

Knowledge of Pregnancy and Its Danger Signs Not Improved by Maternal and Child Health Handbook

Kevin Dominique Tjandraprawira¹ · Ivan Ghozali¹

Received: 30 January 2018 / Accepted: 28 July 2018 / Published online: 10 August 2018
© Federation of Obstetric & Gynecological Societies of India 2018

About the Author



Dr. Kevin Dominique Tjandraprawira graduated with distinction from the Faculty of Medicine, Universitas Padjadjaran in 2016. He has had great interest in the field of obstetrics and gynecology, completing two studies thus far on the genetics aspect of cervical cancer (as part of his undergraduate thesis) and the link between surgically treated endometriosis and preservation of fertility. He aspires to become a specialist in obstetrics and gynecology in the future. Currently, he practises medicine at Majalengka General District Hospital in Majalengka Regency, Indonesia, and in his spare time, he is an avid reader of non-fiction books, covering a wide range of topics, and enjoys traveling immensely.

Abstract

Background High numbers of maternal mortality rate and child mortality rate continue to be the pressing issues in Indonesia. To tackle this problem, multiple approaches have been undertaken, particularly through distributing a Maternal and Child Health (MCH) handbook to every pregnant woman. However, despite the widespread usage

of such handbook, its true efficacy in supporting safe motherhood by improving maternal knowledge on various stages of pregnancy and the associated obstetric danger signs is relatively unknown and remains to be established. **Methods** This is a primary cross-sectional study conducted at Majalengka General District Hospital on recently delivering postpartum women between August and September 2017. A total of 127 women were recruited and later divided into two separate groups according to their self-admission on the degree they had read the MCH handbook ($\geq 50\%$ and $< 50\%$) and administered a pre-validated questionnaire to assess their knowledge around pregnancy and its danger signs.

Results We discovered that our population had high knowledge around pregnancy and its danger signs, and the MCH handbook did not hold a significant role in effecting this finding (p value 0.295). Furthermore, various

Dr. Kevin Dominique Tjandraprawira, Ivan Ghozali, General Physician, Department of Obstetrics and Gynecology, Majalengka General District Hospital (Rumah Sakit Umum Daerah Majalengka).

✉ Kevin Dominique Tjandraprawira
kevin.tjandraprawira@gmail.com

¹ Majalengka General District Hospital (Rumah Sakit Umum Daerah Majalengka), Kabupaten Majalengka, West Java, Indonesia

sociodemographic factors (age, educational backgrounds, welfare status, distance from healthcare center, parity and number of ANC visits) also did not exert a statistically significant influence on the level of knowledge in our population (p values 0.579, 0.521, 0.617, 0.908, 0.342, 0.618 and 0.939 respectively).

Conclusion To conclude, the MCH handbook did not exert a significant influence in improving maternal knowledge levels around pregnancy and the associated obstetric danger signs.

Keywords Maternal and Child Health handbook · Maternal knowledge · Obstetric danger signs

Introduction

Pregnancy is a crucial period requiring the utmost level of attention and care. Lapses in ensuring optimal pregnancy have led to many deaths of mothers and/or children around the times of pregnancy. In Indonesia, high numbers of Maternal Mortality Rate (MMR) and Child Mortality Rate (CMR) continue to be longstanding issues and while a decreasing trend was observed at the turn of the century, the 2012 Indonesia Demographic and Health Survey instead reported a rise in MMR, reaching 359 deaths per 100,000 live births, far exceeding the MDG target of 102 deaths per 100,000 live births [1].

There are many contributing factors to such failure including the poor qualities associated with antenatal, parturition and postnatal cares. The multiplicity of problems has prompted the Indonesian government to launch a multi-pronged approach, particularly by distributing a Mother and Child Health (MCH) handbook to every expecting woman [2]. The first MCH handbook was introduced by Japan in the final decade of the twentieth century and it was championed for empowering women in pregnancy, parturition and early childcare, as well as the pressing obstetric danger signs [3].

The Indonesian MCH handbook contains basic education material on pregnancy, antenatal care visits, parturition, postnatal care, family planning, vaccination, early childcare and developmental milestones presented as both text and pictures combined with many pages on which health practitioners record both the conditions of the mother and the child [3, 4]. Various studies have voiced their support for the MCH handbook, as its usage is associated with higher utilization of maternal health services, higher knowledge of ANC, safe motherhood and early child care and promoting the continuum of maternal, newborn and child health (MNCH) care in Indonesia [5–7]. This practice was later given a stronger support by a Cochrane review published in 2009, which stated that

women would prefer to carry their antenatal records during their pregnancy as it increased their sense of control over, and satisfaction with, their care [8].

However, despite a number of studies focusing on the influence of the MCH handbooks on pregnancy, not many have attempted to investigate its role in increasing awareness of Indonesian women about the various obstetric danger signs and the entailing complications. Thus, this study aims to improve on that and to the authors' knowledge this is the first study with such intent to be performed in a regional hospital in West Java.

Materials and Methods

This is a primary cross-sectional study conducted between August and September 2017 on recently delivering postpartum women treated in the maternity ward of Majalengka General District Hospital (MGDH). All of the participating women had received their MCH handbooks (available only in Indonesian language) at their first antenatal care visit, and they had been referred to the hospital from various primary healthcare centers scattered around Majalengka Regency's 32 districts due to at least one obstetric indication. For this study, 127 eligible women were divided into two groups based on their self-admission on how much they had read their MCH handbooks ($\geq 50\%$ and $< 50\%$). First, oral informed consent was acquired from the participants. Next, the eligible participants were asked to provide their personal data, i.e., their names, dates of birth, educational backgrounds, family income, distance to the nearest healthcare facility and their obstetric history. Then, a standardized questionnaire consisting of 30 questions (most of which were about obstetric danger signs) was administered. It had been pre-validated prior with an Alpha-Cronbach value of 0.733. The patients were given time (15–20 min) to complete the questionnaires, after which they were all collected. Data regarding the patients' final diagnoses and their neonates' anthropometric measurements were also collected. Throughout all the steps mentioned above, data confidentiality was strictly maintained. This study had received ethical approval from both Majalengka district and hospital's ethics review board.

The data were then recorded in a purpose-built Microsoft Excel database with subsequent statistical analysis undertaken with Statistical Package for Social Sciences (SPSS), version 21. α -Level of 0.05 and 80% power was assigned at the beginning of the study, which determined the sample size for each group (37 participants) [9]. Shapiro–Wilk's test was then used to determine the data's normality, and Mann–Whitney U tests were later used to analyze the relationship between the various sociodemographic factors and the degree the MCH handbook had

been read with the final score of the distributed questionnaire. Finally, probability values of less than 5% were considered statistically significant.

Results

In general, sociodemographic characteristics of the women claiming to have read $\geq 50\%$ of their MCH handbooks did not differ markedly from those who had read $< 50\%$ of their MCH handbooks, even though the notable differences will be described below (Tables 1, 2, 3, 4).

Of the 127 women participating in our study, the average age at which they delivered was 29.4 with up to 94

women (74.0%) between the ages of 20 and 35 [10]. The educational backgrounds of the mothers and fathers were also recorded and in general, most of them had not graduated high school. Of the mothers, only 46 women (36.2%) had graduated high school with comparable numbers among the fathers (48 men–37.8%) having attained the same level of education.

Of the 127 participating women (and their spouses), 78 couples (61.4%) survived on less than Rp 1.525 million per month and 118 couples (92.9%) lived less than an hour from the nearest health facility.

Of all the participating women, all had undergone at least one antenatal care (ANC) visit with a health practitioner (midwife or doctor) with 123 women (96.9%) had

Table 1 Sociodemographic factors

No.	Sociodemographic factors	$\geq 50\%$ MCHH readers	$< 50\%$ MCHH readers	Overall results	Assoc. w/questionnaire scores <i>p</i> value (sig < 0.05)
1	<i>Age at giving birth</i>				
	Average age	29.27 (± 6.67)	29.71 (± 6.94)	29.42 (± 6.74)	0.356; 0.726; 0.579
	Number of women between 20 and 35 years old	62 (74.7%)	32 (72.3%)	94 (74%)	
	Number of women < 20 OR > 35 years old	21 (25.3%)	12 (27.7%)	33 (26%)	
2	<i>Education background of mother</i>				
	Having graduated high school	32 (38.6%)	14 (31.9%)	46 (36.2%)	0.254; 0.627; 0.521
	Not having graduated high school	51 (61.4%)	30 (68.1%)	81 (63.8%)	
3	<i>Education background of father</i>				
	Having graduated high school	32 (38.6%)	16 (36.3%)	48 (37.8%)	0.356; 0.647; 0.617
	Not having graduated high school	51 (61.4%)	28 (63.7%)	79 (62.2%)	
4	<i>Economic background</i>				
	Monthly income ≥ 1.525 million IDR	48 (57.8%)	30 (68.2%)	78 (61.4%)	0.823; 0.673; 0.908
	Monthly income < 1.525 million IDR	35 (42.2%)	14 (31.8%)	49 (38.6%)	
5	<i>Distance to the nearest health center</i>				
	≥ 1 h	7 (8.4%)	2 (4.5%)	9 (7.1%)	0.397; 0.647; 0.342
	< 1 h	76 (91.6%)	42 (95.5%)	118 (92.9%)	
6	<i>Number of ANC visits</i>				
	< 4 visits	0 (0%)	4 (9.1%)	4 (3.1%)	0.361; 0.339; 0.439
	≥ 4 visits	83 (100%)	40 (90.9%)	123 (96.9%)	
	4–10 visits	40 (48.3%)	28 (63.6%)	68 (53.5%)	
	11–15 visits	41 (49.3%)	12 (27.3%)	53 (41.7%)	
	> 15 visits	2 (2.4%)	0 (0%)	2 (1.6%)	
	Mean (mode)	10.41 (13)	8.43 (8)	9.72 (13)	
	Minimum; maximum number of visits	4; 27	1; 14	1; 27	
7	<i>Degree to which MCHH had been read</i>				
	$\geq 50\%$	N/A	N/A	83 (65.4%)	0.295
	$< 50\%$	N/A	N/A	44 (34.6%)	
8	<i>Parity of the mothers (at current delivery)</i>				
	Primiparous	28 (33.7%)	18 (40.9%)	46 (36.2%)	0.145; 0.179; 0.618
	Multiparous	55 (66.3%)	26 (59.1%)	81 (63.8%)	

Table 2 Questionnaire results

Parameters	Results
Average score	25.41 (± 3.44)
Number of women with below average scores	49 (38.6%)
Number of women with above average scores	78 (61.4%)
Average score among ≥ 50% MCHH readers	25.47 (± 3.65)
Average score among < 50% MCHH readers	25.30 (± 3.06)

Table 3 Newborn data

No.	Delivery outcome parameters	Results
1	<i>Anthropometric data of newborns</i>	
	Average weight (g)	3131.55 (± 599.37)
	Average length (cm)	49.09 (± 2.82)
	Average head circumference (cm)	33.57 (± 3.06)
2	<i>Delivery method</i>	
	Spontaneous delivery	34 (26.8%)
	Cesarean section	93 (73.2%)
3	<i>Delivery status</i>	
	Preterm	19 (15.0%)
	Term	105 (82.7%)
	Postterm	3 (2.3%)
4	<i>Growth status of newborns</i>	
	Small for gestational age (SGA)	12 (9.3%)
	Appropriate for gestational age (AGA)	109 (84.5%)
	Large for gestational age (LGA)	8 (6.2%)
5	<i>Gender of newborns</i>	
	Male	69 (53.5%)
	Female	60 (46.5%)

had at least four consultations but there were still four women (3.1%) who did not meet the recommended number of antenatal care consultations [4]. Of note, among those who claimed to have read ≥ 50% of their MCH handbooks, all had undergone at least 4 ANC visit, while the four women who had fewer than 4 ANC visits all belonged to the group who had read < 50% of their MCH handbooks. The overall average number of ANC visits was 9.72 with the most frequent number of visits being 13. An interesting finding was a single patient who reported having gone to

health practitioners for at least thrice every month, thus attaining 27 ANC visits in total during her pregnancy.

Relating to the questionnaire administered, the average score on the whole was 25.41, with 49 women (38.6%) performing below the average score and 78 women (61.4%) performing above. When stratified according to the degree these patients had admitted reading the MCH handbook, the following results were obtained:

- among those who had read ≥ 50% of the MCH handbook, the average score was 25.5, with a range of scores between 12 and 30
 - among those who had read less than half the book, the average score was very similar at 25.3, with a range of scores between 14 and 30.
- A question-by-question analysis was also performed, and our results revealed the following highlights:
- 77% of the patients had known the correct minimum number of ANC visits.
 - Up to 96% of patients had known about tetanus toxoid (TT) immunization and their benefit in preventing neonatal tetanus.
 - Up to 96% of patients had been aware that they should not drink traditional herbal remedies during pregnancy.
 - 78% had recognized that swellings of the hands, feet and face constituted an obstetric emergency.
 - 85% of patients knew that ‘water break’ or premature rupture of membrane (PROM) was abnormal.
 - 93.7% of patients correctly identified that bleeding early in pregnancy was an obstetric danger sign
 - 94% of patients correctly answered that prolonged coughing was abnormal in pregnancy.
 - Only 76% of women would feel alarmed by an episode of palpitations during pregnancy.
 - 93% of patients correctly answered that repeated episodes of diarrhea needed an urgent referral to a physician.
 - 83.5% of patients recognized that bleeding during labor constituted an obstetric hazard.
 - 90% of women correctly identified that seizure would be an obstetric emergency.
 - 95% of women knew that prolonged anxiety required a consultation with a physician but only 29% regarded

Table 4 Newborn growth status and MCH handbook reading degree

No.	Questionnaire results	Small for gestational age (SGA)	Appropriate and large for gestational age (non-SGA)	p value
1	Mean score (SD)	25.41 (± 3.56)	25.50 (± 2.65)	0.647
2	Minimum score	12	19	
3	Maximum score	30	28	

prolonged sadness after delivery (postpartum depression) as normal.

- Only 29% of women knew that only fevers more than 2 days during the postpartum/puerperium period required referrals to the nearest health facility.
- 79.5% of patients had known that foul-smelling vaginal discharge during puerperium was an ominous sign.
- Only 84% of women knew the benefits of colostrum and only 88% of women knew the benefits of breastfeeding in preventing future breast malignancies.

As most women delivered at term, most of the babies had attained optimal weights and lengths at delivery. Four women delivered twins, while one unfortunately suffered from IUFD and another delivered a stillborn baby. Of the 129 babies, 69 were male and the rest were female. Furthermore, 109 babies (84.5%) were deemed appropriate for gestational age (AGA).

An analysis has been performed on whether there was a difference in the average questionnaire scores of the mothers who delivered small for gestational age (SGA) newborns as opposed to those who delivered AGA and LGA newborns. There was only very little difference which was eventually declared not statistically significant (p value 0.647).

Next we performed an analysis on how much extent to which the MCH handbook had been read exerted their influences on the final scores of the patients' questionnaires. The Mann–Whitney U test revealed a p value of 0.295, which was not statistically significant. Similar analyses were also performed on the effects of age at delivery, the parents' educational backgrounds and the welfare status on the total scores of the questionnaire. All the subsequent analyses revealed no statistically significant relationships, with p values ranging from 0.342 to 0.908.

Discussion

Indonesia is one of the few countries utilizing an MCH handbook in its attempt of ensuring a mother–child continuum of care [3]. One of the objectives of the MCH handbook is to improve the baseline knowledge about the many do's and don'ts of pregnancy, including the ever-ominous obstetric danger signs [3]. This study has utilized a questionnaire containing statements to which the responses of patients may be interpreted as their baseline knowledge. As mentioned earlier, the average score in our study was already very high, at 25 out of 30 questions. Such high score would indicate that generally, most of the women were already well informed on pregnancy, parturition, early childcare and also pregnancy danger signs. Furthermore, we conducted a further analysis on the

accuracy rate per question to which the results were mostly favorable.

In our study, a very high number of women, at 77%, had known about the correct number of minimum ANC visits and almost all women (96%) knew about the importance of TT injection during pregnancy. Our results are far superior to another study done in a rural area of North India in which Gupta et al. [11] revealed that among their subjects, only around 60% of women had realized the importance of TT injection during pregnancy and very few women, 10.9% of their population, knew of the importance of at least 4 ANC visits.

In our questionnaire, there were two questions about bleeding (in pregnancy and during labor) to which most of the patients had recognized it as a danger sign (94% and 83% respectively). Our study has also elicited the patients' knowledge on other obstetric danger signs. With 84.6% correctly identifying premature rupture of membrane (water-breaking, in layman terms) and 76% identifying swellings of the hands, feet and face as danger signs, our results are more superior to studies published elsewhere. A study by Nithya et al. [12] revealed that among patients referred to their tertiary care facility in India, less than 50% had known about the danger signs during pregnancy and these numbers further dwindled to 27% and 21.2%, respectively, when the same women were questioned regarding their knowledge on danger signs during labor and child birth.

Another study by Ohour, Alkhateeb and Amarin in 2012 revealed a favorable level of knowledge about pregnancy danger signs and symptoms at 72.6% but these numbers faltered when the same women were asked to name the signs and symptoms specifically. Worryingly, only 28.9% realized that vaginal bleeding was an alarming sign and even fewer women (18%) recognized abdominal pain as an emergency [13].

We also questioned our subjects on their knowledge regarding convulsions during pregnancy, and we discovered that 9 out of 10 women recognized that convulsions were an emergency. This figure was greater than results reported from Ethiopia as three separate studies reported not more than 24% of their subjects understood the grave nature of this condition [14–16]. Then, our results also revealed that almost 80% of postpartum women recognized offensive vaginal discharge as a source of worry. Again, this level of knowledge is higher than data from studies done in Africa. Two studies from different regions in Ethiopia reported that in their populations, less than 25% of women recognized the dire implications of malodorous vaginal discharge [15, 16].

In short, these studies from Africa have revealed a recurring theme, with less than 50% were often found to be knowledgeable about obstetric danger signs and symptoms [14–16].

We also enquired our subjects on the importance of breastfeeding, particularly the importance of feeding colostrum to their newborns. Our results revealed at least 84% of women were aware of the immunological benefits of colostrum and this level of knowledge is much superior to results from another study done in India. Ambike et al. reported from their rural hospital that out of 250 mothers treated in the postnatal ward, only 115—less than 50%—had knowledge about the advantages of colostrum. However, this lack of knowledge was then supplemented by the ardent efforts of both the doctors and the patients' relatives, as eventually 95.6% of mothers fed colostrum to their neonates [17].

We discovered no association between the obstetric history (primiparous vs. multiparous) and the scores the patient had. This would suggest that the mother's previous experience didn't play a statistically significant role (p value 0.618) in equipping the patients with the vital knowledge about pregnancy. Contrary to our results, a study done in Enugu State, Nigeria, revealed that parity played a significant role in equipping the women with knowledge on pregnancy danger signs [18].

We found no significant associations between the mothers' and their husbands' educational backgrounds with the final scores (p value 0.521 and 0.617, respectively). This is surprising, as other studies have often listed the education level attained by the mother or the father or both to be significant predictors in the knowledge of pregnancy and its danger signs [13, 18–20].

Comparing the financial backgrounds of the patients and the number of ANC visits on the final scores also elicited similar results, with p values sitting at 0.908 and 0.439, respectively. This result is somewhat comparable to a Ugandan study which discovered that the family income regularity did not significantly influence birth preparedness [19].

Furthermore, the extent to which the MCH handbook had been read ($\geq 50\%$ vs. $< 50\%$) influenced the questionnaire's final score was analyzed, and no significant association (p value 0.295) was discovered. This result would suggest that the MCH handbook had not held a critical role in equipping the mothers for their pregnancies and perhaps, despite the mothers not having read much of the book, they still received the necessary information from other sources, such as from talks during routine ANC visits, mass media or even from their own families and friends [20].

In fact, our cohort would suggest that the routine ANC visits had provided the necessary information as only four out of 127 patients had fewer than the recommended four ANC visits during the course of their pregnancy. Such high percentage of women completing the minimum required number of ANC visits would suggest that these women ascribe those routine consultations to the highest

importance. The huge number of ANC visits, in many cases once per month until 28 weeks' gestation, then every 2 weeks up to 36 weeks and finally, weekly until delivery, would have supplied the mothers with ample knowledge about pregnancy. Furthermore, ANC visits are about repetition and being repeatedly exposed to the same message about pregnancy, parturition and delivery would have made these women well versed in many aspects of pregnancy [15, 16].

As for the exact role played by MCH handbook in influencing knowledge about obstetric danger signs, only very few studies have delved into the subject and with mixed results. A study done in 2007 by Kusumayati and Nakamura [7] found that MCH handbook utilization led to higher maternal knowledge regarding ANC, TT immunization and delivery by a skilled birth attendant but it did not measure the book's influence on knowledge about danger signs. Another local study done in Manado showed that while the handbook did not positively affect the uptake of breastfeeding practice among the local women but again, it did not investigate the handbook's impact on knowledge of obstetric danger signs [21].

A study in Palestine also testified to the effectiveness of the MCH handbook in empowering expecting mothers. They noted that knowledge levels in relation to the practice of breastfeeding and how to cope with the risks of premature rupture of membranes were increased but the study did not focus on other danger signs [22].

Finally, there was a meta-analysis performed by Baquini and Nakamura in 2012 to the effects of MCH handbook, which lent support to the benefits of MCH handbook in increasing knowledge about ANC, delivery by SBA and in health facilities and on childcare. However, their work did not cover the impact of the handbook in making the patients aware of the obstetric danger signs [5].

The limitations of this study are numerous. They include but are not limited to the following:

1. The somewhat small sample size.
2. Selection bias as all subjects came from a single hospital (MGDH) and were all referred due to at least one obstetric indication.
3. Response bias as the patients have either overestimated or underestimated their reading of the MCH handbook. This was further complicated by the lack of method to accurately assess the degree to which the MCH handbook was read. Dividing the scale to $\geq 50\%$ and $< 50\%$ was the authors' arbitrary decision due to their lack of knowledge of a standardized approach.
4. The design of the study involving a questionnaire necessitating a yes–no answer, which would have prompted many patients resort to guessing.

5. The practice of many mothers answering the questionnaire while also eliciting second opinion/help from relatives who were then visiting.
6. The practice of some of the mothers whom consulted the MCH handbook while working on the questionnaire.
7. The possible confounding factors from mass media and knowledge passed from the patients' mothers and relatives.

To conclude, the baseline knowledge level of Indonesian women residing in Majalengka is high regarding obstetric danger signs, pregnancy, parturition and early childcare. However, our study failed to demonstrate any significant influences exerted by various sociodemographic factors and the degrees to which the MCH handbook had been read on the high knowledge level. Further studies would be required to supplement and attest to our findings.

Acknowledgements We would like to thank Dr. Lulu Eva Rakhmalia, MKM for her valuable critique and scholarly input and Dr. Wing Wiryawan, SpOG for his support throughout the study.

Compliance with Ethical Standards

Conflict of interest Kevin Dominique Tjandraprawira and Ivan Ghozali declare that they do not have any conflicts of interest to disclose.

Ethical Approval This study received ethical approval from both Majalengka district and hospital's ethics review boards.

References

1. (BPS) SI, (BKKBN) NPaFPB, Ministry of Health RoIK-M, International I. Indonesia Demographic and Health Survey 2012. Jakarta: 2013.
2. UNICEF. Maternal and child health. Jakarta: UNICEF; 2012. https://www.unicef.org/indonesia/A5-_E_Issue_Brief_Maternal_REV.pdf.
3. Bhuiyan SU, Nakamura Y. Continuity of maternal, neonatal and child health care through MCH handbook for ensuring the quality of life. *Child Research*; 2009 [updated January 1, 2009; cited 2017 17 July].
4. Indonesia MoHRo. *Buku Kesehatan Ibu dan Anak*. Jakarta: Ministry of Health, Republic of Indonesia, Japan International Cooperation Agency; 2016.
5. Nakamura Y. Is Maternal and Child Health Handbook effective? Meta-analysis of the effects of MCH handbook. *Kokusai Hoken Iryo (J Int Health)*. 2012;27(2):121–7.
6. Osaki K, Hattori T, Kosen S. The role of home-based records in the establishment of a continuum of care for mothers, newborns, and children in Indonesia. *Glob Health Action*. 2013;6:1–12.
7. Kusumayati A, Nakamura Y. Increased utilization of maternal health services by mothers using the Maternal and Child Health Handbook in Indonesia. *Kokusai Hoken Iryo (J Int Health)*. 2007;22(3):143–51.
8. Brown HC, Smith HJ, Mori R, Noma H. Giving women their own case notes to carry during pregnancy. *Cochrane Database Syst Rev*. 2015. <https://doi.org/10.1002/14651858.CD002856.pub3>.
9. Dawson B, Trapp RG. Research questions about two separate or independent groups. In: Foltin J, Lebowitz H, Fernando N, editors. *Basic & clinical biostatistics*. New York: McGraw Hill Medical; 2004. p. 134–61.
10. Cunningham FG, Leveno KJ, Bloom S, et al. *Preconceptional counseling*. *Williams obstetrics*. 23rd ed. New York: McGraw Hill Medical; 2010. p. 174–88.
11. Gupta R, Shora T, Verma A, et al. Knowledge regarding antenatal care services, its utilization, and delivery practices in mothers (aged 15–49 years) in a rural area of North India. *Trop J Med Res*. 2015;18(2):89–94.
12. Nithya R, Dorairajan G, Chinnakali P. Do pregnant women know about danger signs of pregnancy and childbirth? A study of the level of knowledge and its associated factors from a tertiary care hospital in Southern India. *Int J Adv Med Health Res*. 2017;4(1):11–7.
13. Okour A, Alkhateeb M, Amarin Z. Awareness of danger signs and symptoms of pregnancy complication among women in Jordan. *Int J Gynaecol Obstet*. 2012;118(1):11–4.
14. Hailu D, Berhe H. Knowledge about obstetric danger signs and associated factors among mothers in Tsegedie District, Tigray Region, Ethiopia 2013: community based cross-sectional study. *PLoS ONE*. 2014;9(2):e83459.
15. Bililign N, Mulatu T. Knowledge of obstetric danger signs and associated factors among reproductive age women in Raya Kobo district of Ethiopia: a community based cross-sectional study. *BMC Pregnancy Childbirth*. 2017;17(1):70.
16. Bogale D, Markos D. Knowledge of obstetric danger signs among child bearing age women in Goba district, Ethiopia: a cross-sectional study. *BMC Pregnancy Childbirth*. 2015;15:77.
17. Ambike D, Ambike A, Raje S, et al. Knowledge, awareness and breast-feeding practices of postnatal mothers in a rural teaching hospital: a cross sectional survey. *Int J Reprod Contracept Obstet Gynecol*. 2017;6(12):5429–34.
18. Agunwa C, Nnebue CC, Duru CB, et al. Knowledge of obstetric danger signs among women of reproductive age in rural communities in Enugu State, Nigeria. *Am J Health Res*. 2015;3(6):376–80.
19. Kabakyenga JK, Östergren P-O, Turyakira E, et al. Knowledge of obstetric danger signs and birth preparedness practices among women in rural Uganda. *Reprod Health*. 2011;8(1):33.
20. Sood S, Sengupta M, Shefner-Rogers CL, et al. Impact of the SIAGA maternal and neonatal communication campaign on knowledge of danger signs and birth preparedness in West Java, Indonesia. *J Health Mass Commun*. 2009;1(1/2):40–57.
21. Pandara VE. *Utilization of MCH handbook and exclusive breastfeeding among mothers of children 6 to 12 months old in Manado, Indonesia*. Salaya: Mahidol University; 2006.
22. Hagiwara A, Ueyama M, Ramlawi A, et al. Is the Maternal and Child Health (MCH) handbook effective in improving health-related behavior? Evidence from Palestine. *J Public Health Policy*. 2013;34(1):31–45.