe during labor. (Patabendige et al., 2021)

Skilled birth attendants utilize partographs to record significant developments during labor. This partograph sheet was created to gather and record all pertinent data over a 12-hour period, beginning with the start of contractions and ending with the delivery of the baby. This partograph helps staff members make decisions by indicating when labor is moving normally and when they should be equipped to step in. (LE Litwin et al., 2018a)

However, the effectiveness of using partograph in monitoring labor is not optimal currently. This is related to the attitude of health workers who still lack knowledge in the use of paper partographs. Furthermore, to overcome this challenge, many researchers have made improvements to partographs (Rahman et al., 2019a), one of the efforts made is to develop partographs in the form of applications (electronic partographs). An electronic version of the paper-based partograph that automatically plots labor and delivery trends is called a "e-

partograph." It has alarm systems installed to notify Provider Health Care staff of the upcoming examination schedule in case of danger. In addition, the development of this partograph is based on an android tablet with reference to the partograph issued by WHO with the aim of making it easier for officers to monitor and document during childbirth (Okokon et al., 2014; Weerasekara, 2014). Therefore, the e-partograph intervenes to improve efficiency in filling patients' information during labor and childbirth, allows Primary health care (PHC) workers to seek and receive real-time professional support and reduces time to accessing lifesaving care, even after normal work hours.

On the other hand, seeing as new electronic partograph innovations are increasingly being tested and implemented in situations with limited capacity, it is critical to carefully assess what has been accomplished in order to inform implementers and policy makers on the effectiveness of technology in evidence-based practice.

METHODS

Study Design

This Systematic Review follows the guidelines of the Statement of Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) (David Moher1 et al., 2015). The data has completed a review on the journal using three academic databases including PubMed, Science Direct, and Google Scholar.

Inclusion and Exclusion Criteria

Selection of the inclusion criteria that have been determined for this systematic review, using population, intervention, comparison, outcomes, and study design (PICOS). Furthermore, population in this study were skilled birth attendants and obstetric care providers who provide childbirth services and use electronic-based partographs in monitoring them. This study was also including grey literature. Moreover, the exclusion criteria such as labor monitoring using paper partographs.

Search Strategy

This literature search used articles in English from Pubmed, Science Direct, and Google Scholar from 2016 to 2022. The literature used the keywords "partograph", "electronic", and "obstetric". The literature found there were 182 articles filtered using the keywords above. The articles were then narrowed down and identified based on the PICOS and obtained as many as

109 articles that could be included in the article screening process. In the meantime, at the article screening stage according to the suitability of the article based on the abstract, there were 150 articles. Then a feasibility selection was carried out based on the essence and scope of the discussion in the article as a whole, it was found that 16 articles could be made for further selection, namely as many as 13 articles that were included in the inclusion and 3 article were excluded.

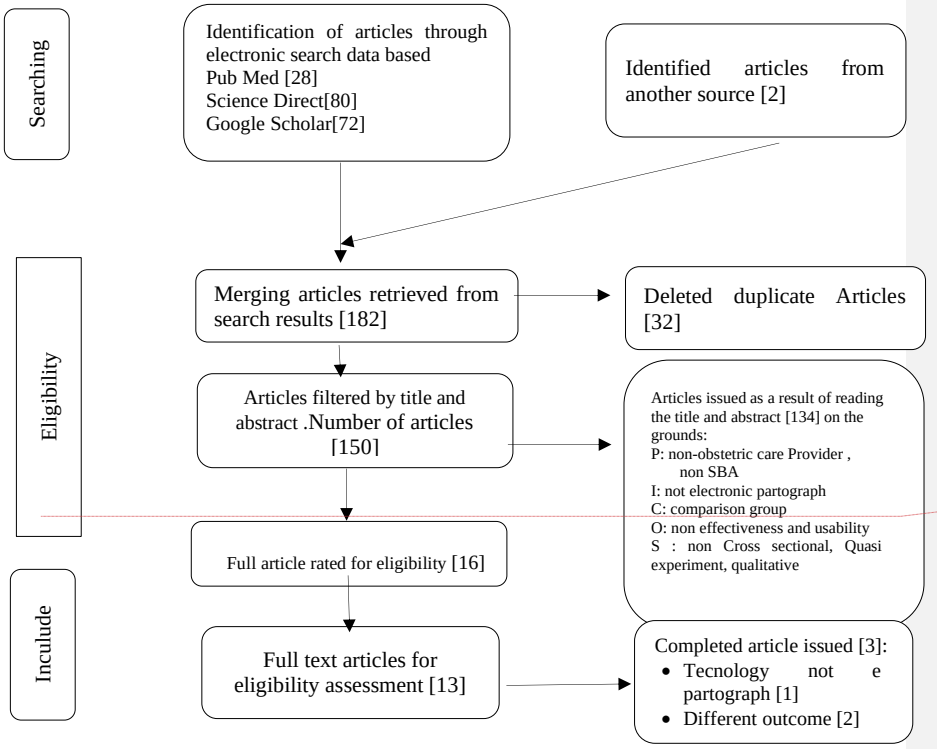

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Figure 1

Steps for selecting articles are illustrated in the PRISMA flowchart

Quality Assessment

The outcomes from the electronic search data-based articles were gathered, identified, and then exported to a Microsoft Excel spreadsheet. The filtered and qualified publications were evaluated and data were independently extracted by three writers (WMN, YB, and RBU). Additionally, any differences of opinion among the three authors (WMN, YB, and RBU) about the findings of the three reviewers were resolved through discussion and consensus. Additionally, each study's comparability, methodology (including sampling approach, response rate, and study representativeness), and outcomes were analyzed using JBI tools. For cross-sectional, quasi-experimental, and qualitative investigations, the JBI was used to rate the methodological soundness of a study and assess the degree to which potential biases in its design and analysis had been addressed. Therefore, all articles assigned a JBI score of 50% or more could be considered a "good" low-risk study.

RESULTS

Overview of Included Studies

The thirdteen studies have been reviewed and all labor monitoring used application-based partographs. The use of the term was different from one another. "Life Curve", mLabour, PrasavGraph, Digital Partograph and Intrapartum Monitoring Mobile Application (DAKSH) [12] are android-based Mobile applications (Begum et al., 2020) (Schweers et al., 2016) (Singh et al., 2019), one of the terms for the tools used for childbirth monitoring with various gadgets that may be accessed using a smartphone or tablet or other devices (e partograph).(L. Litwin et al., n.d.) (Rahman et al., 2019) (Sanghvi et al., 2019) (States & States, 2022), (Tadesse et al., 2019), digital partograph is some of the names of tools used based on android and Word Electric Browser (WEB); and some other names such as Web-Based Partograph, and midwifery documentation use Web Based.(Ahmad et al., 2019) (Tandiallo et al., 2019)

Furthermore, these studies were conducted in five countries as follows: India, Indonesia, Kenya, Tanzania, and Northwest Ethiopia. As a consequence of concluding the results of the articles, it showed that users of this application-based partograph were varied. In Indonesia the users of partograph application were midwives, midwifery students, and researcher; in contrast to other countries for the life Curve [India] application, m labor used by doctors during childbirth monitoring, DAKSH used by nurses; e used by Skilled Birth Attendant (SBA): Doctor, Nurse, Midwife. e partograph was used by SBA (doctors, midwives, nurses) and Staff nurses and medical officers. E-partograph used by Obstetric care providers (a certified

midwife, nurse, Health Officers, Integrated Emergency Obstetrics and Surgery & Medical Doctors who tend to the woman's needs throughout birth and delivery). Accordingly, in an attempt to make the analysis more comprehensible, we used the research and the numerous publications in which they were reported. As a result, the findings were presented in a narrative form.

Table 1

Overview of Included Studies

No	Authors	Years	Countries	Name Application	User	Study Design	Score of JBI (%)
1	Begum et al	2017	India	Life curve	Doctor	Cross-sectional	75
2	Sanghvi et al	2017	Kenya	E-partogram	Skill birth attandent (SBA): doctor, nurse, midwife	Mixed-method, quasi-experimental	89
3	Rahman et al	2019	India	E-partograph	SBA (doctor, nurse, midwife)	Quasi-experimental	100
4	Schweers et al	2016	India	M-labour	Doctor	Qualitative	50
5	Singh et al	2016	India	Prasav graph	Doctor	Qualitative	50
6	Juwita et al	2019	Indonesia	Midwifery documentation use web based	Midwives	Cross-sectional	50
7	Singh et al	2021	India	E-partograph	Staff nurses and medical officers	Cross-sectional	75
8	Litwin et al	2018	Tanzania	E-partograph	SBA	Qualitative	50
9	Tandiallo et al	2019	Indonesia	Web-based partograph	researcher	Quasi-experimental	100
10	Tadesse et al	2019	Northwest Ethiopia	E-partograph	Prenatal care providers	Cross-sectional	100

					(midwife, nurse, health officers, doctor)		
11	Ulfa et al	2020	Indonesia	Digital partograph	Midwife students	Cross-sectional	50
12	Singh et al	2019	India	Digital Partograph and Intrapartum Monitoring Mobile Application	Nurses	Cross-sectional	88
13	Ningrum et al	2019	Indonesia	Digital partograph	Midwife	Qualitative	70

Comparing The Efficacy of e Partograph and paper Partograph

The use of the partograph is an important step to ensure the care provided high quality to mothers and newborns during labor. As a further matter, the development of an application-based partograph aims to improve care during labor by overcoming the challenge of the low use of paper partographs.(Begum et al., 2020) (L. E. Litwin et al., 2018) (Schweers et al., 2016) Additionally, from the results of the analysis of the articles carried out, there was an increase in labor outcomes based on monitoring using an application-based partograph (e partograph) compared to a paper partograph. Thus, in labor monitoring using the Life Curve Mobile application, measuring performance parameters are assessed on a scale of 1-5 with a total score of 45. Therefore, the results revealed that the Life Curve has displayed a score of 42.7 compared to the paper partograph with a score of 19.52. This demonstrates that the difference (p =.001) is highly significant. The paper partograph (2.17±1.18) was statistically significantly lower than the average-SD life curve (4.74±.52): p.0002. These findings showed that the use of a life curve mobile application improved SBA's efficiency in providing delivery care. (Begum et al., 2020). In addition, this is in line with the results of other studies which showed that using an e-partograph was easier to maintain normal labor and take action. On the other hand, the e-partograph usage during delivery could complicate things for the mother and fetus, according to the examination of the article's data. In turn, the use of the e Partograph results in a result of 56 % (95 % CI = 27 % -73 %), a tendency away from caesarean sections [43 %to 37 % at Jessore Hospital and from 36 percent to 25 % in Kushtia Hospital] and away from preterm labor compared to the use of the paper partograph.(Rahman et al., 2019) (Sanghvi et al., 2019) The results of the article analysis explained the reasons for developing this application-based partograph to solve various problems that arise when using paper partographs, one of which was the very low use of paper partographs (Ningrum et al., 2019). From the results that could be seen the use of e-partographs revealed that the frequency of recording appears to be higher on web-based partographs, which is 26 (86.7%) compared to the speed of recording using conventional methods, which is 25 (83.3%) (Ahmad et al., 2019), the majority of SBA (87-91%) completed Partograph filling (L. Litwin et al., n.d.), WEB-based partographs were faster in recording contractions, oxytocin, and delivery p-value 0.000 (<0.05). (Tandiallo et al., 2019). Therefore, these results indicated that the e-partograph was more effective in maintaining normal delivery, preventing complications during labor and increasing use during labor monitoring.

Advantages of e Partograph with paper Partograph

Partograph is an instrument to track record the progression of labor. The key parameters in the partograph are the progression of labor (cervical dilating, contractions, and descent of the bottom portion), maternal health (systolic pressure, pulse and temperature) and fetal condition (fetal heart rate, amniotic fluid and moulage). In monitoring the paper partograph, the filling and interpretation depends on the person filling it out. In e partograph there are several advantages that could be felt when using it. Moreover, the partograph application (e partograph) developed in the form of a mobile phone or tablet based on android with a web-based computer device, with the advantages made by each developer. One of the benefits of using a partograph is being able to make decisions when monitoring labor, whether this delivery can be assisted or an action is needed (Ayenew & Zewdu, 2020) (Ningrum et al., 2019). The e-partograph has several advantages over the paper partograph. In some system applications, which are made by adding notification features in the form of audio and visual warnings, which show the charging time, and complications that occur in mothers and babies. This notification system really helps users to determine what decisions and actions to take.

In some applications, there are other advantages, such being able to store data that has been filled in, graphs appear according to the data filled in with varying display results. This partograph program has made use of a "delay-tolerant framework," making it usable even in unfavorable internet network circumstances.(Singh et al., 2019), and some can even be used without using the internet network (Ningrum et al., 2019). This shows that the e-partograph has other benefits compared to the paper partograph. Throughout the labor and delivery process, several inventors have concentrated on low-cost digital solutions to address problems with the paper partograph, improve care quality, enhance documentation, and facilitate decision-making. (Adepoju et al., 2017)

Acceptance of e Partograph at Among Health Workers

Application development on partographs aims to make it easier for users to fill in partographs. Most of the SBAs agree that the e-partograph greatly simplifies filling and increases its use, but it should be a concern for obstetric services with a high rate of delivery cases. It takes a lot of SBA who are trained in order to be more optimal in their utilization. (Sanghvi et al., 2019). Almost all SBA (93%) showed confidence and comfort in using e Partograph, SBA gave a positive impression and felt efficient and easy to use. The SBA expresses faith in their capacity to comprehend and take action on the reminders and cautions

provided in the e-partograph. The SBA's behavior in relation to filling out the partograph changes while using the e-partograph. (L. Litwin et al., 2018) (Ningrum et al., 2019).

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Tabel 2

Summary of Selected Studies

No	App Name	Description	Outcome	Result
1	Life Curve	Android-based application, equipped with colors that appear on the screen to describe the condition of the mother and children	The utilization of life curve	The overall results for the paper partograph (19.52) and the Live Curve (42.7) are significantly different from one another (p.001). The average score SD for the life curve is exactly remarkably higher (4.74±.52) than for paper partographs (2.17±1.18): p.0002.
2	e partogram	Application based on android tablet, there is an audio and visual reminder system when it comes to doing the next check and in case of complications	The utilization of e Partogram to maintain normal delivery	There are 842 active phase maternity customers using ePartograms and data from 1,042 clients observed using paper partograms. The ePartograms usage was allied a 56 percent (95 %t CI= 27 % -73 percent) fewer chances of problems with fetal outcomes than with paper partographs.
3	e partograph	Tablet, smartphone, or computer based applications. There is a system that emits a red signal if it shows complications during labor. The application has the capacity to store data both locally and remotely in a central database.	The evaluation of partograph applications' viability and efficiency	Labor monitoring used paper partographs to identify 42% of long hours worked; during phase 2, monitoring with e-partographs showed just 29% of long hours worked. Similar outcomes were seen at Jessore DH, where the use of paper partographs lowered lengthy labor rates from 30% to 7%.

4	m labour	A mobile application refers to the WHO partograph, the display on the screen is not boring and minimizes filling errors.	The use of ml labour in documenting partographs	m Labour lets professionals used to reminder system, emergency decision support, and assistance for the entire patient lifecycle, from admission to referral, are all included in mLabour.
5	PrasavGraph	The program is built on Android and was created using a delay-tolerant architecture, allowing it to function even in unreliable internet connections.	PrasavGraph application for childbirth monitoring	It is easy to use on a smartphone, so it is hoped that the partograph will be easier to use in the delivery process of health workers in the peripheral area which until now is still very low.
6	Midwifery Documentation Use Web Based	The application web based	Recording Speed	The frequency of recording appeared to be higher on web-based partographs, namely 26 (86.7%) compared to the speed of recording using conventional methods, which was 25 (83.3%)
7	e partograph	The tablet-based partograph application used is named DAKSH. The app allows the integration of several features such as alerts and alarms to improve the user experience.	The use and Acceptance	Tablet-based partographs were preferable to paper-based ones since they saved time and were simple to use. It offers a reminder option, which is helpful for healthcare professionals.
8	e partograph	Partograph app for Android tablets, with a focus on enhancing the simplicity and	The feasibility and use of e partograph	There were the most of SBA (87–91%) completed the ePartogram by registering the client, making the first and subsequent observations, and using the screen on the first shift.

		effectiveness of real-time documentation		
9	Web-Based Partograph	computer-based partographs with the use of internet networks	The utilization of web-based partographs	The WEB-based partographs was quicker for documenting contractions, oxytocin levels, and delivery processes. The accuracy of internet-based partographs in earlier detection, which showed a p-value of 0.000 (0.05), and emergency detection, which has a p-value of 0.014, can be used to compare their use to that of conventional partographs (0.05).
10	e partograph	partograph in mobile phone	Mobile phone usage for e-Partograph	There were 205 smartphone owners (or 46% of them) used e-partograph. Healthcare with a positive attitude toward Partograph (AOR = 2.76.95% C.I: 1.49-5.09) and education in linked fields (AOR = 7.63.95% C.)
11	Digital Partograph	web-based partograph design	utilizing digital partographs as a teaching tool	The signification of the p-value displayed 0,000 < 0.05, meaning that electronic partographs as a medium education are very effective for developing partographic filling of student's skills.
12	Digital Partograph and Intrapartum Monitoring	The tablet-based DAKSH application. Real-time labor monitoring, fundamental decision-making help with better	The utilization of DAKSH	Around 463 births were observed at the hospital during this time, of which 91.56 % (n=424) were registered in the application.

	Mobile Application	warnings, and logging are all features of the app.		
13	Digital Partograph	Android-based partographs, real-time recording, there is a notification system in case of labor difficulties, can be accessed on the playstore	The use of digital partographs, behavior change, stakeholder support	The results of the study show that the Google Playstore's digital partograph application can already be used as a tool to track the progress of births. Midwives are behaving differently when using digital partographs as a result of its accessibility.

DISCUSSION

Digital partographs are designed to solve various problems that arise when using paper partographs (Ningrum et al., 2019). Many researchers are developing partograph applications in various countries in the world, but all of them have different effectiveness, advantages and levels of acceptance.

Based on Sanghvi et al. (2017), the usage of e-partograph application has a higher effectiveness than using the paper partograph. It was determined that using an electronic partograph reduced the likelihood of a complicated fetal outcome by 56% (95% CI = 27% - 73%) compared to using a conventional partograph.(Sanghvi et al., 2019) The practitioner using partographs to a much greater extent to adhere to typical labor observations. Rahman et al. (2019) made the same claim, explaining that the facility-based caesarean section rate is trending downward in both institutions, dropping from 43 % in Jessore to 37 % and from 36 percent to 25 % at Kushtia Hospital in Bangladesh. Similar outcomes were shown in Jessore, Bangladesh, where the percentage of protracted labor was lowered from 30% of long labors recorded by e-partograph to 7% with paper partographs. (Rahman et al., 2019) Litwin et al (2018) stated that the majority of health professionals finished filling out the e Partogram: registering clients, first and subsequent observations, and utilizing screens easily on the first shift; the usage of the e Partogram to monitor 103 births in 84 shifts; the fifth shift reported a rise to 100%. In terms of recording, the use of e-partographs is reported to be more effective when compared to paper partographs, as stated by Juwita et al (2019) that the study results revealed that the frequency of recording appears to be higher on web-based partographs, which was 26 (86.7%) compared to recording speed using conventional methods that is equal to 25 (83.3%). The research of Tandiallo et al (2019) revealed that for recording contractions, oxytocin, and births, an internet-based partograph was easier to use than a traditional partograph.(Tandiallo et al., 2019)

Additionally, the early detection precision of the WEB-based partograph has a p-value of 0.000 (0.05), and its accuracy in emergency detection is 0.014 (0.05), indicating that it differs from the use of conventional partographs. The referral process' p-value, however, is 1,000 (>0.05), indicating that there is no distinction between the use of WEB-based partographs and traditional partographs. Ulfa et al(2020)'s study on the digital partograph is a highly effective learning tool for acquiring partographic knowledge, according to research on the effectiveness of the e-partograph as a teaching aid for students. Based on Begum et al. (2017), the e-partograph application has the advantages of being easier to fill out, automatically generating

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graphs, more interesting to work with, providing timely automatic reminders to evaluate mothers in labor, generating digital color coded warning numbers, and sending automatic text messages to supervisors in situations abnormal. Singh et al (2016) also showed that e-partographs are easy to use on smartphones, so it is hoped that partographs will be easier to use in the delivery process by health workers in the periphery which is still very low. Research on the advantages of the e-partograph was also carried out by Ningrum et al (2019), it demonstrated that the digital partograph's information system had complied with the demands for system excellence, information excellence, and user satisfaction. Digital partographs have been useful for clinical decision-making, tracking the course of labor, documenting, keeping tabs on the health of the mother and fetus, and gaining support from involved people for such applications.Several studies have also assessed the level of acceptance of e-partographs by health workers. Singh et al (2021) demonstrated that nursing and medical professionals came to the conclusion that tablet-based partographs are superior to paper-based partographs because they are quicker and simpler to use. Research by Litwin et al. (2018) showed that almost all health workers (93%) Health professionals reported a positive opinion of the ePartogram and believed that it was effective and simple to use. Additionally, they showed trust in their ability to understand and respond to this e-reminders partograph's throughout the fifth shift.(L. Litwin et al., 2018) Tadesse et al (2019) assessed the level of acceptance of e-partographs in terms of cellphone ownership for application installation, from the survey results, it was found that 205 (46%) were eager to use cellphones for e-Partographs.(Tadesse et al., 2019.)

CONCLUSION

Most studies showed that the development of an application-based partograph aimed to facilitate the process of monitoring labor. With the e-partograph, the end result of delivery was better than with the paper partograph. E partograph was able to maintain normal delivery, reduce the incidence of cesarean section and prolonged labor. In addition, the e-partograph provided the advantage that there was an audio and visual reminder system that could be used to detect complications during childbirth, all data was stored and could be accessed again so that the documentation system was easier. And the level of SBA acceptance of the e partograph was very good as evidenced by the higher level of use of the e partograph compared to the paper partograph.

ACKNOWLEDGMENT

Special thanks to Universitas Sebelas Maret, Surakarta, and Faculty of Science Universitas Galuh, Indonesia for supporting this research, and all parties involved.

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Commented [A.6]: I recommend a **minor revision** of the manuscript. The suggested revisions are minimal and aimed at improving the overall clarity and presentation of the manuscript. I look forward to seeing the revised version

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Widya Maya Ningrum <widyamayaningrum@unigal.ac.id>

Resubmission of Revised Manuscript (Second Revision)

1 pesan

Widya Maya Ningrum <widyamayaningrum@unigal.ac.id> 29 September 2022 pukul 18.30
Kepada: Enrique Santiago López-Loyo <lopezloyoe@gmail.com>

Dear Editor,
I hope this email finds you well.

I am writing to resubmit the revised version of our manuscript titled "The effectiveness and usability of electronic partograph for obstetric care: A systematic review" to Gaceta Médica de Caracas, ID 25058. We have addressed the comments and suggestions provided by the reviewers during the second round of review and made further revisions as requested.

Please find the revised manuscript attached along with a detailed response to the additional reviewers' comments. We have highlighted the changes made in this version for your convenience.

Thank you for your time and consideration. We look forward to your feedback and hope that the revisions meet the expectations of the reviewers.

Should you require any additional information or have further questions, please feel free to contact me.

Best regards,

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October 18, 2022

Widya Maya Ningrum
Doctoral Program on Public Health,
Universitas Sebelas Maret, Surakarta,
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Dear Widya Maya Ningrum:

We are pleased to inform you that your manuscript titled "The Effectiveness and Usability of Electronic Partograph for Obstetric Care: A Systematic Review" was accepted for publication in volume 130 (Supplement 5) 2022 of the Gaceta Medica de Caracas. The manuscript is currently in the process of the layout for the Galley Proofs and the correspondent revision. We expect that the Special Supplement will be published around the second week of November 2022.

Best regards,

Dr. Anita Stern Israel
Senior Editor
Gaceta Medica de Caracas

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DE CARACAS

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por el

DR. LUIS RAZETTI

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Dr. Luis Razetti

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Los trabajos originales, revisiones sistemáticas y metanálisis deben tener un resumen estructurado, como se indica a continuación:

Debe contener un máximo de 250 palabras, y los siguientes segmentos:

- Introducción: ¿Cuál es el problema principal que motivó el estudio?
- Objetivo: ¿Cuál es el propósito del estudio?
- Métodos: ¿Cómo se realizó el estudio? (selección de la muestra, métodos analíticos y observacionales).
- Resultados: ¿Cuáles son los aspectos más importantes? (datos concretos y en lo posible su significancia estadística)
- Conclusión: ¿Cuál es la más importante que responde al objetivo?

Al final se anotarán 3 a 6 palabras clave.

Resumen en inglés

Debe corresponderse con el resumen en español. Se sugiere que este sea revisado por un traductor experimentado, a fin de garantizar la calidad del mismo.

Introducción

Incluir los antecedentes, el planteamiento del problema y el objetivo del estudio en una redacción libre y continua debidamente sustentada por la bibliografía.

Método

Señalar claramente las características de la muestra, el o los métodos empleados con las referencias pertinentes, de forma que se permita a otros investigadores, realizar estudios similares.

Resultados

Incluir los hallazgos importantes del estudio, comparándolos con las figuras estrictamente necesarias y que amplíen la información vertida en el texto.

Discusión

Relacionar los resultados con lo reportado en la literatura y con los objetivos e hipótesis planteados en el trabajo.

Conclusión

Describir lo más relevante que responda al objetivo del estudio.

Agradecimientos

En esta sección se describirán los agradecimientos a personas e instituciones así como los financiamientos.

Referencias

Se presentarán de acuerdo con las Recomendaciones ICMJE.

Indicarlas con números arábigos entre paréntesis en forma correlativa y en el orden en que aparecen por primera vez en el texto, cuadros y pie de las figuras. En las citas de revistas con múltiples autores (más de seis autores), se deberá incluir únicamente los 6 primeros autores del trabajo, seguido de et al.,

a. Artículos en revistas o publicaciones periódicas: apellido(s) del autor(es), inicial del nombre(s). Título del artículo. Abreviatura internacional de la revista: año; volumen: páginas, inicial y final. Ejemplo: Puffer R. Los diez primeros años del Centro Latinoamericano de la Clasificación de Enfermedades. Bol. Of San Pam. 1964;57:218-229.
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c Capítulo de un libro: apellido(s) del autor(es), inicial(es) del nombre. Título del capítulo. En: apellido(s) e inicial(es) del editor(es) del libro. Título del libro. Edición. Lugar de publicación (ciudad): casa editora; año.p. página inicial y final. Ejemplo: Aoün-Soulie C. Estado actual de la salud en Venezuela. En: Aoün-Soulie C, Briceño-Iragorry L, editores. Colección Razetti Volumen X. Caracas: Editorial Ateproca; 2010.p.87-124- (No lleva "Edición por tratarse de la primera).

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Artículos de revisión

Versarán sobre un tema de actualidad y de relevancia médica. El autor principal o el correspondiente deberá ser una autoridad en el área o tema que se revisa y anexará una lista bibliográfica de sus contribuciones que avale su experiencia en el tema.

Las secciones y subtítulos serán de acuerdo con el criterio del autor. Incluir un resumen general en español y en inglés que no exceda de 150 palabras. La extensión máxima del trabajo será de 20 cuartillas. Las ilustraciones deberán ser las estrictamente necesarias, no siendo más de seis, la bibliografía suficiente y adecuada y en la forma antes descrita.

Artículos especiales

Son aquellas contribuciones que por su importancia el Comité Redactor considere su inclusión en esta categoría.

Casos clínicos

Deberán constar de resumen en español e inglés (máximo 100 palabras) en formato libre. Constará de introducción, presentación del caso, discusión, ilustraciones y referencias, con una extensión máxima de 10 cuartillas y apegadas a las instrucciones a los autores.

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En esta sección se incluirán los artículos relacionados con aspectos históricos, filosóficos, bases conceptuales y éticas de la medicina. Aunque su estructura se dejará a criterio del autor, deberá incluir resúmenes en español e inglés (máximo 100 palabras) en formato libre, referencias bibliográficas citadas en el texto y en listadas al final del manuscrito, siguiendo los lineamientos citados para los manuscritos de GMC.

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Se informará sobre los avances y descubrimientos terapéuticos más recientes aparecidos en la literatura nacional e internacional y su aplicación en nuestro ámbito médico. La extensión máxima será de cuatro cuartillas y con un máximo de cinco referencias bibliográficas. Deberá incluir resúmenes en español en inglés, en formato libre (máximo 100 palabras).

Información epidemiológica

Será una sección de información periódica sobre los registros epidemiológicos nacionales e internacionales, destacando su importancia, su comparación con estudios previos y sus tendencias proyectivas. La extensión máxima será de cuatro cuartillas y deberá incluir resúmenes en español en inglés (máximo 100 palabras), en formato libre.

Comunicaciones breves

Serán considerados en esta sección, los informes preliminares de estudios médicos y tendrán la estructura formal de un resumen como se describió previamente (máximo 150 palabras). Se deberán incluir 10 citas bibliográficas como máximo.

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Se plantearán los aspectos éticos del ejercicio profesional y aquellos relacionados con los avances de la investigación biomédica y sus aplicaciones preventivas y terapéuticas. Su extensión máxima será de cuatro cuartillas y cuatro referencias bibliográficas, deberá incluir resúmenes en español e ingles (máximo 100 palabras) en formato libre.

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Esta sección estará dedicada a contribuciones tendientes a informar al médico acerca de las disposiciones legales, riesgos y omisiones de la práctica profesional que puedan conducir a enfrentar problemas legales. Su máxima extensión será de cuatro cuartillas y no más de cinco referencias bibliográficas. Deberá incluir resúmenes en español e inglés (máximo 100 palabras).

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ARTÍCULO DE REVISIÓN

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The effectiveness and usability of electronic partograph for obstetric care: A systematic review

La efectividad y la utilidad del partograma electrónico para la atención obstétrica: Una revisión sistemática

Widya Maya Ningrum[1ab]*, Rahayu Budi Utami[2c], Yeny Ristaning Belawati[3a], Tita Rohita[4b], Kurniati Devi Purnamasari[5b]

SUMMARY

Introduction: *Partograph is an instrument used to monitor and prevent labor complications. Unfortunately, a large number of situations where there is limited awareness of how to use a partograph as a labor monitoring tool. One of the efforts made is to develop partographs in the form of electronic partograph (e-partograph) applications. This review aims to analyze the effectiveness and usability of electronic partograph for obstetric care.*
Methods: *This study conducted a systematic review of journals using three academic databases (Science Direct, PubMed, and Google Scholar) with a publication range from 2016 to 2022. Furthermore, the subjects in this study were skilled birth attendants (SBAs) and obstetric care providers. Inclusion criteria in the literature study were using electronic-based partographs in monitoring. The journal-reviewed guidelines used Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA).*
Results: *This study found 13 studies exploring the e-partograph in the last six years (2016-2022). Most of the results reviewed the effectiveness of using e-partographs compared to paper partographs. In addition, the e-partograph has shown another advantage. There was a reminder system when filling in data by the SBA. It could identify if the labor process were normal or required further treatment. Using an e-partograph could effectively save time and was easy to use. SBA was easy to accept and apply.*
Conclusion: *The use of e-partograph gives better final results than paper partograph. E-partograph is able to maintain normal delivery and reduce the incidence of cesarean section and prolonged labor. Although the e-partograph was designed to provide benefits for its users, there was an audio and visual reminder system that could be used to detect complications during childbirth.*

Keywords: *Electronic, health care, obstetric, partograph*

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RESUMEN

Introducción: *El partograma es un instrumento utilizado para monitorear y prevenir complicaciones del parto. Desafortunadamente, existe una gran cantidad de situaciones en las que existe una conciencia limitada sobre cómo utilizar un partograma como herramienta de control del trabajo de parto. Uno de los esfuerzos realizados es desarrollar partogramas*

en forma de aplicaciones de partograma electrónico (e-partograph). Esta revisión tiene como objetivo analizar la efectividad y la utilidad del partograma electrónico para la atención obstétrica.
Métodos: *Este estudio realizó una revisión sistemática de revistas utilizando tres bases de datos académicas (Science Direct, PubMed y Google Scholar) con un rango de publicación de 2016 a 2022. Además, los sujetos de este estudio fueron parteras calificadas (SBA) y atención obstétrica. proveedores Los criterios de inclusión en el estudio de la literatura fueron el uso de partogramas electrónicos en la monitorización. Las pautas revisadas por revistas utilizaron Elementos de informes preferidos para revisión sistemática y metanálisis (PRISMA).*
Resultados: *Este estudio encontró 13 estudios que exploran el e-partograph en los últimos seis años (2016-2022). La mayoría de los resultados revisaron la efectividad del uso de partogramas electrónicos en comparación con los partogramas en papel. Además, el e-partograph ha mostrado otra ventaja. Había un sistema de recordatorio al completar los datos por parte de la SBA. Podría identificar si el proceso de parto fue normal o requirió tratamiento adicional. El uso de un e-partograph podría ahorrar tiempo de manera efectiva y fue fácil de usar. SBA fue fácil de aceptar y aplicar.*
Conclusión: *El uso del e-partograma da mejores resultados finales que el partograma en papel. E-partograph es capaz de mantener un parto normal y reducir la incidencia de cesárea y trabajo de parto prolongado. Aunque el e-partograph fue diseñado para brindar beneficios a sus usuarios, había un sistema de recordatorio de audio y visual que podía usarse para detectar complicaciones durante el parto.*

Palabras clave: *Electrónica, atención a la salud, obstétrica, partograma*

INTRODUCTION

Infections, prolonged labor, bleeding, and other complications after childbirth have perished 303 000 women in 2015 (1-4). Moreover, long labor directly results in 6-10 % of maternal and infant mortality and morbidity. One of the efforts to prevent the occurrence of morbidity and mortality in mothers and babies during childbirth is by monitoring labor and handling fast and appropriate actions (1,5-7). Therefore, the World Health Organization (WHO) advocates a partograph to observe during labor (1).

Skilled birth attendants utilize partographs to record significant developments during labor. This partograph sheet was created to gather and record all pertinent data over 12 hours, beginning with the start of contractions and ending with the delivery of the baby. This partograph helps staff members decide when labor is moving normally and when they should be equipped to step in (8-12).

However, the effectiveness of using a partograph in monitoring labor is not optimal currently. This is related to the attitude of health workers who still lack knowledge of paper partographs. Furthermore, to overcome this challenge, many researchers have improved partographs (1,13). One of the efforts is to develop partographs in the form of applications (electronic partographs). An electronic version of the paper-based partograph that automatically plots labor and delivery trends is called an e-partograph. It has alarm systems installed to notify Provider Health Care staff of the upcoming examination schedule in case of danger. In addition, the development of this partograph is based on an android tablet concerning the partograph issued by WHO to make it easier for officers to monitor and document childbirth (3,5). Therefore, the e-partograph improves efficiency in filling patients' information during labor and childbirth, allows Primary health care (PHC) workers to seek and receive real-time professional support, and reduces time to accessing lifesaving care, even after normal work hours.

On the other hand, as new electronic partograph innovations are increasingly being tested and implemented in situations with limited capacity, it is critical to carefully assess what has been accomplished to inform implementers and policymakers on the effectiveness of technology in evidence-based practice.

METHODS

Study Design

This Systematic Review follows the guidelines of the Statement of Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) (14). In addition, the data has completed a review on the journal using three academic databases, including PubMed, Science Direct, and Google Scholar.

Inclusion and Exclusion Criteria

The inclusion criteria for this systematic review have been determined using population, intervention, comparison, outcomes, and study design (PICOS). Furthermore, the population in this study were skilled birth attendants and obstetric care providers who provided childbirth services and used electronic-based partographs in monitoring them. This study was also including grey literature. Moreover, the exclusion criteria, such as labor monitoring using paper partographs.

Search Strategy

This literature search used articles in English from PubMed, Science Direct, and Google Scholar from 2016 to 2022. The literature used the keywords "partograph", "electronic", and "obstetric". The literature found there were 182 articles filtered using the keywords above. The articles were then narrowed down and identified based on the PICOS and obtained as many as 109 articles that could be included in the article screening process. In the meantime, at the article screening stage, according to the suitability of the article based on the abstract, there were 150 articles. Then a feasibility selection was carried out based on the whole discussion's essence and scope in the article. It was found that 16 articles could be made for further selection, namely as many as 13 articles included in the inclusion and 3 articles excluded.

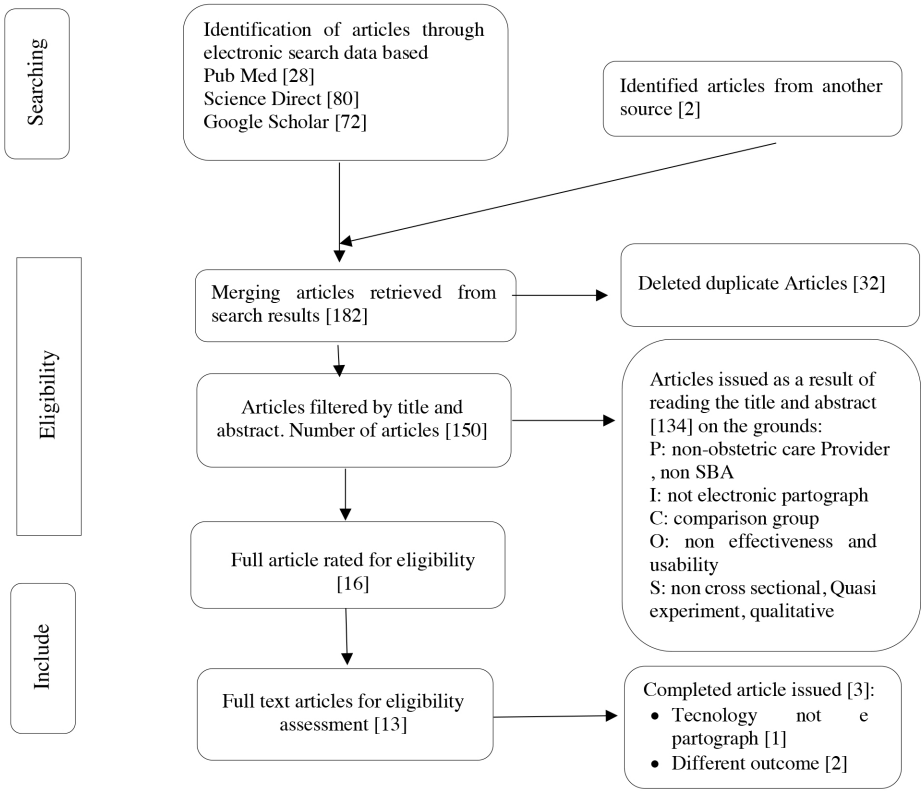

Figure 1. Steps for selecting articles are illustrated in the PRISMA flowchart.

Quality Assessment

The outcomes from the electronic search data-based articles were gathered, identified, and then exported to a Microsoft Excel spreadsheet. The filtered and qualified publications were evaluated, and three writers independently extracted data (WMN, YB, and RBU). Additionally, any

differences of opinion among the three authors (WMN, YB, and RBU) about the findings of the three reviewers were resolved through discussion and consensus. Additionally, each study's comparability, methodology (including sampling approach, response rate, and study representativeness), and outcomes were analyzed using Joanna Briggs Institute (JBI) tools. For cross-sectional, quasi-experimental, and qualitative investigations, the JBI was used to rate the methodological soundness of a study and assess the degree to which potential biases in its design and analysis had been addressed. Therefore, all articles assigned a JBI score of 50 % or more could be considered a "good" low-risk study.

RESULTS

Overview of Included Studies

The thirteen studies have been reviewed, and all labor monitoring used application-based partographs. However, the use of the term was different from one another. For example, "Life Curve", mLabor, PrasavGraph, Digital Partograph, and Intrapartum Monitoring Mobile Application (DAKSH) are android-based mobile applications (8,15,16), one of the terms for the tools used for childbirth monitoring with various gadgets that may be accessed using a smartphone or tablet or other devices (e-partograph) (1,8,17-19). digital partograph is some of the tools used based on android and Word Electric Browser (WEB), and some other names such as Web-Based Partograph and midwifery documentation use web-based (20,21).

Furthermore, these studies were conducted in five countries: India, Indonesia, Kenya, Tanzania, and Northwest Ethiopia. Because of concluding the results of the articles, it showed that users of this application-based partograph varied. For example, in Indonesia, the users of the partograph application were midwives, midwifery students, and researchers; in contrast to other countries for the life Curve [India] application, m labor used by doctors during childbirth monitoring, DAKSH is used by nurses; e used by Skilled Birth Attendant (SBA): Doctor, Nurse, Midwife. e partograph was used by SBA (doctors, midwives, nurses) and Staff nurses and medical officers. E-partograph is used by Obstetric care providers (certified midwife, nurse, Health Officers, Integrated Emergency Obstetrics, and Surgery & Medical Doctors who tend to the woman's needs throughout birth and delivery). Accordingly, to make the analysis more comprehensible, we used the research and the numerous publications in which they were reported. As a result, the findings were presented in a narrative form.

Comparing The Efficacy of e-Phartograph and paper Partograph

The use of the partograph is an important step in ensuring the high-quality care provided to mothers and newborns during labor. Further, developing an application-based partograph aims to improve care during labor by overcoming the challenge of the low use of paper partographs (8,15,22). Additionally, from the results of the analysis of the articles carried out, there was an increase in labor outcomes based on monitoring using an application-based partograph (e-partograph) compared to a paper partograph. Thus, in labor monitoring using the Life Curve Mobile application, measuring performance parameters are assessed on a scale of 1-5 with a total score of 45. Therefore, the results revealed that the Life Curve scored 42.7 compared to the paper partograph, which scored 19.52. This demonstrates that the difference ($p=0.001$) is highly significant.

On the other hand, the paper partograph (2.17 ± 1.18) was statistically significantly lower than the average-SD life curve ($4.74\pm.52$): $p=0.0002$. These findings showed that the use of a life curve mobile application improved SBA's efficiency in providing delivery care (15). In addition, this is in line with the results of other studies, which showed that using an e-partograph was easier to maintain normal labor and take action. However, on the other hand, e-partograph usage during delivery could complicate things for the mother and fetus, according to the examination of the article's data. In turn, the use of the e-Partograph results in a result of 56 % (95 % CI= 27 % -73 %), a tendency away from cesarean sections [43 %to 37 % at Jessore Hospital and from 36 percent to 25 % in Kushtia Hospital] and away from preterm labor compared to the use of the paper partograph (1,17).

Table 1. Overview of Included Studies.

Nº	Authos	Year	Countries	Name Application	User	Study Design	Score of JBI (%)
1	Begum et al.	2017	India	Life curve	Doctor	Cross-sectional	75
2	Sanghvi et al.	2017	Kenya	E-partogram	Skill birth attendant (SBA): doctor, nurse, midwife	Mixed-method, quasi-experimental	89
3	Rahman et al.	2019	India	E-partograph	SBA (doctor, nurse, midwife)	Quasi-experimental	100
4	Schweers et al.	2016	India	M-labor	Doctor	Qualitative	50
5	Singh et al.	2016	India	Prasav graph	Doctor	Qualitative	50
6	Juwita et al.	2019	Indonesia	Midwifery documentation use web-based	Midwives	Cross-sectional	50
7	Singh et al.	2021	India	E-partograph	Staff nurses and medical officers	Cross-sectional	75
8	Litwin et al.	2018	Tanzania	E-partograph	SBA	Qualitative	50
9	Tandiallo et al.	2019	Indonesia	Web-based partograph	Researcher	Quasi-experimental	100
10	Tadesse et al.	2019	Northwest Ethiopia	E-partograph	Prenatal care providers (midwife, nurse, health officers, doctor)	Cross-sectional	100
11	Ulfa et al.	2020	Indonesia	Digital partograph	Midwife students	Cross-sectional	50
12	Singh et al.	2019	India	Digital Partograph and Intrapartum Monitoring Mobile Application	Nurses	Cross-sectional	88
13	Ningrum et al.	2019	Indonesia	Digital partograph	Midwife	Qualitative	70

The results of the article analysis explained the reasons for developing this application-based partograph to solve various problems that arise when using paper partographs, one of which was the very low use of paper partographs (23). From the results that could be seen, the use of e-partographs revealed that the frequency of recording appears to be higher on web-based partographs, which is 26 (86.7 %), compared to the speed of recording using conventional methods, which is 25 (83.3 %) (20), the majority of SBA (87 %-91 %) completed Partograph filling (2), WEB-based partographs were faster in recording contractions, oxytocin, and delivery p-value 0.0001 ($P<0.05$) (21). Therefore, these results indicated that the e-partograph was more effective in maintaining normal delivery, preventing complications during labor, and increasing use during labor monitoring.

Advantages of e Partograph with paper Partograph

Partograph is an instrument to track record the progression of labor. The key parameters in the partograph are the progression of labor (cervical dilating, contractions, and descent of the bottom portion), maternal health (systolic pressure, pulse, and temperature), and fetal condition (fetal heart rate, amniotic fluid, and moulage). In monitoring the paper partograph, the filling and interpretation depend on the person filling it out. In e-partograph, several advantages could be felt when using it. Moreover, the partograph application (e-partograph) was developed in the form of a mobile phone or tablet based on android with a web-based computer device, with the advantages made by each developer. One of the benefits of using a partograph is making decisions when monitoring labor, whether this delivery can be assisted or action is needed (23,24). The e-partograph has several advantages over the paper partograph in some system applications, which are made by adding notification features in the form of audio and visual warnings, which show the charging time and complications that occur in mothers and babies. This notification system helps users to determine what decisions and actions to take.

In some applications, there are other advantages, such as storing data filled in and graphs appearing according to the data filled in with varying display results. In addition, this partograph program has made use of a "delay-tolerant framework," making it usable even in unfavorable internet network circumstances (25), and some can even be used without using the internet network (23). This shows that the e-partograph has other benefits compared to the paper partograph. Throughout the labor and delivery process, several inventors have concentrated on low-cost digital solutions to address problems with the paper partograph, improve care quality, enhance documentation, and facilitate decision-making (19).

Acceptance of e-Partograph Among Health Workers

Application development on partographs aims to make it easier for users to fill in partographs. Most SBAs agree that the e-partograph greatly simplifies filling and increases its use, but it should be a concern for obstetric services with a high rate of delivery cases. It takes a lot of trained SBA to be more optimal in their utilization (17). Almost all SBA (93 %) showed confidence and comfort in using e-Partograph. SBA gave a positive impression and felt efficient and easy to use. The SBA expresses faith in their capacity to comprehend and take action on the reminders and cautions provided in the e-partograph. The SBA's behaviour in relation to filling out the partograph changes while using the e-partograph (8,26).

DISCUSSION

Digital partographs are designed to solve various problems arising from paper partographs (23). Many researchers are developing partograph applications in various countries in the world, but all of them have different effectiveness, advantages, and levels of acceptance.

Based on Sanghvi et al. (2017), using the e-partograph application has higher effectiveness than using the paper partograph (23). It was determined that using an electronic partograph reduced the likelihood of a complicated fetal outcome by 56 % (95 % CI = 27 % - 73 %) compared to a conventional partograph. The practitioner uses partographs to a much greater

Table 2. Summary of Selected Studies.

Nº	App Name	Description	Outcome	Results
1	Life Curve	Android-based application, equipped with colors that appear on the screen to describe the condition of the mother and children	The utilization of the life curve	The overall results for the paper partograph (19.52) and the Live Curve (42.7) are significantly different from one another (p.001). However, the average SD score for the life curve is remarkably higher (4.74±.52) than for paper partographs (2.17±1.18): p.0002.
2	e-partogram	Application based on android tablet, there is an audio and visual reminder system when it comes to doing the next check and in case of complications	The utilization of e-Partogram to maintain normal delivery	There are 842 active phase maternity customers using e-Partograms and data from 1,042 clients observed using paper partograms. The e-partograms usage was 56 percent (95 %t CI= 27 % -73 percent) with fewer chances of fetal outcomes problems than paper partographs.
3	e-partograph	Tablet, smartphone, or computer-based applications. A system emits a red signal if it shows complications during labor. The application can store data both locally and remotely in a central database.	The evaluation of partograph applications' viability and efficiency	Labor monitoring used paper partographs to identify 42% of long hours worked; during phase 2, monitoring with e-partographs showed just 29% of long hours worked. Similar outcomes were seen at Jessore DH, where paper partographs lowered lengthy labor rates from 30% to 7%.
4	m-labor	A mobile application refers to the WHO partograph. The display on the screen is not boring and minimizes filling errors.	The use of m-labor in documenting partographs	m-labor lets professionals use a reminder system, emergency decision support, and assistance for the entire patient lifecycle, from admission to referral, which is all included in labor.
5	PrasavGraph	The program is built on android and was created using a delay-tolerant architecture, allowing it to function even with unreliable internet connections.	PrasavGraph application for childbirth monitoring	It is easy to use on a smartphone, so it is hoped that the partograph will be easier to use in the delivery process of health workers in the peripheral area, which is still very low until now.
6	Midwifery Documentation Use Web Based	The application web-based	Recording Speed	The frequency of recording appeared to be higher on web-based partographs, namely 26 (86.7%), compared to the speed of recording using conventional methods, which was 25 (83.3%)
7	e-partograph	The tablet-based partograph application used is named DAKSH. The app allows the integration of several features, such as alerts and alarms, to improve the user experience.	The use and acceptance	Tablet-based partographs were preferable to paper-based ones since they saved time and were simple to use. It offers a reminder option, which is helpful for healthcare professionals.
8	e-partograph	Partograph app for Android tablets, with a focus on enhancing the simplicity and effectiveness of real-time documentation	The feasibility and use of e partograph	Most SBA (87–91%) completed the ePartogram by registering the client, making the first and subsequent observations, and using the screen on the first shift.
9	Web-Based Partograph	Computer-based partographs with the use of internet networks	The utilization of web-based partographs	The WEB-based partographs were quicker for documenting contractions, oxytocin levels, and delivery processes. In addition, the accuracy of internet-based partographs in earlier detection, which showed a p-value of 0.000 (0.05), and emergency detection, which has a p-value of 0.014, can be used to compare their use to that of conventional partographs (0.05).
10	e-partograph	Partograph in mobile phone	Mobile phone usage for e-Partograph	205 smartphone owners (or 46% of them) used e-partograph. Healthcare with a positive attitude toward Partograph (AOR = 2.76.95% C.I: 1.49-5.09) and education in linked fields (AOR = 7.63.95% C.)
11	Digital Partograph	web-based partograph design	Utilizing digital partographs as a teaching tool	The signification of the p-value displayed 0,0001 < 0.05, meaning that electronic partographs as a medium of education are very effective for developing partographic filling of students' skills.
12	Digital Partograph and Intrapartum Monitoring Mobile Ap-plication	The tablet-based DAKSH application. Real-time labor monitoring, fundamental decision-making help with better warnings, and logging are all app features.	The utilization of DAKSH	Around 463 births were observed at the hospital, of which 91.56 % (n=424) were registered in the application.
13	Digital Partograph	Android-based partographs, real-time recording, there is a notification system in case of labor difficulties can be accessed on the play store	The use of digital partographs, behaviour change, stakeholder support	The study results show that the Google Playstore's digital partograph application can already be used to track the progress of births. Midwives are behaving differently when using digital partographs as a result of their accessibility.

extent to adhere to typical labor observations (17). Rahman et al. in 2019 made the same claim, explaining that the facility-based cesarean section rate is trending downward in both institutions, dropping from 43 % in Jessore to 37 % and from 36 % to 25 % at Kushtia Hospital in Banglades (16). Similar outcomes were shown in Jessore, Bangladesh, where the percentage of protracted labor was lowered from 30 % of long labor recorded by e-partograph to 7 % with paper partographs. Most health professionals finished filling out the e-Partogram: registering patients, first and subsequent observations, and utilizing screens easily on the first shift; the usage of the e Partogram to monitor 103 births in 84 shifts; the fifth shift reported a rise to 100 % (8,16). In terms of recording, the use of e-partographs is reported to be more effective when compared to paper partographs, as stated by Ahmad et al., 2019 that the study results revealed that the frequency of recording appears to be higher on web-based partographs, which 26 (86.7 %) compared to recording speed using conventional methods that are equal to 25 (83.3 %) (25). The previous research revealed that for recording contractions, oxytocin, and births, an internet-based partograph was easier to use than a traditional partograph (21).

Additionally, the early detection precision of the web-based partograph has a p-value of 0.0001 (0.05), and its accuracy in emergency detection is 0.014 (0.05), indicating that it differs from conventional partographs. The referral process' p-value, however, is 1 000 (>0.05), indicating that there is no distinction between the use of WEB-based partographs and traditional partographs (25). Study on the digital partograph is a highly effective learning tool for acquiring partographic knowledge, according to research on the effectiveness of the e-partograph as a teaching aid for students. Based on Begum et al., 2020, the e-partograph application has the advantages of being easier to fill out, automatically generating graphs, more interesting to work with, providing timely automatic reminders to evaluate mothers in labor, generating digital color-coded warning numbers, and sending automatic text messages to supervisors in situations abnormal (20). Singh et al., 2019 also showed that e-partographs are easy to use on smartphones, so it is hoped that partographs will be easier to use in the delivery process by health workers in the periphery, which is still very low (22). Research on the advantages of the e-partograph was also carried out by Ningrum et al., 2019, and it demonstrated that the digital partograph's information system complied with the demands for system excellence, information excellence, and user satisfaction (26). Digital partographs have been useful for clinical decision-making, tracking the course of labor, documenting, keeping tabs on the health of the mother and fetus, and gaining support from involved people for such applications. Several studies have also assessed the level of acceptance of e-partographs by health workers. Nursing and medical professionals concluded that tablet-based partographs are superior to paper-based partographs because they are quicker and simpler to use (24). Research by Litwin et al. (2018) showed that almost all health workers (93 %) Health professionals reported a positive opinion of the e-Partogram and believed that it was effective and simple to use (8). Additionally, they showed trust in their ability to understand and respond to these e-reminders partograph's throughout the fifth shift (8,19). The level of acceptance of e-partographs in terms of cellphone ownership for application installation, from the survey results, it was found that 205 (46 %) were eager to use cell phones for e-Partographs (19).

CONCLUSION

Most studies showed that the development of an application-based partograph aimed to facilitate the process of monitoring labour. With the e-partograph, the result of delivery was better than with the paper partograph. E-partograph maintained normal delivery and reduced the incidence of caesarean section and prolonged labour. In addition, the e-partograph provided the advantage that there was an audio and visual reminder system that could be used to detect complications during childbirth. Furthermore, all data was stored and could be accessed again to make the documentation system easier. The level of SBA acceptance of the e-partograph was excellent, as evidenced by the higher use of the e-partograph compared to the paper partograph.

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