

# Promotive and Preventive Programs for Health Workers and Mothers on Newborn Umbilical Cord Care to Prevent Infection During the Neonatal Period

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**Abstract** Umbilical cord infections can be prevented by caring for the umbilical cord properly. The data regarding proper and correct umbilical cord care of newborn babies by mothers in North Sumatra Province is limited. Hence, this community service aimed to determine the proportion of knowledge in umbilical cord care for newborn babies using the open-dry cord care method. The community service project was held on August 24, 2023, in Pematang Siantar City, North Sumatra Province. In this activity, we provided counseling on the open-dry cord care method for umbilical cord care by presentation and discussion using modules, posters, and leaflets. We used a pre-test and post-test questionnaire to assess the knowledge level of health workers and mothers. Participant demographic data and results are presented in the form of proportion data. This counseling was attended by 150 participants consisting of 52 health workers and 98 mothers. Before the counseling, 39 health workers and 93 mothers did not know how to take care of the umbilical cord properly. After the counseling, the knowledge of umbilical cord care using the open-dry cord method increased by 15.4% for health workers and 24.5% for mothers. Based on the results, over 80% of participants were found to have had a satisfactory level of knowledge about umbilical cord care after the counseling session. This community service program should be conducted regularly to further enhance the knowledge of health workers and mothers on proper umbilical cord care.

## 1. INTRODUCTION

Community service is the dissemination of science, technology, and arts produced by universities to the community institutionally. The community service program is part of the Tri Dharma of Higher Education (Ismawan et al., 2022). This program aims to help the community apply the research's results in science, technology, and art to empower the knowledge, skills, and attitudes of the target community group (Ismawan et al., 2022; Lembaga Pengabdian Kepada Masyarakat, 2023).

Postpartum infection is still the leading cause of neonate death in the world. According to data from the

World Health Organization (2022), about 2.3 million children worldwide died during the neonatal period each year, especially in developing countries. It was reported that 21 neonates die per 1000 live births due to severe infections, including umbilical cord infection (omphalitis), which is one of the significant predispositions (World Health Organization, 2022).

In Indonesia, the infant mortality rate has decreased from 24 deaths per 1,000 live births in 2017 to 16.85 deaths per 1,000 live births in 2020. These result shows a significant reduction, even exceeding the target in 2022,

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18.6% of deaths per 1,000 live births. However, based on maternal perinatal data death notification in 2021, infection of newborn baby is one of the top three causes of death (Kementerian Kesehatan RI, 2022).

The umbilical cord serves as the connection between the baby and the mother during pregnancy and is cut after birth. The remaining stump gradually dries and falls off within 5 to 15 days. During this time, skin and enteric bacteria can colonize the umbilical cord tissue, potentially leading to infection. Omphalitis, a condition caused by polymicrobial infection, can occur as a result. The most common pathogens responsible for this infection include *Staphylococcus aureus*, *Streptococcus pyogenes*, and gram-negative bacteria such as *Escherichia coli*, *Klebsiella pneumoniae*, and *Proteus mirabilis* (Painter et al., 2022). Several factors contribute to the occurrence of umbilical cord infections in developing countries, including poor hygiene and sanitation practices for newborns after leaving the hospital, the involvement of untrained birth attendants, and traditional umbilical cord care methods that do not adhere to established standards or guidelines (Obeagu & Obeagu, 2024).

Umbilical cord infections can be prevented through proper care. This care should follow established procedures, such as those outlined by the World Health Organization (2015) and the Ministry of Health of the Republic of Indonesia (2015), which recommend the open-dry cord care method. The key principle of umbilical cord care is to keep the cord dry and clean. Proper care leads to positive outcomes, with the umbilical cord typically detaching within 5 to 7 days without complications. Faster detachment also has social and economic benefits, including reduced maternal anxiety and lower associated costs.

Data from Riset Kesehatan Dasar Nasional (2018) shows that only 41.5% of umbilical cord care was carried out correctly according to normal delivery. North Sumatra Province only has 17.3% of correct umbilical cord care carried out by mothers of newborn babies. This indicates that mothers of newborns still require education on proper umbilical cord care.

We did this community service program so health workers should have a better understanding of carrying out umbilical cord care and know the signs and symptoms of umbilical cord infection. They can increase their knowledge and skill to take care of umbilical cord care at hospital, then educate and train the mothers for proper and correct umbilical cord care when the baby is cared for at home.

Based on previous data, this community service aims to assess the knowledge of health workers and mothers on umbilical cord care using the open-dry cord care method and recognize the signs and symptoms of umbilical cord infections.

## 2. METHOD

This community service program, called Perintis Community Service, was organized by lecturers and

students from the Faculty of Medicine, University of North Sumatra. It took place at the Balai Kota building in Pematang Siantar City, North Sumatra Province, on August 24, 2023, from 9:00 AM to 2:00 PM WIB. The event began with remarks from the moderator, followed by a speech from the team leader, an opening address by the Mayor of Pematang Siantar, and the presentation of placards and baby scale souvenirs to the city government.

Approximately 150 participants attended the program, including health workers, mothers, and members of the Family Welfare Empowerment (PKK) women's group. The program was divided into three sessions. The first session focused on counseling about the open-dry umbilical cord care method. The speaker used a 13-slide PowerPoint presentation, which included both theory and images, to explain the principles of umbilical cord care, signs and symptoms of infection, and potential complications of umbilical cord infection. After the counseling session, there was a discussion and Q&A session to encourage interaction, clarify information, and engage the participants on the topic.

The third session was a simulation on proper handwashing techniques to prevent infection during umbilical cord care. Medical students worked directly with the mothers to demonstrate how to wash their hands correctly.

To assess participants' knowledge of the open-dry umbilical cord care method, they completed a questionnaire before and after the educational session (pre-test and post-test). The questionnaire covered five domains of knowledge related to umbilical cord care (understanding, objectives, benefits, methods, and impact) and included 26 true/false statements. The questionnaire had been analyzed for validity and reliability, with all statements deemed valid and a Cronbach's alpha value of 0.933 (Nugroho & Wahyuni, 2021). Knowledge levels were categorized as good, adequate, or poor. A "good" level of knowledge was defined as 20 or more correct answers (76% or higher), "adequate" knowledge was 15 to 19 correct answers (56% to 75%), and "poor" knowledge was 14 or fewer correct answers (55% or lower).

Demographic data and the pre-test and post-test results were presented as proportional data. The success of the community service program was measured by the improvement in participants' post-test scores compared to their pre-test scores.

At the end of the program, we distributed guidance modules, colorful posters, and leaflets about umbilical cord care for newborns using the open-dry method to the health workers.

## 3. RESULT AND DISCUSSION

Three departments from the Faculty of Medicine-Pediatrics, Obstetrics and Gynecology, and Mental Health-participated in the Perintis Community Service program. The Mayor of Pematang Siantar, the Head of the Health Service, and the Director of Djasemen Saragih Regional General Hospital also attended the event. The implementation of

this community service began with counseling as illustrated in Figure 1.

This community service was attended by 150 participants. Fifty-two health workers (consist of men and women) and 98 mothers attended the counseling activities. Attendees seemed enthusiastic about participating in this counseling session. After that session ended, 3 mothers and 1 health worker of the participants asked questions.

The assessment of proper and correct newborn umbilical cord care was carried out by using a questionnaire. The medical students from the Medical Faculty, Universitas Sumatera Utara, distributed the questionnaire to health workers and mothers. They filled out the questionnaire before the counseling (pre-test) and after the counseling (post-test). Figure 2 shows the distribution of questionnaires to health workers and mothers.



Figure 1 . Counseling on umbilical cord care with the open-dry cord care method to health workers and mothers in Pematang Siantar City, North Sumatra Province



Figure 2 . Distribution of questionnaires to health workers and mothers in Pematang Siantar City, North Sumatra Province

Table 1 shows the data characteristics of health workers in this community service. Most health workers were 36-45 years (50%) and graduated from college (96.2%). We also obtained that 47 health workers (90.4%) were civil servants (general doctors, nurses and midwives), 3 health workers (5.8%) were midwives who practice privately, and 2 health workers were retired civil servants. Based on the number of children characteristics, 31 health workers have more than two children (59.6%), 13 health workers (25%) have two children, and eight health workers have one child (15.4%).

Table 1 . Characteristics of health workers participating in community service

| Characteristics           | n = 52             | %             |      |
|---------------------------|--------------------|---------------|------|
| <b>Health Workers</b>     |                    |               |      |
| <b>Age</b>                | 20-24 years old    | 0             | 0    |
|                           | 25-35 years old    | 10            | 19.2 |
|                           | 36-45 years old    | 26            | 50   |
|                           | > 45 years         | 16            | 30.8 |
| <b>Education</b>          | Elementary school  | 0             | 0    |
|                           | Junior high school | 0             | 0    |
|                           | Senior high school | 1             | 1.9  |
|                           | Bachelor           | 50            | 96.2 |
|                           | Others             | 1             | 1.9  |
|                           | <b>Jobs</b>        | Civil servant | 47   |
|                           | Private employee   | 0             | 0    |
|                           | Self-employee      | 0             | 0    |
|                           | Midwife            | 3             | 5.8  |
|                           | Others             | 2             | 3.8  |
| <b>Number of children</b> | 1 person           | 8             | 15.4 |
|                           | 2 people           | 13            | 25   |
|                           | > 2 people         | 31            | 59.6 |

Table 2 . Characteristics of mothers participating in community service

| Characteristics  | n = 98                    | %        |      |
|------------------|---------------------------|----------|------|
| <b>Mothers</b>   |                           |          |      |
| <b>Age</b>       | 20-24 years old           | 6        | 6.1  |
|                  | 25-35 years old           | 34       | 34.7 |
|                  | 36-45 years old           | 37       | 37.8 |
|                  | > 45 years                | 21       | 21.4 |
| <b>Education</b> | No school                 | 1        | 1    |
|                  | Elementary school         | 3        | 3.1  |
|                  | Junior high school        | 4        | 4.1  |
|                  | Senior high school        | 68       | 69.4 |
|                  | Bachelor                  | 21       | 21.4 |
|                  | Others                    | 1        | 1    |
| <b>Jobs</b>      | Civil servant             | 3        | 3.1  |
|                  | Private employee          | 3        | 3.1  |
|                  | Self-employee             | 18       | 18.4 |
|                  | Housewife                 | 62       | 63.3 |
|                  | Miscellaneous             | 12       | 12.2 |
|                  | <b>Number of children</b> | 1 person | 21   |
|                  | 2 people                  | 30       | 30.6 |
|                  | > 2 people                | 47       | 48   |

Meanwhile, there were 98 mothers participated in the health counseling. The characteristics data of these mothers can be seen in Table 2. Based on Table 2, most mothers (37.8%) who participated in community service were 36-45 years old, on the other hand the fewest mothers (6.1%) were 20-24 years old. Unfortunately, only 34.7% of mothers on the active reproductive age (25-35 years) attended this counseling. In fact, mothers need to be informed and understood about the umbilical cord care of newborn babies at this age. This data proportion of mother's reproductive age who participated in community service is lower than in the Demak Regency (92.2%) (Chamidah et al., 2023) and Tebing Regency (68.4%) (Panggabean et al., 2024). We obtained more than 60% mothers participated in health

**Table 3 .** Distribution of health worker questionnaire contents before and after counseling on newborn umbilical cord care

| Domain                            | Before       |                | After        |                |
|-----------------------------------|--------------|----------------|--------------|----------------|
|                                   | Correct (n%) | Incorrect (n%) | Correct (n%) | Incorrect (n%) |
| Definition of umbilical cord care | 52 (100%)    | 0 (0%)         | 52 (100%)    | 0 (0%)         |
| Purpose of umbilical cord care    | 52 (100%)    | 0 (0%)         | 51 (98.1%)   | 1 (1.9%)       |
| Benefits of umbilical cord care   | 49 (94.2%)   | 3 (5.8%)       | 49 (94.2%)   | 3 (5.8%)       |
| Umbilical cord care methods       | 13 (25%)     | 39 (75%)       | 21 (40.4%)   | 31 (59.6%)     |
| Impact of umbilical cord care     | 51 (98.1%)   | 1 (1.9%)       | 52 (100%)    | 0 (0%)         |

**Table 4 .** Distribution of mothers' questionnaire contents before and after counseling on newborn umbilical cord care

| Domain                            | Before       |                | After        |                |
|-----------------------------------|--------------|----------------|--------------|----------------|
|                                   | Correct (n%) | Incorrect (n%) | Correct (n%) | Incorrect (n%) |
| Definition of umbilical cord care | 92 (93,9%)   | 6 (6,1%)       | 98 (100%)    | 0 (0%)         |
| Purpose of umbilical cord care    | 94 (95,9%)   | 4 (4,1%)       | 95 (96,9%)   | 3 (3,1%)       |
| Benefits of umbilical cord care   | 85 (86,7%)   | 13 (13,3%)     | 91 (92,9%)   | 7 (7,1%)       |
| Umbilical cord care methods       | 5 (5,1%)     | 93 (94,9%)     | 29 (29,6%)   | 69 (70,4%)     |
| Impact of umbilical cord care     | 89 (90,8%)   | 9 (9,2%)       | 94 (95,9%)   | 4 (4,1%)       |

counseling were housewives and the rest of them were employee (civil servant, private employee and self-employee) and only 12.2% were laborers and retirees.

As part of the evaluation, Table 3 and Table 4 present the distribution of knowledge among health workers and mothers regarding newborn umbilical cord care, both before and after the counseling session. According to Table 3, all health workers (100%) knew the definition and purpose of umbilical cord care prior to counseling. After the counseling session, 100% of health workers understood the impact of umbilical cord care, and over 94% were aware of its benefits.

However, only 40% of health workers correctly answered questions about the umbilical cord care method after the counseling. This indicates a 15.4% increase in their knowledge of the method. One possible reason for this modest improvement is that the lecture-based material, which included colored pictures, may not have fully engaged the participants. Incorporating videos, simulations, or hands-on practice might better illustrate the method. Additionally, holding the counseling on weekends rather than weekdays could help improve the health workers' focus and attentiveness to the material.

Based on Table 4 above, all mothers (100%) knew the meaning of umbilical cord care, and more than 90% knew the purpose, benefits, and impact of umbilical cord care after counseling. The mother's knowledge about umbilical cord care using the umbilical open-dry cord care method also increases by 24.5%. Increment of this mother's knowledge might show that the mother is the primary caregiver for the baby. This counseling regarding umbilical cord care for newborns needs to be provided routinely, especially in the North Sumatra Province. So, the mother's knowledge regarding proper and correct care for newborns' umbilical cords can increase to 100%.

Based on results, the assessment shows the knowledge improvement of newborn umbilical cord care among health workers and mothers before (pre-test) and after (post-test) the counseling session. This improvement can be seen in Table 5 and Table 6.

Based on Table 5, the knowledge level of most health workers was categorized as good level, 86.5% before counseling and increase to 90.4% after counseling on newborn umbilical cord care with the open-dry umbilical cord care method. On the other hand, the data shows that 9.6% of health workers still had an adequate level of knowledge after counseling.

In Table 6, most mothers (56.1%) had a good level of knowledge about umbilical cord care before counseling. However, a previous study in Gorontalo City showed only 40.5% of mothers have good knowledge of the open-dry cord care method (Yusuf et al., 2023). This difference could be attributed to characteristics of mothers who participate in community service, such as maternal age. In this study, most mothers were 25 to 45 years old. Meanwhile, in a previous study in Gorontalo City, most mothers were 20 to 25 years old. Mothers aged 25 to 45 years will find it easier to understand and easily accept knowledge because they have a high level of maturity and thinking power as well as mental maturity due to experiences.

**Table 5 .** Changes in knowledge level of health workers before and after counseling on newborn umbilical cord care

| Variables | Knowledge Level |           |
|-----------|-----------------|-----------|
|           | Before          | After     |
| Poor      | 0 (0.0)         | 0 (0.0)   |
| Adequate  | 7 (13.5)        | 5 (9.6)   |
| Good      | 45 (86.5)       | 47 (90.4) |

**Table 6 .** Changes in mothers' knowledge level before and after counseling on newborn umbilical cord care

| Variables | Knowledge Level |           |
|-----------|-----------------|-----------|
|           | Before          | After     |
| Poor      | 7 (7.1)         | 3 (3.1)   |
| Adequate  | 36 (36.7)       | 6 (16.3)  |
| Good      | 55 (56.1)       | 79 (80.6) |

The mother's good level of knowledge increased to 80.6% after counseling about umbilical cord care, more than 90% knew the definition, the purpose and the impact

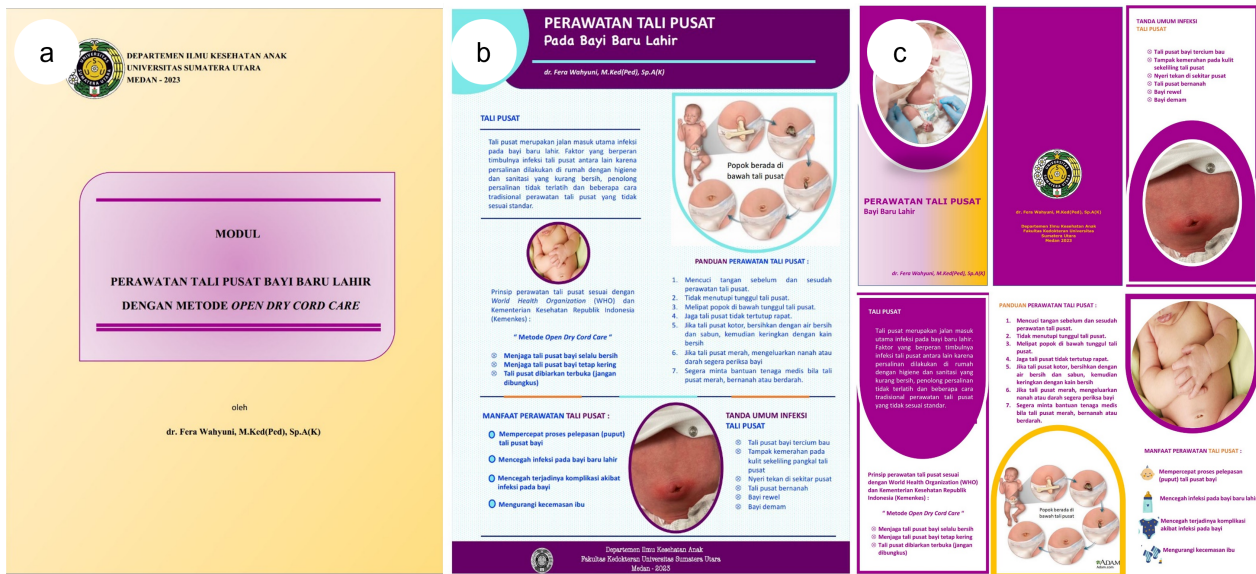


Figure 3. (a) The umbilical cord care guideline module; (b) The umbilical cord care poster; (c) The umbilical cord care leaflet

of umbilical cord care. These were related because most of them had senior high school (69.4%) and bachelor’s degrees (21.4%). Hence, it would be easier for them to understand and absorb information during counseling. According to the findings of this study, a mother’s education level is an important factor in having a good level of knowledge. But unfortunately, only 29.6% were correct about the umbilical cord care method after counseling. Based on the results, routine counseling umbilical cord care using the open-dry cord care method is needed to increase the mother’s level of knowledge.

At the end of this community service activity, we gave the umbilical cord care guideline module to the Head of the Pematang Siantar City Health Service. The title of this guideline module is *Perawatan Tali Pusat Bayi Baru Lahir dengan Metode Open-Dry Cord Care*. This module is a reading material or guide for health workers to increase their knowledge and skills in performing cord care for newborns. Furthermore, this module can be used as a guide to conduct counseling in the community. It is hoped that counseling to the community will continue through health workers in Pematang Siantar City.

Counseling on proper newborn umbilical cord care can utilize posters. The poster with the title *Perawatan Tali Pusat pada Bayi Baru Lahir* contains information on the definition, principles, guidelines, benefits of umbilical cord care, and common signs of umbilical cord infection if not treated properly. In addition, the poster also displays pictures that inform the umbilical cord care method and signs of umbilical cord infection that parents should be aware of. Hence, the public will understand the information more easily. This poster will be placed on health facilities’ walls, such as Posyandu, Puskesmas, and Hospitals. Through this poster, it is hoped that the community can read and receive correct information about umbilical cord care in newborns.

Another form of dissemination of information to the community is giving and distributing leaflets about newborn

umbilical cord care. This leaflet contains brief information on the definition of umbilical cord, the principles of umbilical cord care, the guidelines for umbilical cord care, the benefits of umbilical cord care, and common signs of umbilical cord infection if not treated properly and correctly. The leaflet contains pictures of how to wash hands properly, how to perform umbilical cord care, and signs of umbilical cord infection. So, through this leaflet, the information conveyed is more easily understood by the community. This leaflet can be distributed to prospective parents, pregnant or postpartum women, and families. Through this leaflet, it is hoped that the community will receive correct health information. These can be seen in Figure 3.

## 4. CONCLUSION

This community service program successfully increased the knowledge of health workers and mothers on caring for the umbilical cord using the open-dry method and recognizing signs of infection in newborns. Health workers should now have a stronger understanding of how to perform proper umbilical cord care and identify symptoms of infection. This improved knowledge allows them to provide better care in hospitals and educate mothers on proper umbilical cord care when the baby is at home. However, regular continuation of this program is essential to maintain and further enhance the knowledge of both health workers and mothers on proper umbilical cord care.

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## CONFLICT OF INTERESTS

There is no conflict of interest during the implementation of the program. This Perintis scheme community service program is funded by the Faculty of Medicine, University of North Sumatra.

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