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Original article

Effectiveness of an in-situ simulation scenario on umbilical stump hygiene in newborns

Eficácia de cenário de simulação in situ sobre higienização do coto umbilical do recém-nascido

Efectividad de un escenario de simulación in-situ sobre la higiene del muñón umbilical en recién nacidos

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Abstract

Objective: To verify the impact of in-situ simulation on umbilical cord hygiene in newborns, focusing on postpartum women's knowledge, skills, and attitudes. **Method:** A quasi-experimental study including 53 postpartum women during their stay in the rooming-in unit of a teaching hospital. Data collection took place from August 2022 to February 2023. Two pre-tests and two post-tests were applied after the simulation, along with repeated measures ANOVA and Sidak's post-hoc test. **Results:** Significant differences were found between the pre- and post-tests ($p < 0.001$). The pre-tests did not differ from each other, but they did differ from the post-tests, and the post-tests did not differ from each other, but they did differ from the pre-tests. ANOVA showed an effect of in-situ simulation on the mean adequacy of the technique, and Sidak's post-hoc test confirmed the adequacy of care after the simulation. **Conclusion:** Training postpartum women in umbilical stump hygiene using an in-situ simulated scenario proved effective.
Descriptors: Neonatal Nursing; Health Education; Infant, Newborn; Umbilical Cord; Simulation Training

Resumo

Objetivo: verificar o impacto da simulação *in situ* sobre a higienização do coto umbilical do recém-nascido no conhecimento, habilidade e atitude de puérperas. **Método:** estudo quase experimental, com inclusão de 53 puérperas, durante internação da díade no Alojamento Conjunto de um hospital de ensino. Coleta de dados de agosto de 2022 a fevereiro de 2023. Aplicados dois pré-testes e dois pós-testes após simulação, Anova de medidas repetidas e Post-Hoc de Sidak. **Resultados:** diferenças significativas foram encontradas entre os pré e pós-testes ($p < 0,001$). Os pré-testes não diferiram entre si, porém diferiram dos pós-testes e, os pós-testes não diferiram entre si, mas diferiram dos pré-testes. A Anova mostrou efeito da simulação *in situ*

sobre as médias de adequação da técnica, a Pós-hoc de Sidak confirmou a adequação do cuidado após a simulação. **Conclusão:** a capacitação de puérperas para higienização do coto umbilical com cenário simulado *in situ* apresentou-se efetiva.
Descritores: Enfermagem Neonatal; Educação em Saúde; Recém-Nascido; Cordão Umbilical; Treinamento por Simulação

Resumen

Objetivo: Verificar el impacto de la simulación in-situ en la higiene del cordón umbilical en recién nacidos, centrándose en los conocimientos, habilidades y actitudes de las postpartum women. **Método:** Estudio cuasiexperimental con 53 postpartum women durante su estancia en la unidad de alojamiento conjunto de un hospital universitario. La recopilación de datos se realizó entre agosto de 2022 y febrero de 2023. Tras la simulación, se aplicaron dos pruebas previas y dos posteriores, junto con un ANOVA de medidas repetidas y la prueba post-hoc de Sidak. **Resultados:** Se encontraron diferencias significativas entre las pruebas previas y posteriores ($p < 0,001$). Las pruebas previas no difirieron entre sí, pero sí de las pruebas posteriores, y las pruebas posteriores no difirieron entre sí, pero sí de las pruebas previas. El ANOVA mostró un efecto de la simulación in-situ en la adecuación media de la técnica, y la prueba post-hoc de Sidak confirmó la adecuación de la atención tras la simulación. **Conclusión:** La capacitación de postpartum women en la higiene del muñón umbilical mediante un escenario simulado in-situ resultó eficaz.
Descriptores: Enfermería Neonatal; Educación en Salud; Recién Nacido; Córdon Umbilical; Entenamiento Simulado

Introduction

After birth, the clamped and severed umbilical cord is called the umbilical stump. The mummification process that gives rise to the umbilical scar occurs around three to four days after birth, and the stump detaches between four and eight days, possibly extending up to 15 days.[1] During this period, the devitalized stump, in the presence of dirt, acts as a substrate for bacterial growth, and the umbilical cord is characterized as a direct entry point to the neonatal bloodstream.[2]

In developing countries, the risk of developing omphalitis (umbilical stump infection) is six times higher than in developed countries. Therefore, the World Health Organization (WHO) recommendation takes these differences into account. The WHO recommends dry care (keeping the stump dry without the use of products) for developed countries and hospital births in institutions with low infection rates. However, it advocates the use of antiseptics once a day in home births in developing countries with high neonatal mortality and inadequate hygiene.[3-4]

Given the wide diversity of realities across the country, the Brazilian Society of Pediatrics recommends that pediatricians assess each context and individualize guidance regarding umbilical cord care, and more specifically, the use of antiseptic solutions.[4] The importance of instructing caregivers on proper hand hygiene when handling newborns (NBs) is highlighted, as well as frequent diaper changes, keeping the diaper folded below the umbilical stump to avoid contact with moisture and keeping it in contact with air,[4] in addition to rigorous observation of the periumbilical region to detect possible signs of inflammation. These guidelines should be part of caregivers' training provided by nurses during hospitalization in the maternity ward for the maintenance of home care. In context, the institution where this study is conducted recommends the daily use of 70% alcohol for umbilical cord hygiene for all NBs, according to the institution's standard operating procedure.[5]

Therefore, the best strategies for training caregivers in umbilical cord care must be considered. In this regard, to promote meaningful learning, ensuring there are no doubts regarding care, the use of active methodologies stands out, and more specifically, clinical simulation is highlighted as an alternative. Studies have shown that simulated practices are capable of improving care, ensuring patient safety, maximizing learning, and limiting the frequency and impact of possible adverse events.[6,7] Although its results in the teaching-learning process are well-established, the use of simulation in caregiver training is a recent and still incipient topic, especially in-situ simulation.[8] In-situ simulation is characterized by being developed in participants' own environment.[9-11] In this type of realistic simulation, participants do not need to move and more realistic conditions are provided, as they use elements of their own environment (materials, equipment and physical structure).[9-11] It is presented as a resource for developing specific skills that can be trained without posing threats or insecurity to participants, as they are already immersed in the environment.[12-13]

Simulation is characterized as a technique, situation, or environment that allows people to experience realistic scenarios,[14] to solve everyday problems, train skills, and retain knowledge.[15] The simulation performed is characterized as in-situ,

as it was carried out at the bedside, in the hospital unit where the mother and NB were hospitalized, since postpartum women are trained and perform this care during their stay in the rooming-in unit.

It is noteworthy that caregiver training is essential because they will be the providers of care at home. Therefore, the best learning strategies should be used to promote meaningful learning. The vulnerability of NBs, who depend on caregivers for their health maintenance, must also be considered. However, the literature shows a scarcity of studies addressing in-situ simulation for caregiver training, as well as a lack of studies addressing its use in umbilical cord care, justifying the knowledge gap and the need for this study.

The study aimed to verify the impact of in-situ simulation on postpartum women's knowledge, skills, and attitudes regarding umbilical stump hygiene in NBs.

Method

This is a quasi-experimental study, with data collection between August 2022 and February 2023. The guidelines for non-randomized studies Transparent Reporting of Assessments with Nonrandomized Designs (TRENDS) guided the development of this study.[16]

The study was conducted in the rooming-in wards of a teaching hospital in the countryside of Minas Gerais, which has 12 beds. According to institutional data, 1,310 childbirths were recorded in 2024. The hospital is a referral center for high-risk pregnancies, infectious diseases during the pregnancy-puerperal cycle, pathological prenatal care for the 27 municipalities that make up the *Triângulo Sul* of Minas Gerais, and low-risk pregnancies treated in its outpatient clinic and in Health District I of Uberaba (approximately 150,000 inhabitants). It is worth noting that many municipalities in the *Triângulo Sul* of Minas Gerais do not have a hospital. It should be emphasized that the institution adopts the standard operating procedure of cleaning the umbilical stump with 70% alcohol.[5]

The sample was non-probabilistic and based on convenience. The study included 53 hemodynamically stable, conscious, and oriented postpartum women, regardless of the type of childbirth, that had occurred more than 12 hours prior, who presented with

good physical and psychological conditions based on clinical assessment by the researchers, as well as the team and their medical records, and who remained in the ward accompanied by their live NBs. To participate, they had to still be physically able to perform the simulated activity (having already gotten up after childbirth), without any complaints of discomfort, signs and/or symptoms at the time. Postpartum women aged between 15 and 18 years were informed, as were their guardians, with the consent form signed by the legal guardians and the assent signed by the participants themselves.

Postpartum women under 15 years of age were excluded because they constitute a minority group within the service's target population and because all research instruments needed to be adapted for this age group. Postpartum women with visual and/or auditory impairments, comprehension difficulties, current mental disorders that could alter their ability to retain knowledge, skills, and attitudes, or who had limited upper limb movement, were ineligible due to limitations for the simulated intervention. However, all excluded postpartum women, as well as their families, received standard institutional guidance regarding the care of their NBs' umbilical stump.

A methodological study was previously conducted in two phases. The first consisted of developing a checklist for umbilical stump hygiene techniques; creating a simulated practice scenario; and simultaneously, developing a realistic simulated stump that closely approximated the umbilical stump in consistency and mobility, and that could be cleaned with antiseptic solution without damaging it, to be attached to a NB simulator. Semantic validity of the checklist and simulated scenario was performed by 11 experts, all professors with experience in the subject, with 100% agreement in the first round. The second stage consisted of developing and recording the scenario, followed by validity by 11 experts with experience in assisting postpartum women and NBs. It should be noted that recording was chosen due to the health restrictions imposed by COVID-19. All items from the three stages (briefing, scenario in action, and debriefing) obtained agreement scores above 0.91, thus being considered valid.[1]

Daily, the researchers went to the nurse in charge and consulted the daily census of assisted dyads in the unit, searching for postpartum women eligible for

the study, based on inclusion and exclusion criteria. Before initial contact with participants, if necessary, their medical records were consulted to verify compliance with the selection criteria.

Eligible postpartum women were sufficiently informed about the study objectives, and it was ensured that all signed the Informed Consent Form (ICF) or the Informed Assent Form (IAF), which was also signed by their legal guardian.

After consenting to participate in the study, eligible postpartum women were approached by two researchers, trained and calibrated by the principal investigator, in a dialogue about the umbilical stump hygiene technique. At that time, any possible doubts of participants were raised, and a description of how they performed the care, which consisted of item 1 of the checklist, was requested.

After the initial contact, each postpartum woman was asked to demonstrate the technique performed on their NBs, which constituted the first pre-test (pre-1) observed by the researchers, who were guided by a validated checklist.[5] Thirteen items from the checklist were observed, namely: 1. Hand hygiene before starting care; 2. Gather necessary materials; 3. Assess the periumbilical region for signs of inflammation; 4. Avoid touching the cotton part of the swab when removing it from the packaging; 5. Moisten the swab with alcohol without touching the dropper; 6. Hold the clamp securely to perform the technique; 7. Protect the periumbilical region with gauze; 8. Clean the base of the stump; 9. Clean the stump from the base to the tip on both sides; 10. Clamp hygiene; 11. Properly use both ends of the swab; 12. Keep the stump upwards to avoid contact with secretions and close the diaper; and 13. Hand hygiene after care. It should be noted that the checklist was validated and, based on this validity, adopted as a standard operating procedure at the institution where the study was conducted.

After the research team demonstrated the technique, they were asked to perform it again, this time on a low-fidelity baby mannequin adapted for the research with the insertion of the umbilical stump. This stump was designed specifically for the study and printed in silicone using a 3D printer and glued to the base of the umbilical scar, in the central region of the mannequin's abdomen, with gel glue. The performance verified from checklist items constituted the second pre-test (pre-2).

The objective of initially performing the technique on NBs was to verify how postpartum women were performing the care, according to the institutional guidelines received and their performance, in order to allow a realistic assessment. The other tests were performed on a mannequin to avoid performing the hygiene procedure more than once, mainly in relation to the absorption of 70% alcohol by NBs' skin, and to ensure their safety.

Sociodemographic, clinical, and obstetric data were collected from medical records of postpartum women and NBs. Figure 1 shows the mannequin and simulated stump used in the scenario.

Figure 1 – Low-fidelity baby mannequin and simulated umbilical stump, used in the umbilical stump hygiene scenario for postpartum women. Uberaba, MG, Brazil, 2023

Following the pre-test, the simulated intervention was initiated with the participation of postpartum women. It is important to note that the activity was conducted individually, and women had already received institutional guidance on the first day after childbirth regarding umbilical cord care. The intervention was applied on the first day after childbirth, respecting the inclusion criteria related to postpartum women's condition. Postpartum women's hospital stays generally last 48 hours, and applying the intervention on the first day was to ensure the feasibility of administering a new test before hospital discharge.

During pre-briefing, postpartum women were briefed on the scenario (the baby's medical history was read to them, and the materials and equipment for performing the technique were presented), and received all the necessary information, including learning objectives, logistical data, and other details for conducting the simulated

practice. Each postpartum woman took an active role in the scenario's actions, acting as the baby mannequin's "mother". The scenario described to postpartum women included, among other information, that mothers had just changed their children's diaper after bathing (mannequin) but had not yet cleaned the umbilical stump. Therefore, the goal was for postpartum woman to decide to clean the umbilical stump at that moment and perform the care appropriately. This was observed by the researchers through the completion of the checklist items and constituted the first post-test (post-1). At the end of the scene, a structured debriefing took place, and postpartum women were able to express their feelings, reflect on and summarize their actions in the scenario. The researchers then instructed them to return the following day.

Twenty-four hours after the simulated intervention, the researchers asked postpartum women to demonstrate umbilical stump hygiene again, which constituted the second post-test (post-2).

Postpartum women's knowledge, skills, and attitudes regarding umbilical cord care were compared before and after the simulated intervention. Therefore, they were not allocated into groups, but their performance in the simulated scenario actions was compared before and after, with two pre-tests and two post-tests. It is emphasized that all postpartum women performed all tests in their own ward, at the bedside, which characterizes in-situ simulation.

All information was entered into a checklist with a technique description, and a validated scenario on umbilical stump care for postpartum women and their families was used.[1] It should be noted that at the end of the meeting, postpartum women received an illustrated educational booklet on umbilical stump care, prepared by researchers from the group, and any questions were answered.

The collected data was coded and stored in an Excel® database, entered by double entry. They were then imported into the Statistical Package for the Social Sciences (SPSS) version 23 for processing and analysis.

Sociodemographic and obstetric variables of postpartum women and their NBs were grouped and related according to the objective, seeking to group similar responses. The results were analyzed using descriptive statistics (mean and standard deviation) and treated as absolute and percentage indices, and presented in tabulated form.

To analyze postpartum women's knowledge, skills, and attitudes regarding umbilical stump hygiene, adequacy, inadequacy, or non-performance indices were calculated based on the standard operating procedure for the technique, which comprises the checklist items (absolute and relative frequencies). To assess the effect of the intervention, repeated measures ANOVA and Sidak's post-hoc test were applied. P-values ≤ 0.05 were considered significant.

The study was approved by a Research Ethics Committee (REC), under CAAE 31662320.7.0000.8667 and Opinion 4.070.774 of June 4, 2020, and its entire development was guided and based on the Guidelines and Regulatory Standards for Research involving human beings, contained in Resolution 466/12/CNS/MoH.

ICF was obtained from all individuals involved in the study through written means, with one copy remaining with the researcher and one copy given to participants. In the case of minors, an age-appropriate IAF was signed and signed by their legal guardians.

Results

Sample characterization

The study included 53 postpartum women, admitted between August 2022 and February 2023. The sample consisted of women with a mean age of 26.8 years (±6.7), ranging from 16 to 43 years, who self-identified as brown (29 – 54.7%), lived with a partner (35 – 66.0%), had completed high school (24 – 45.3%), and 17 (32.1%) were employed and contributed to the family income.

As for obstetric characteristics, the number of pregnancies ranged from one to six, with a mean of two (± 1.23) pregnancies. However, primiparous women predominated in the sample (25 - 47.2%). Gestational age ranged from 34 to 41 weeks, with a mean of 38.17 ± 1.81 gestational weeks. Notably, 11 (21.2%) neonates were born prematurely. Normal delivery was the most frequent mode of birth (34 – 64.2%), and the neonates weighed a mean of 3,090 grams, ranging from 1,845 to 4,370 grams.

Postpartum women's knowledge, skills, and attitude regarding umbilical stump hygiene prior to in-situ simulation

In the first pre-test (pre-1), postpartum women were asked to perform umbilical cord care on their NB child. In this test, the item with the highest number of conformities was the separation of materials before the technique (45 – 84.9%).

Non-conformities predominated in the items as follows: assessment of the site for identification of signs of inflammation and hand hygiene after the technique, which were not performed by any of the participants. The items with the highest percentage of non-conformities were the use of both sides of the stick and hygiene from the base to the tip of the stump (24 – 45.3%).

After the first pre-test, the postpartum woman was asked to perform umbilical stump care again on the baby mannequin, which constituted the second pre-test (pre-2). When caring for the stump on the mannequin, the results were similar to pre-test 1. The item with the highest number of compliances was the separation of materials before the technique (45 – 84.9%). Again, no postpartum woman performed the assessment of the area to identify signs of inflammation. The item with the predominance of non-conformities was the proper use of both ends of the cotton swab (24 – 45.3%).

Postpartum women's knowledge, skills, and attitude regarding umbilical stump hygiene after in-situ simulation

After conducting the two pre-tests, the simulated intervention was performed at the bedside in the ward where the dyad was being cared for. At the beginning of the intervention, the researchers ensured that the dyad had already received instructions and performed umbilical stump care. Subsequently, they read the clinical case, which described the need to clean the umbilical stump after changing the NB's diaper; this constituted the pre-briefing stage. Following this, briefing began, where all the materials necessary for performing the technique were located and described, and the mannequin and simulated stump were presented. At this point, they had the opportunity to explore the locations, materials, and mannequin. Subsequently, it was also explained that a checklist would be completed and its purpose explained, and that strengths and areas for improvement would be discussed after the activity. A

confidentiality agreement was also signed at this time, and the activity's purpose was discussed. Pre-briefing lasted five minutes, and the briefing itself up to ten minutes.

The simulated activity was performed by postpartum women and lasted five to ten minutes. Debriefing was conducted after the activity was completed. It is important to note that all participants completed the technique without needing to be finalized by the researchers. A semi-structured script was used in the debriefing. The following questions were asked: How did you feel? Could you describe the scenario you experienced? What did you do right? What were the positive points? What would you do differently? What points could be improved? What will you take away from this for your life? What did you learn? The debriefing lasted up to 10 minutes. The scenario development itself lasted a mean of 30 to 40 minutes.

Following the simulation, postpartum women were again observed by the researchers regarding their performance, using the checklist as a guide for observation. This consisted of the first post-test (post-1). In this test, the item with the highest number of conformities was the separation of materials before the technique (53 – 100%), with frequent conformity also regarding not touching the cotton when removing the flexible swab from its packaging (52 – 98.1%) and not touching the cotton swab to moisten the swab using the dropper (52 – 98.1%). The item with the highest number of non-conformities was site assessment for identifying signs of inflammation (7 – 13.2%).

Twenty-four hours later, the researchers returned and asked postpartum women to repeat the umbilical stump care procedure on the mannequin, which constituted the second post-test (post-2). The items that achieved 100% compliance were: separation of materials before the technique; not touching the cotton when removing the flexible swab from its packaging; not touching the cotton swab to moisten the swab; keeping the stump upwards; and positioning the diaper below the umbilical stump so as not to press on the abdominal region. The item with the highest number of non-conformities was site assessment for identification of signs of inflammation (nine – 17.0%). Half of the items (seven – 50%) no longer had non-conformities in the second post-test. Table 1 shows the number of items assessed as adequate in each of the tests performed.

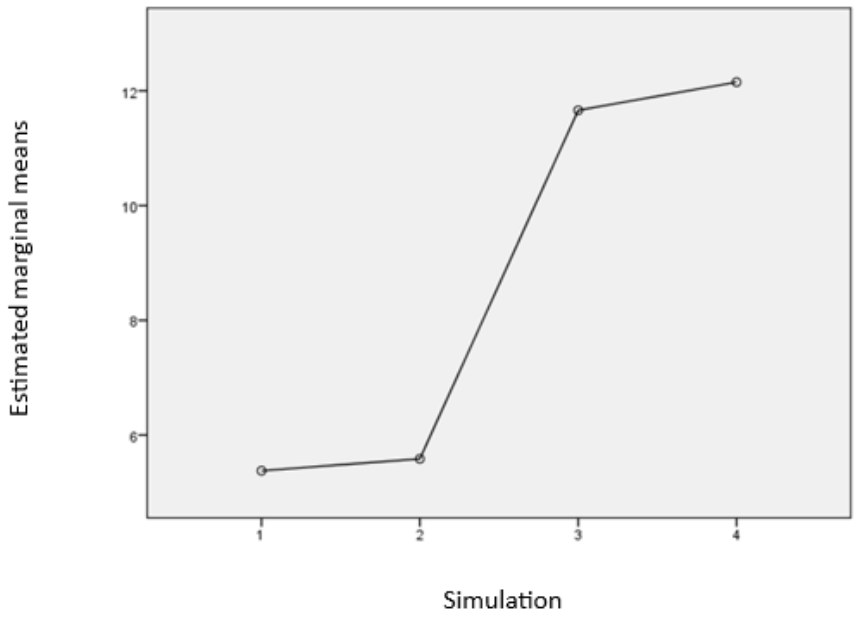
Table 1 – Number and percentage of items conforming to the technique in the tests performed, mean, standard deviation, minimum and maximum. Uberaba, MG, Brazil, 2023

Item assessed	Pre-test 1		Pre-test 2		Post-test 1		Post-test 2	
	N	%	N	%	N	%	n	%
1. Technique description	43	81.1	43	81.1	51	96.2	51	96.2
2. Hand hygiene (before the technique)	01	1.9	01	1.9	03	5.7	04	7.5
3. Separation of materials to be used	45	84.9	45	84.9	53	100.0	53	100.0
4. Site assessment (identification of signs of inflammation)	-	-	-	-	07	13.2	09	17.0
5. Do not touch the cotton swab when removing it from the packaging	44	83.0	44	83.0	52	98.1	53	100.0
6. Moisten the tip of the swab with 70% alcohol without the dropper touching the swab	44	83.0	44	83.0	52	98.1	53	100.0
7. Hold the clamp securely while performing the technique	38	71.7	39	73.6	51	96.2	52	98.1
8. Protect the periumbilical region with gauze/compress	08	15.1	08	15.1	38	71.7	30	56.6
9. Clean the base of the stump	30	56.6	30	56.6	47	88.7	51	96.2
10. Cleanse from the base to the tip of the stump	03	5.7	04	7.5	45	84.9	49	92.5
11. Clean the clamp	02	3.8	02	3.8	47	88.7	49	92.5
12. Use both ends of the clamp correctly	02	3.8	02	3.8	42	79.2	48	90.6
13. Keep the stump upright and close the diaper properly	27	50.9	27	50.9	49	92.5	53	100.0
14. Hand hygiene (after the technique)	-	-	01	1.9	36	67.9	38	71.7
Mean and standard deviation	5.38	1.963	5.58	2.014	11.66	2.084	12.15	1.378
Minimum and maximum	1	11	1	12	3	14	8	14

Significant differences were found between the pre- and post-tests ($p < 0.001$). ANOVA showed that there is an effect of in-situ simulation (F-test (2,126, 110,557), $p < 0.001$). Pre-test 1 did not differ from the second pre-test ($p = 0.474$), and differed from post-tests 1 and 2 ($p < 0.001$). Pre-test 2 did not differ from the first pre-test ($p = 0.474$),

and differed from post-tests 1 and 2 (p <0.001). Post-test 1 differed from pre-tests 1 and 2 (p < 0.001), and did not differ from post-test 2 (p = 0.535). Similarly, post-test 2 differed from pre-tests 1 and 2 (p < 0.001), and did not differ from post-test 1 (p = 0.535). Sidak's post-hoc test showed that the technique items presented higher mean conformity scores after in-situ simulation, as shown in Figure 2. Times 1 and 2 refer to pre-tests, and times 3 and 4 to the tests after in-situ simulation.

Figure 2 – Diagram representing Sidak's post-hoc test in the four performance moments. Uberaba, MG, Brazil, 2023



Discussion

This study revealed that postpartum women were performing umbilical cord care inadequately, even though they had received instructions on how to do so.

Similarly, a cross-sectional study conducted in Tanzania with 315 young mothers (15 to 35 years old) assisted in Primary Health Care units, whose NBs were between seven and 28 days old, found that 62.2% had adequate knowledge about umbilical cord care, prevention, and identification of omphalitis. However, when asked to perform the care, only 21% had good stump care practices. An association was found with knowledge deficit and postpartum women living in rural areas, women with low

education levels, and those who had home births. Poor practices were associated with women with low education levels, living in rural areas, housewives, and primiparous women.[17] This study also reinforces the need for greater guidance for primiparous women, who were predominant in the study.

In-situ simulation was the approach chosen for training postpartum women in this study. Studies indicate that this modality, carried out in real-life scenarios and in participants' own environment, offers numerous advantages, including meaningful learning.[9-11]

In the present study, significant differences were found in the compliance index of the items that make up the umbilical stump hygiene technique after the simulated scenario. It is noteworthy that although already well-established in the literature, the results of teaching strategies using simulation are rarely employed as a didactic resource in caregiver training.[12] It is worth highlighting that caregiver training is essential to ensure continuity of care at home.[13] However, for caregiver training to be effective, it requires a proactive approach, communication skills, and training to acquire specific care skills. Furthermore, it must be considered that caregivers have higher levels of anxiety compared to professionals and even the patients themselves, due to the total responsibility for caregiving.[18] Hence, simulation is a highly effective strategy because it allows learning and practicing skills in safe environments.[18] A study with caregivers of cancer patients showed that 43% were not instructed on home care,[18] reinforcing the need for caregiver training.

No studies were found in the literature that used simulation to train postpartum women and their families in umbilical cord hygiene, which makes this study original. Furthermore, the scarcity of studies on the use of realistic simulation in training for neonatal care is emphasized.

The use of simulation in training caregivers of pediatric and neonatal patients was frequently observed for critically ill patients, with a predominance of studies involving home care for tracheostomized patients after hospital discharge.

In all cases, the intervention proved effective in learning the necessary care techniques.[12,17-19] It is also worth highlighting that facilitating the transition from hospital discharge to home care should be one of the goals of care, especially for neonatal and pediatric patients.[12,17-19]

Simulated scenarios, with increasing difficulty and realism, were developed with 15 caregivers of children with special health needs in preparation for hospital discharge. Initially, the caregivers expressed feelings of fear and anxiety, but after training, they showed relief, self-confidence, and satisfaction with their performance, highlighting the importance of a facilitator's support. It was also noted that they felt more secure in performing all caregiving tasks and capable of facing potential challenges.[8]

Furthermore, regarding studies that used simulation in the training of caregivers of children and NBs, care for cancer patients,[12] and those with chronic diseases,[17] has been described. Its application in Primary Health Care has been identified, in the management of fever in children,[20] showing positive results in the acquisition of skills for childcare at home and management of unexpected situations in this environment.[12,17, 20]

In primary care, a study stands out involving 160 parents of children aged three months to five years enrolled in preschools. Simulated training on the management of childhood fever was conducted, with 80 parents participating in the experimental group and 80 in the control group. Anxiety levels were measured before the intervention, after six months, and after one year. Anxiety regarding childhood fever decreased over time in both groups. However, a greater reduction was observed in the group that underwent the simulated training.[20] This study highlights that simulation is possible at any level of attention, plausible and applicable to situations considered every day and simple, similar to the technique tested in the study.

One of the points that deserve highlighting is the use of a checklist to verify the skills to be tested, applied in this research and described in other studies.[5,20] The checklist facilitates better assessment by the facilitator, as does the feedback during debriefing.[20] Another relevant aspect in this study, also highlighted in others, is simulation repetition.[20] Studies indicate that repeating the technique improves self-confidence, reduces anxiety, and consequently increases the security to provide care.[20]

It is therefore noted that all the studies described reinforce the importance and positive aspects of simulation in caregiver training. It is also noteworthy that, in the study conducted, a high-fidelity umbilical stump simulator, produced using a 3D printer, was developed for this purpose. A similar study was carried out with the construction of a low-cost, high-fidelity simulator for insulin administration training aimed at patients and caregivers. When using a simulator, critical points of the technique could be identified, allowing for effective and directive intervention. It was found that discharge care recommendations provide greater patient safety.[21] It should be noted that, according to the International Nursing Association for Clinical Simulation and Learning (INACSL), fidelity differs from technology, and high technology does not necessarily mean high fidelity, which is based on the realism conveyed by the mannequin, prototype, or scenario.[22]

Finally, we emphasized the importance of training caregivers in umbilical cord care, which involves great symbolism. A study pointed out that the umbilical cord is extremely symbolic and represents a child's vital center, which generates a lot of anxiety when handling it. Care, although simple, represents parental responsibility, and is therefore delegated to older and significant people in a mother's life, who generally provide this care.[23] Similarly, a health education project with pregnant women indicated that this care generates a lot of anxiety in mothers, who lacked knowledge and did not know how to handle the umbilical stump. When asked who would take care of the stump, all emphatically replied that it would be the maternal grandmother.[24] The study indicated that grandmothers' care was permeated by popular knowledge and beliefs, which could compromise the umbilical stump's healing process and increase the risk of omphalitis. Therefore, it was necessary to involve grandmothers, in addition to mothers, in the guidance to ensure safe care.[24] Hence, the need to include not only postpartum women, but also their support network in these training sessions is highlighted.

Given popular knowledge, the anxiety it causes in caregivers, the umbilical stump care, and the impacts in the studies presented, the relevance of simulation for learning and promoting safe neonatal care is believed.

As limitations of this study, the small sample size and the study design can be cited. However, such limitations may constitute potential research problems for future studies, given the benefits presented. Thus, the development of randomized studies with a larger sample size is recommended.

As contributions of this study, caregiver training through in-situ simulation proved effective and feasible based on the results presented. This research can contribute to new studies, enriching new discussions on the subject. Furthermore, it highlights the importance of caregiver training through meaningful learning strategies to ensure safe neonatal care and the crucial role of nurses in this process. Thus, the use of innovative teaching strategies in their practices is recommended.

Conclusion

A significant number of non-conformities were observed even after receiving institutional guidance regarding umbilical stump care. There was greater conformity in the separation of materials for umbilical stump hygiene and higher rates of non-conformity in the periumbilical region assessment for detecting signs of inflammation. The analysis indicated no differences among pre-tests. However, a difference was observed in the first post-test when compared to the pre-test. The second post-test did not differ from the first, indicating no differences in learning throughout the observation period. Thus, training in umbilical stump hygiene using the in-situ simulated scenario proved effective in increasing postpartum women' knowledge, skills, and attitudes.

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