Correlation of Neonatal Danger Signs at Different Times with Perinatal Obstetrical Danger Signs and Complications.

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DOI: https://doi.org/10.15520/ijnd.v10i02.2808

Abstract: Background: Perinatal period encountered by risks and complications raise the risk of perinatal morbidity and mortality. Aim: this study aimed to determine type of correlation of neonatal danger signs at different times with perinatal obstetrical danger signs and complications. Design: A descriptive research design. Setting: This study was implemented in the Obstetrics Department at Women’s Health Center, Assiut University Hospital, Egypt. Subjects: 150 postpartum women admitted to previous mentioned setting. Sample: a convenient sample of 150 postpartum women. Instrument: Structured interview questionnaire used to collect data. Results: There were a positive correlation reported between maternal danger signs/morbidities during pregnancy with danger signs in their neonates at birth, early, after 7 days and late at 28 days postpartum. Conclusions: From our findings we can conclude that there were a positive correlation reported between maternal danger signs/morbidities during pregnancy with danger signs in their neonates at birth & early (0.682 , 0.755 & 0.005 respectively) and a significant correlation was found regarding maternal postpartum period and neonatal danger signs at birth however, no significant correlation reported during early neonatal period. Recommendations: Implementing ongoing training programs for health care providers who care for high-risk women (preconception, ante partum, antepartum and postpartum).

Key Words: Neonatal danger signs, perinatal obstetrical danger signs.

INTRODUCETION

Neonate period is a time of comprehensive and continuing transition of the system from the intra-uterine setting to the external world, including the initial period after birth which is called the perinatal era. This applies to the first 28 days and divides further into early neonates (birth to less than 7 days), and late neonatal cycles (7 days to < 28 days). It is a critical time in an individual’s life and therefore neonatal health has a significant impact on future well-being and life expectancy [1].

Early detection of neonatal diseases by identifying signs of neonatal vulnerability represents a significant step towards better survival of newborns [2].

Overall, almost 130 million neonates are born each year, 4 million of whom die in the first 28 days of their lives as reported by the Egyptian Demographic Health Survey (EDHS) in 2016, accounting for 40% of the deaths of children under 5 years of age [2]. Many neonatal deaths occur in low-income and middle-income countries, primarily Sub-Saharan Africa most neonatal deaths happen [3]. The neonatal mortality rate in Egypt decreased steadily from 59.6 deaths per 1,000 live births in 1967 to 12.8 deaths per 1,000. Most of these newborns die at home (with the exception of the established health system) where only a few mothers and families are aware of newborn disease symptoms, which is why it is disturbing that many newborns die every year, particularly when their death is preventable [4]. Because of a variety of problems / diseases experienced by a neonate during the perinatal era affecting the date of conception, the neonatal period is considered the most hazardous time of life, from the twentieth week of gestation to the twenty-eighth day of the newborn. During this process, high-risk mothers with warning signs like vaginal bleeding, severe headache, vision problems, high fever, swollen hands and decreased fetal activity that suggest obstetric complications eventually have negative effects on the neonate [5]. Perinatal duration risk is generally defined as the risk of mother, fetus or newborn morbidity or mortality before, during or following delivery. High risk mothers are likely to give birth to compromised children, who experience several serious problems predicted by warning signs [6]. Some of those widely recognized as a symptom of neonatal threat include breastfeeding failure, low or high temperature, respiratory disease and history of constipation / diarrhea seizure. [3] The identification of such signs can result in a high overall sensitivity and specificity to predict the need to seek newborn treatment [7,8].

Among the major causes of perinatal morbidity and high-risk mortality from pregnancy is the most common of these [9]. Integrated neonatal and disease program management established by the World Health Organization (WHO) focused on the identification and prompt treatment of neonatal threat symptoms [3,10]. Similarly, Bhutta et al [11] identified early detection by caregivers, whether mom or health care provider with prompt and successful referral, of signs of neonatal danger was described as the foundation stone of the Millennium Development Goal programs to reduce neonatal mortality. As an informative effect on perinatal and neonatal morbidity reductions and death is being suggested, further research efforts have begun and great emphasis has been placed on improving maternal health and antenatal care. For fact, complications for pregnancy and delivery cause more than half child deaths [6].

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Neonatal deaths have come to gain attention on the global political agenda of the last century[12]. Reducing neonatal morbidity and mortality needs immediate caregiver identification of possible neonatal danger signs and early treatment visits to the nearest clinic[13 ]. Mortality risk can be higher even if both the neonate and the mother show several signs of danger or complications [14]. The researchers are interested in studying and analyzing the incidence of perinatal hazard signs or complications to address these variations, exploring the correlations that they observed during the perinatal period between various hazard signs and complications in neonates and their moms.

**Study aims**
- To determine types of neonatal danger signs noticed in neonatal period
- To identify types of perinatal danger signs noticed in perinatal period
- To determine relationship between neonatal and perinatal maternal danger signs at different times

**Study question**
Is there a relationship between neonatal danger signs and perinatal maternal danger signs and its complications?

**SUBJECT**

**Study design:** A descriptive correlational design.

**Setting:** This study was carried out at in Postpartum ward - department of Obstetrics, Assiut University Hospital, Egypt.

**Sample:** This study included a convenient sample of 150 postpartum women and their newborns who admitted to the Obstetrics Department during the period of study that begun from May to July 2018.

**METHODS**

**Tool of data collection:**
A structured interviewing questionnaire was used to collect the data after reviewing the related literature, questionnaire was written in Arabic language to simplify the process of data collection and it involved four sections as the following:

**Section 1:** Socio-demographic data such as (age, educational level, residence, occupation & mobile number of the mothers).

**Section 2:** Data related to obstetrics history such as (number of parity, abortions, stillbirths, neonatal deaths, number of living children and Section 3: data related to antenatal care such as (frequency of antenatal clinic visits place of antenatal follow up).

**Section 4:** Maternal morbidity data such as (medical / obstetrical risk factors, types of perinatal (antenatal, intrapartum and postpartum warning signs/ morbidity).

**Section 5:** Neonatal data which included two subsections
1. Neonatal outcome characteristics such as (body weight, Apgar score, admission to, and duration of, Neonatal Intensive Care Unit (NICU).
2. Neonatal follow-up: list of types of neonatal warning signs/morbidity during (early neonate (1st week) and late neonate (from 2nd to 4th week). And maternal health seeking behavior for these problems.

**Field work:** It implemented in two phases

1. **Interview and assessment phase:**

   Where participants were interviewed and evaluated in the postpartum ward during their hospital stay and asked about any troubling symptoms for her – either herself or her newborn indicating health problems. Then a follow-up card showing the location, the date of the first and second visits, before the women leave the hospital, researcher's mobile number to contact her if any issues have arisen was given.

2. **Follow-up phase:**

   During which mothers asked to attend for follow-up in outpatient clinic on the 7th and 28th postpartum days. During these 2 meetings each mother was asked regarding presence of any warning signs / problems either for her – self or her newborn during this period and what their type of seeking behavior regarding this issue. To take immediate proper action or make referral if needed accordingly as well as mothers who cannot attend clinic followed by telephone.

**Ethical consideration:**

- An official approval was obtained from the Ethical Committee of the Faculty of Nursing, Assiut University
- The official approval was obtained from the responsible administrative staff of the research work (the Directors of the Women's Health Center, the Chairman of the Inpatient Obstetrics Department and the Ambulance Clinic) after explaining the purpose of the study
- Oral informed consent was obtained from the participants after explanation of the purpose of the study and each of them was entitled to withdraw from the analysis at any time, whatever the reason. Participants were told that all their data remained highly confidential.

**Validity and reliability:**

Validity and reliability of the instrument (A) were done by panel of expertise in the field of Maternal and Newborn Health Nursing and Obstetrics and Gynecology medicine. The instruments were reviewed for simplicity of language, comprehensiveness and understandability. Test-retest reliability was applied by the researcher for testing the internal consistency of the instruments. It is the administration of the same instruments to the same participants under similar conditions on two or more occasions. The validity and reliability of the study tools which revealed a value of 0.789 for the reliability test and a value of 0.765 for CVI.

**Pilot study:**

A pilot study was conducted to test the feasibility, applicability and understandability of the instruments. It was conducted on 10% of the total sample (15) students were chosen. Accordingly, the necessary modifications were done in the form of reformulation of some questions and omitting of others due to unavailability to be answered accurately by the students. The sample of the pilot study was excluded from the study.

**Statistical analysis**

The collected data were scored, tabulated and analyzed using (SPSS) version 22. Descriptive as well as nonparametric statistics were utilized to analyze the data.
pertinent to the study. The level of significance was set at \( p < 0.05 \). Chi square test, Independent sample t-test, Fischer exact test (FE), Mean and repeated measure. The correlation coefficient was applied using the r-Pearson test to classify the variables that may influence the frequency of hazard signs to determine whether a positive or negative correlation is present.

RESULTS

As regard socio-demographic characteristics of studied participants table 1 showed that the mean age of participant mothers were \( 26.57 \pm 5.4 \) and nearly two-thirds of them aged 20-30 years lived in urban area respectively, and only (36% & 14%) of them had secondary school & university and above respectively lastly the majority of the participants were housewives

Table 2: demonstrated that less more than one third (40%) of the studied participants were multipara and nearly two-thirds of them (64%) 1 < 3 living children with no history of abortion and only (12.7%) of them had history of neonatal death with the most common cause (31.6%) linked to hypoxia, respectively.

Table 3: revealed that the majority (94.7%) of the mothers had frequent history of regular antenatal care visit and almost three-quarters (71.3%) of them attended mainly outpatient clinics at university hospitals. But the vast minority (5.3%) have visited private clinics 3-6 times over two-thirds, and the vast minority (7.3%) visited the clinic fewer than three times.

Figure 1: portrayed that most common types of high risk encountered among studied mother during pregnancy were (24.7%) anemia followed by (20%) hypertension and convulsions and vaginal bleeding (16.7%).

Figure 2&3: demonstrates that nearly three-quarters (75.3%) of the total sample had antenatal danger signs, categorized as continuous headaches (45.3%) edema & persistent abdominal pain (36%) , fever (15.3%) however, backache and dyspnea accounted for at least one (2.7%) for each. Regarding labor danger signs, only (5.3%) of the sample had danger signs during labor the most common were prolonged labor & dyspnea, Vaginal bleeding (22.7%) followed by premature rupture of membrane & obstructed labor (22.7%) (35.3%, 32.4% & 32.4%) respectively more over, postnatal danger signs, encountered among more than two-thirds (67.3%) of the total sample, the most frequent one was dysuria and fever >38°C (32.7% & 28.7% respectively).

Table 4: revealed up that more than half (57.3% & 52.7%) of the overall sample their gestational age ranged between 33 - < 37 weeks and a neonatal weight ranged between (2000 - <3000 gm.) respectively as regard apgar score nearly (69.3%) were had bad Apgar score, all of them admitted to NICU due to respiratory distress followed by neonatal jaundice (36.3% & 24.7 % respectively) and the mean duration of stay was 6.2±3.5 days.

Concerning early (at birth) neonatal warning signs and morbidities that reported among neonate table 5 showed that the majority (80%) of the total sample had so early neonatal danger signs/morbidities categorized as with a most prevalent one is neonatal jaundice 69.3%, followed by too weak to suck/feed 50.7%, fever >38°C 34.7% & difficult of breast feeding 40.5 % respectively and the least reported one was disturbed conscious level (4%). whoever, in the first week after birth neonatal danger were more prevalent among (75.3%) of neonate in form of neonatal jaundice, eye inflammation(17%) then chest infection& colicky pain (9.8%) however almost these neonatal danger signs disappear at 28th day postpartum. While the mothers were managing these morbidities by seekin to medical care in hospitals (68.8%) , (28.8%) of them went to private clinic to seek care the least of them 2.8% did not seek for medical care and used herbs/remedies in homeon the other hand 100% of mothers seeking medical care in private clinic.

Table 6 & Figure 4, 5&6: revealed that there were a positive correlation reported between number of maternal danger signs/morbidities during pregnancy with danger signs in their neonates at birth& early and a significant correlation was found regarding maternal postpartum period and neonatal danger signs at birth however, no significant correlation reported during early neonatal period. In addition, there was no significant correlation between signs of maternal danger during childbirth and signs of neonatal threat at birth, early and late.

Table 1: Socio-demographic characteristics among studied participants

|                      | No. =150 | Percentage |
|----------------------|----------|------------|
| **Mothers’ age:**    |          |            |
| < 20                 | 22       | 14.6       |
| 20-30                | 96       | 63.3       |
| 30-40                | 26       | 17.3       |
| >40                  | 6        | 4          |
| Mean ±SD(range)     | 26.57±5.4(18-42) |          |
| **Residence**        |          |            |
| Urban                | 102      | 68         |
| Rural                | 49       | 32         |
| **Education level**  |          |            |
| Illiterate           | 37       | 24         |
| Basic education (primary & preparatory school) | 39 | 25.3 |
| Secondary school     | 53       | 35.7       |
| University and above | 21       | 14         |
| **Occupation**       |          |            |
| Housewife            | 138      | 92         |
| Employer             | 12       | 8          |

Ayat M. Omar, et, at International Journal of Nursing Didactics, 10 (02) February, 2020
Table 2: Obstetrics history among studied participants.

| No. of parity       | No. | Percentage |
|---------------------|-----|------------|
| Nullipara           | 17  | 10.7       |
| Primipara           | 31  | 20.6       |
| Multipara           | 60  | 40         |
| Grandmultipara      | 42  | 28         |
| Mean ±SD (range)    | 2.36±1.57(0-7) |

| No. of living child | No. | Percentage |
|---------------------|-----|------------|
| None                | 20  | 13.3       |
| 1 ≤ 3               | 96  | 64         |
| >3                  | 34  | 22.7       |
| Mean ±SD (range)    | 2.25±1.62(0-7) |

| No. of abortion     | No. | Percentage |
|---------------------|-----|------------|
| None                | 104 | 70         |
| 1-2                 | 37  | 24.7       |
| ≥3                  | 9   | 6          |
| Mean ±SD (range)    | 0.57±1(0-4)   |

| No. of neonatal death: | No. | Percentage |
|------------------------|-----|------------|
| No                     | 131 | 87.3       |
| Yes (one child)        | 19  | 12.7       |
| Mean±SD (range)        | 0.1±0.3(0-1) |

Neonatal death causes: n=18

| Causes          | No. | Percentage |
|-----------------|-----|------------|
| Infection       | 5   | 26.3       |
| Pneumonia       | 4   | 22.2       |
| Dyspnea         | 4   | 22.2       |
| Hypoxia         | 6   | 31.6       |

Table 3: Pattern of antenatal care among studied participants

| Items                        | No.150 | Percent % |
|------------------------------|--------|-----------|
| Pregnancy follow up care:    |        |           |
| Yes                          | 142    | 94.7      |
| No                           | 8      | 5.3       |
| Antenatal care frequency     |        |           |
| None                         | 8      | 5.3       |
| >3                           | 11     | 7.3       |
| 3 – 6                        | 102    | 68.0      |
| More than 6                  | 29     | 19.3      |
| Mean ±SD (range)             | 5.3±2.27(0-12) |
| Setting for follow up:       |        |           |
| MCH                          | 27     | 5.3       |
| Obstetric outpatient clinic  | 107    | 71.5      |
| Private clinic               | 8      | 68.0      |
Fig. 1: Types of most common high risk during pregnancy.

Figure 2: Perinatal obstetrical danger signs among studied participants

Figure 3: Types of most common postnatal danger signs

- Dyspnea
- Vomiting
- Backache
- Unusual or severe abdominal pain or...
- Painful urination
- Severe & persistent vomiting
- Absence or decrease fetal movement
- Persistent abdominal pain
- Edema of hands, face, legs & feet
- Fever above 100 F (>37.7°C)
- Frequent, severe, and/or...
- Vaginal bleeding including spotting
Table 4: Neonatal characteristics of neonate

| Condition                        | No. =150 | Percentage |
|----------------------------------|----------|------------|
| Gestational age                  |          |            |
| <30                              | 3        | 2          |
| 30<33                            | 5        | 3.9        |
| 33<37                            | 86       | 57.3       |
| 37<40                            | 51       | 34         |
| ≥40                              | 5        | 3.3        |
| Mean± SD (range)                 | 36,36±4(13-40) | |
| Neonatal body weight / grams     |          |            |
| <1000                            | 5        | 3.3        |
| 1000<2000                        | 20       | 13.3       |
| 2000<3000                        | 79       | 52.7       |
| ≥3000                            | 46       | 30.7       |
| Mean± SD(range)                  | 2744±557.08(900-3500) | |
| Apgar score outcome              |          |            |
| Good                             | 46       | 31.7       |
| Bad                              | 104      | 69.3       |
| Admission to NICU                |          |            |
| Yes                              | 102      | 68         |
| No                               | 48       | 32         |
| Reasons for admission to neonatal intensive care unit | | |
| Apnea                            | 15       | 14.7       |
| Preterm                          | 13       | 12.7       |
| Neonatal jaundice                | 24       | 24.7       |
| Respiratory distress             | 37       | 36.3       |
| Respiratory distress and neonatal jaundice | 13       | 12.7       |
| Length of stay at NICU           |          |            |
| 1>3 days                         | 20       | 19.6       |
| 3>7 days                         | 49       | 48         |
| >7 days                          | 33       | 32.3       |
| Mean ±SD (range)                 | 6.20±3.5(0-14) | |
Table 5: Neonatal danger signs during neonatal period

| Neonatal danger signs / morbidities (at birth) | No. =150 | Percentage |
|---------------------------------------------|----------|------------|
| Yes                                         | 120      | 80         |
| No                                          | 28       | 18.7       |
| Too weak to suck/ feed                      | 76       | 50.7       |
| Difficult of breast feeding                 | 50       | 30.3       |
| Jaundice                                    | 104      | 69.3       |
| Fever >38 C                                 | 52       | 34.7       |
| Severe continuous vomiting                  | 17       | 11.3       |
| Abdominal distention                        | 33       | 22         |
| Diarrhea & constipation                      | 31       | 20.7       |
| Odor, drainage, or bleeding from the umbilical cord | 9 | 6 | |
| Excessive crying & irritability             | 11       | 7.3        |
| Cyanous                                     | 30       | 20         |
| Disturbed conscious level                   | 6        | 4          |
| Convulsion                                  | 33       | 22         |

| No. | Percentage |
|-----|------------|
| Yes | 120        |
| No  | 28         |

| Neonatal danger signs | Early Neonatal danger signs (1st to week) | Late Neonatal danger signs (2nd to 4th week) |
|-----------------------|------------------------------------------|---------------------------------------------|
| No                    | %                                       | No | % |
| Yes                   | 112                                     | 75.3 | 19 | 12.0 |
| No                    | 38                                      | 24.7 | 131 | 88.0 |

Frequency of neonatal danger signs

| Dyspnea and jaundice | 12 | 10.7 | 0 | 0.0 |
|----------------------|----|------|---|-----|
| Vomiting and fever   | 9  | 8    | 0 | 0.0 |
| Neonatal jaundice    | 21 | 18.7 | 0 | 0.0 |
| Eyes inflammation    | 19 | 17   | 0 | 0.0 |
| Continuous vomiting  | 12 | 10.7 | 0 | 0.0 |
| Abdominal distention | 10 | 9    | 0 | 0.0 |
| Difficult breast feeding | 9 | 8   | 0 | 0.0 |
| Colicky pain         | 11 | 9.8  | 13 | 8.0 |
| Neonatal chest infection | 10 | 8.9 | 13 | 8.0 |

Maternal health seeking for danger signs for their neonates

| Maternal danger signs and complications | Maternal danger signs and Complications during Labor | Maternal danger signs and Complications during Postpartum | Maternal danger signs and Complications during | Maternal danger signs and Complications during
|---------------------------------------|----------------------------------------------------|---------------------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| Go to hospital for medical treatment  | 77 | 68.8 | 0 | 0.0 |
| Go to private clinic for medical treatment | 32 | 28.8 | 26 | 100.0 |
| Used herbs/remedies in home           | 3  | 2.8  | 0 | 0.0 |

Table 6: Correlation analysis of neonate danger signs at different times with perinatal obstetrical danger signs and complications among study participants

| Maternal danger signs and complications | Neonatal Danger Signs | At birth | Early (at day postpartum) | Late (at day 28th postpartum) |
|----------------------------------------|-----------------------|----------|---------------------------|-----------------------------|
| - Antenatal maternal danger signs and Complications | - r | 0.682 | 0.001** | 0.755 | 0.005 | 0.948 |
| - Maternal danger signs and Complications during Labor | - r | 0.018 | 0.001** | 0.037 | 0.152 | 0.066 |
| - Postpartum maternal danger signs and Complications | - r | 0.886 | 0.001** | 0.031 | 0.137 | 0.095 |

Correlation analysis measured by r/Pearson test.
Figure 4, 5 & 6: Correlation analysis of neonate danger signs at birth, 7 days, 28 day with antenatal maternal danger signs and complications

DISCUSSION

Numerous studies have investigated determinants to neonatal mortality in resource-limited settings, but a paucity of researches have concentrated on a warning signs of neonates and complications, considering these irregular health conditions that may potentially conduce to debilitating complications or death [15,16]. The current study were the first one that tried to identify the degree of correlation between neonatal and perinatal obstetrical danger signs. The current results demonstrated that higher percentage of participants’ neonate had early danger signs at birth with the frequently ordered signs included neonatal jaundice, followed by too weak sucking fever > 38 C & breast feeding difficulties (86.8%, 62%, 42.1% and 40.5% respectively). This finding was compatible with Kibaru and Otara [17] who stated that poor suckling and fever were the frequently mentioned signs of newborn hazards. Mortality of mothers and neonate elevated during extended period from beginning childbirth through the first 28 postpartum days. Almost of maternal mortality occurs during those few weeks (with the exception of those from illegal abortion) and nearly two-thirds of infant deaths. Intra-partum period is still the most likely time faucet death. [18] This problem induces researchers to investigate in detail the current study. Understanding the danger signs of the neonates in cases like this is one way to seek early treatment. Current study reported that the majority (94.7%) of the mothers had a current history of regular antenatal care visit and almost three-quarters (71%) of them attended mainly outpatient clinics at university hospitals, but the vast minority (5.3%) attended private clinics also around two-thirds attended the clinic 3-6 occasions as well as less than three times the lesser proportion (7.3 percent) attended the clinic. These mirrored the awareness of high-risk mothers about their neonates as many of them are searching for medical care in medical facilities and private clinics; Nevertheless, Gupta et al [19] pointed out that care-seeking behavior among mothers underscored the urgent need for awareness among them to identify the signs of neonatal danger. This outcome may represent a significant recognition of mothers with neonatal signs of danger, and justify that higher than two-thirds of the participants explored seeking medical treatment in hospitals on day 7 postpartum. In this regard, Okawa et al [6] reported that less than four Antenatal care visits contributed to a higher chance of birth of neonates with danger signs.

More than forty percentage of mothers complicated during pregnancy, whereas more than half 55% of them had the 6 recognised elements of crucial antenatal services, which suggests that reduced Antenatal care visits contribute to disrupted detection and management of potential hazards. This result was at discrepancy with our findings. Although the regular presence in the AN clinic. The proportion of neonatal danger signs was low, this may be due to poor quality of antenatal care. In comparison, one might wonder whether the Women’s Health Center's obstetric care system, Assiut, needs to be precisely evaluated. As more than two-thirds of participants complicated during pregnancy and reported during the postpartum period regarding signs of danger.
less, for those with complications during labor and the occurrence of neonatal hazard signs no significant correlation has been reported. This could be highlighted as professional delivery care has traditionally been positively correlated levels of neonatal mortality (WHO, 2000)[20].

Nevertheless, Okawa et al.[6] disagreed with this observation. Recording that a significant proportion of maternal complications is strongly correlated with the proportion of neonate 1 dangerous signs (r = 0.20; p < 0.005) In addition, with respect to the related maternal risk factors Brentani & Fink [21] stated in their analysis that high-risk pregnancies are the main causes of perinatal mortality that adversely affect neonatal mortality. In addition, the literature has identified a variety of antenatal and intra-partum causes to be substantially correlated with perinatal and neonatal deaths [22].

CONCLUSION AND RECOMMENDATIONS

From our findings we can concluded that there were a positive correlation reported between maternal danger signs/morbidities during pregnancy with danger signs in their neonates at birth & early (0.682, 0.755 &0.005 respectively) and a significant correlation was found regarding maternal postpartum period and neonatal danger signs at birth however, no significant correlation reported during early neonatal period.

RECOMMENDATIONS

Implementing ongoing training programs for health care providers who care for high-risk women (preconception, ante partum, antepartum and postpartum) and further study needed to investigate health care workers (midwives) should be carried out in order to provide a holistic mother-friendly awareness and care for all mothers, especially expectant mothers.

ACKNOWLEDGEMENT

We would like to thank all participant mothers for their great full participation.

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