

MOTHERS KNOWLEDGE TOWARDS WOUND CARE IN THE GREATER BANDUNG AREA

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ABSTRACT

Objective: Proper wound care is essential to prevent complications and worsening of the injured patient. Everyone in the family needs to possess wound care knowledge, especially the mother, who plays a role in making decisions about health care and family health behaviors. This study aims to evaluate mothers' knowledge towards wound care in the Greater Bandung Area.

Methods: This cross-sectional study involved 100 participants with varied backgrounds and had met the inclusion criteria. The study was conducted using questionnaires distributed online to the mother community living in the Greater Bandung Area, West Java, then data processing and analysis were carried out.

Results: The results showed that mothers in the Greater Bandung Area had a good level of knowledge (27%), average (52%), and less (21%). In addition, plasters with wound care solutions were still the mothers' main choice in wound care. Nevertheless, there are many choices of pharmaceutical dosage forms for wound care that have been developed today to optimize the wound healing process.

Conclusion: Most of the mothers already have an average level of knowledge to good. However, there are still quite a lot of mothers who have a lack of knowledge related to wound care. Therefore, educational programs must be developed to raise awareness about wound care and management, as well as knowledge about pharmaceutical dosage forms for wound care.

Keywords: Wound care, Wound healing, Wound care pharmaceutical dosage forms, Mothers' knowledge

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INTRODUCTION

Wounds are conditions that occur when there is a disruption in the normal structure and function of the skin. Wounds may result from various causes, including injuries, surgical interventions, or extrinsic factors, such as friction or pressure, as well as underlying health conditions, such as diabetes and vascular disease [1]. Wounds can have major impacts that sufferers may not realize. Wounds can reduce the quality of life, which can be manifest as pain, difficulty in activities, anxiety and social isolation, infections and chronic diseases, or even death [2, 3]. Based on the cause, wounds are categorized into acute wounds (surgical wounds and burns) and chronic wounds (foot ulcers, diabetic wounds, and pressure sores) [2]. Wounds are also classified based on the level of contamination and the condition of the wound, namely clean wounds, clean-contaminated wounds, contaminated wounds, and dirty-infected wounds. The wound must be cleaned and treated appropriately to prevent the spread of infection and further injury [4-6].

Evidence on the prevalence of wounds among patients admitted to healthcare facilities and those not admitted is limited. However, according to RISKESDAS 2018 data, the national prevalence of injury was 9.2%. This percentage increased from the previous survey conducted in 2013, which was 8.2%. The province with the highest injury prevalence, at 13.8%, is Southeast Sulawesi. In contrast to the national percentage, the prevalence of injury in West Java Province is lower and ranks 23rd out of the 33 surveyed provinces [7]. Based on surveys conducted in the UK and Denmark, it is stated that there are approximately three to four individuals per 1,000 population have one or more wounds. A considerable number of these wounds become chronic, with one study reporting that around 3,500 people per million will live with a wound, and approximately 15% of wounds remain unhealed after one year from the onset of the wound. This often leads to a prolonged burden for the patient, family and health system. However, these events are inevitable [2, 8].

Wound care can be provided by medical professionals (especially by community nurses) in health facilities for wounds that tend to be severe. Additionally, wound care can also be carried out in the

community, which is an unskilled practice carried out at home, especially for minor injuries requiring first aid [9]. First aid is the initial, immediate and temporary care given to an injured or ill person in a life-threatening situation with effective actions to sustain life and maintain the best possible condition until emergency medical care can be obtained [10]. Acquiring knowledge in wound care is critical to prevent the potential for worse events or even reduce the occurrence of death [11].

In this study, a survey was conducted to evaluate mothers' knowledge towards wound care in the Greater Bandung Area. Mothers are perceived to be the primary decision-makers for daily household needs. Mothers bear the most responsibility for decisions about their family's healthcare and health behaviors, including wound care. Moreover, mothers have a vital role in teaching and modeling their health-related attitudes and beliefs to other family members [12, 13]. Currently, there is a lack of research on mothers' knowledge towards wound care that has been conducted and published in journals. Research related to the level of knowledge of wound care is currently more focused on healthcare professionals in health facilities. Nevertheless, not all wounds need to be treated at a healthcare facility. Therefore, it is important to know mothers' knowledge towards wound care, which can help to determine appropriate wound care practices and pharmaceutical dosage forms for wound care to improve wound care practices in the community.

MATERIALS AND METHODS

Study design

This study is a descriptive observational study that used a cross-sectional method and prospective data collection. The variable observed was the level of mothers' knowledge towards wound care. The distribution of the level of mothers' knowledge was presented based on the categorical variables (including age, education level, work status, and income status). The study obtained data by administering an online questionnaire in the form of Google Forms through various social media platforms to the mother community living in the Greater Bandung administrative area, West Java. At the

beginning of the study, participants were given information regarding the purpose of the study, benefits, and risks. This study was approved by the Research Ethics Committee, Universitas Padjadjaran, Indonesia (No. 1216/UN6. KEP/EC/2023).

Participants

The subjects of this study comprised of 100 participants selected through purposive sampling techniques using the Lemeshow formula because the exact number of mothers in the households was unknown. The sampling process was performed based on the inclusion and exclusion criteria. The sample inclusion criteria were mothers (≥ 19 y old) who live in the Greater Bandung Area, have experience with wound care within the last six months, and were willing to fill out the questionnaire. Meanwhile, the exclusion criteria were participants who were not willing to fill out the questionnaire, participants who did not answer the questionnaire completely, and participants who were unable to use the Internet and did not understand how to fill out the questionnaire using Google Forms.

Survey tools

This study used a validated questionnaire. Questionnaires were developed by compiling questions based on literature studies [9, 14, 15]. The questionnaire was translated into Indonesian version, then validation and reliability were carried out. The questionnaire included individual characteristics and self-identity, as well as queries related to wound care knowledge with Guttman Scale answer options. The Guttman scale was used as the knowledge assessment criteria with firm true or false answer intervals. Correct answers were scored 1, whereas incorrect answers were scored 0.

Data collection

The procedures for collecting research data included: (1) The researchers determined the location to conduct the survey; (2) A preliminary study was conducted to identify the research problem; (3)

The researchers developed a survey tool in the form of a questionnaire through Google Forms; (4) The researchers checked the validity and reliability of the questionnaire on 30 participants; (5) Data collected by distributing questionnaire online to participants who met the predetermined criteria; and (6) The completeness of the answers provided by respondents was checked by the researchers.

Data analysis

Quantitative data were processed by editing, coding, processing, and cleaning. Then, univariate analysis was carried out to describe the characteristics of the research variables. Data were presented in the form of percentages of each category of answers made in the frequency distribution table.

RESULTS AND DISCUSSION

Background characteristics

This study involved 100 participants who met the established criteria. The characteristics of participants, including age, education, occupation, and average monthly family income, which are shown in table 1. The age of the participants in this study ranged from 19 to 55 y (mean age 33.08 ± 7.90 y, 95% confidence interval [31.53–34.63], median age 33 y). In terms of educational level, 29 participants (29%) had secondary education (high school or less) and 71 participants (71%) were higher education. These results indicate that most participants have a high level of education. Therefore, it can be inferred that the mothers' knowledge of wound care may be classified as moderate to good. The occupational characteristics of the participants revealed that 65 participants (65%) were working, with the most common type of occupation being as an employee (53.85%), while the others were not working or were housewives (35%). Out of the participants, 20 participants had an average family income of <3 million Rupiah (20%), 3 million to 5 million Rupiah for 37 participants (37%), and >5 million Rupiah for 43 participants (43%).

Table 1: Background characteristics of participants

Characteristics	n	Frequency (%)
Age		
19–30 y (young adults)	43	25
31–45 y (middle-age adults)	48	48
>45 y (old-age adults)	9	18
Education level		
Secondary education or less	29	29
Higher level	71	71
Work		
Working	65	65
Not working	35	35
Type of occupation		
Employee	35	53.85
Civil Servant	9	13.85
Self-employed	9	13.85
Student	7	10.77
Cook	1	1.53
Other	4	6.15
Average monthly family income		
<3 million Rupiah	20	20
3–5 million Rupiah	37	37
>5 million Rupiah	43	43

Previous experience with wound care

Previous experience with wound care within the last six months is presented in table 2. 30.77% had experience in treating cuts, which was the most common type of wound treated by the participants compared to other types of wounds. Most participants had treated one wound (52%). Among several possible wound sites, participants experienced the most wounds appearing on the fingers (24.01%) and the least on the wrist (0.56%). Most of the wounds treated were non-infectious (63.78%). Moreover, other wound conditions consisted of wounds with partial thickness skin loss (14.96%) and bleeding <10 cc (11.02%). Dirty wounds were experienced by 9.45%

of participants and there were 0.79% of participants who had bleeding >10 cc. Among the participants, 58% of them was not carried out primary medical care by professionals to treat wounds (such as treatment at clinics, hospitals, health centers, etc. by healthcare professionals). In addition, the time elapsed between the wound incidents and receiving primary medical care was within one month (34%) and after one month (8%).

The majority of participants obtained information related to wound care at home from non-medical sources, namely family and friends (40.27%) or social media (15.44%), and medical sources, namely healthcare professionals (24.16%). According to a study

that assessed the public's trust in social media, 51.5% of Americans, 76.9% of Koreans, and 81.4% of Hong Kong citizens acknowledged using social media to obtain health information. Furthermore, 66.2% of Americans, 94.6% of Koreans, and 86.1% of Hong Kong citizens acknowledged using blogs to obtain health information. This shows that non-medical sources, particularly

social media, have a significant impact on people's behaviors and attitudes, even in the medical field [16]. However, the Hispanic Survey of American datasets in 2007 reported that participants who received health information from doctors (medical sources) had a higher level of knowledge when compared to those with a lack of information [17].

Table 2: Characteristics of previous experience with wound care

Characteristics	n	Frequency (%)
Type of wound*		
Cuts	52	30.77
Falls	51	30.18
Surgical wounds	29	17.16
Burns	16	9.47
Ulcers	15	8.88
Diabetic wounds	4	2.37
Other	2	1.18
Number of wounds		
1	52	52
2	22	22
3	15	15
>3	11	11
Location of wound*		
Finger	43	24.02
Leg	33	18.44
Arm	26	14.53
Other	22	12.29
Elbow	19	10.61
Knee	16	8.94
Facial	15	8.38
Head	4	2.23
Wrist	1	0.56
Wound appearance*		
No indication of infection	81	63.78
Partial thickness skin loss	19	14.96
<10 cc bleeding	14	11.02
Dirty	12	9.45
>10 cc bleeding	1	0.79
Time elapsed between the wound incident and receiving primary medical care		
No primary medical care	58	58
Within 1 mo	34	34
After 1 mo	8	8
Source of information on home wound care*		
Non-medical sources		
Family and friends	60	40.27
Social media (Facebook, Instagram, Tiktok, WhatsApp, etc.)	23	15.44
Media (TV, newspaper, internet, etc.)	19	12.75
Medical sources		
Healthcare professionals	36	24.16
Health awareness campaign	4	2.68
Brochure	4	2.68
Other	3	2.01

*Questions with more than 1 answer.

Mothers' knowledge about wound care

Knowledge in this study focuses on the mothers' knowledge of wound care, including knowledge about wound care practices and factors that may influence the wound healing process. Table 3 presents the percentage of correct and incorrect answers of

participants in answering questions related to knowledge about wounds and wound care. The questions that had the highest percentage of correct answers were those related to signs of infection that could present as fever (94%) and questions related to factors that could affect the wound healing process, namely getting enough sleep (91%).

Table 3: Knowledge about wound care

Questions	Frequency (%)	
	Correct	Incorrect
Wound care is best carried out by someone aside from the patient [false]	60	40
Wounds can prevent individuals from going outside [false]	59	31
Superficial (simple) wounds do not need treatment [false]	42	58
The healing process is aided by exposing wounds to fresh air [false]	47	53
Redness and swelling may indicate a wound infection [true]	85	15
Fever may indicate a wound infection [true]	94	6
Pain may indicate a wound infection [true]	65	35
Plaster should be tightly stretched across a dressing [false]	49	51
It is best to swiftly pull off the plaster from the skin [false]	50	50
Smoking has a negative effect on wound healing [true]	76	24
Water may cause wound healing to be delayed [false]	61	39
Getting enough sleep may help promote wound healing [true]	91	9
Maintaining the wound's moisture balance can aid wound healing [true]	81	19
Proper exercise may help promote wound healing [true]	62	38

This level of knowledge section comprises of 14 valid questions that have both correct and incorrect answers. The score for the correct answer is 1, while for the incorrect answer is 0. The average value of the total score is 9.22 ± 2.25 , with a total score range that varies from

4 to 14 from the maximum total score of 14. Furthermore, the level of knowledge is categorized into three categories: good (correctly answered 76–100%), average (correctly answered 56–75%), and less (correctly answered <56%) [18].

Table 4: Distribution of knowledge level

Item	Good (%)	Average (%)	Less (%)
Overall	27	52	21
Age			
19–30 y (young adults)	9	20	14
31–45 y (middle-age adults)	14	28	6
>45 y (old-age adults)	4	4	1
Education level			
Secondary education or less	7	19	3
Higher level	20	33	18
Work			
Working	20	31	14
Not working	7	21	7
Average monthly family income			
<3 million Rupiah	3	13	4
3–5 million Rupiah	10	21	6
>5 million Rupiah	14	18	11

Based on table 4, the majority of mothers in the Greater Bandung Area, namely 52 participants (52%) had average knowledge related to wound care. Meanwhile, 27 participants (27%) had good knowledge of wound care. The results also showed that there were still mothers with poor levels of knowledge, as many as 21 participants (21%). The results of this study are associated with the characteristics of participants. Most participants have a relatively high level of education, indicating the mothers' knowledge of wound care can be classified as average-to-good. A study conducted by Malaekah *et al.* [9] in Riyadh Region, Saudi Arabia reported that most participants had average-to-poor knowledge attributed to their low education level. Nonetheless, the direct categorization of having a good level of knowledge cannot apply to most participants in this study, who were highly educated (71%). This result could be influenced by misconceptions related to non-medical information, such as wound care practices gained from family and friends, as well as from the media and social media [9].

Based on these findings, there is a need for wound care education in order to increase knowledge, then attitudes and practices in wound care [19, 20]. Wound care knowledge has a positive correlation with wound care practices [21, 22]. Therefore, improving wound care knowledge can enhance the skills in wound care [19].

Information about wound and wound care

Table 5 provides information about wounds and wound care, including trends in the type of wound dressing and pharmaceutical dosage forms for wound care used at home. Participants mostly used plaster (38.71%) for wound dressing. In addition, there were also participants who chose not to use wound dressings (3.23%). Wound

care must be done immediately to prevent further skin damage, promote the wound-healing process, and reduce the risk of infection, especially in the case of open wounds [23, 24]. The wound must be dressed to cover the wound, so it can accelerate the wound healing process. When the wound is left open, new surface cells can easily dry out. As these cells dry out, the wound-healing process tends to slow down [25, 26]. In the case of open wounds, microorganisms enter into the wounds, leading to infection. Delay in treating an infected wound can worsen the condition. Bacterial colonization of infected wounds can result in severe inflammation, such as sepsis, or even amputation in the worst cases, which can significantly increase mortality and morbidity [24, 27, 28]. Selection of an appropriate wound dressing that can maintain moisture around the wound area is necessary to ease the burden on the patient. When moisture is maintained, the process of removing the wound dressing will be less painful and distressing compared to a wound dressing with a dry environment. Moreover, the selection of an appropriate dressing is required to reduce the frequency of dressing changes and accelerate the wound-healing process [29, 30].

The most commonly used pharmaceutical dosage form for wound care at home was the povidone-iodine solution (46.74%). Wound care spray was the least preferred type of pharmaceutical dosage form for wound care (4.35%). There are various pharmaceutical dosage forms that can be used for wound care. Topical dosage forms, such as liquids, semi-solids, transdermals, plasters, and film-forming sprays, tend to be used [31, 32]. Topical drugs remain critical to treating all wound types by accelerating the wound healing process and reducing infection risk. Therefore, the exploration of novel therapeutic agents for topical wound treatment is still in high demand [33].

Table 5: Information about wound and wound care

Information	n	Frequency (%)
Type of dressing used at home*		
Plaster	72	38.71
Gauze	66	35.48
Cotton	33	17.74
Towel	7	3.76
None	6	3.23
Other	2	1.08
Type of pharmaceutical dosage form for wound care used at home*		
Povidone Iodine solution	86	46.74
Antiseptic/antibiotic ointment	41	22.28
Mercurochrome/acrinol solution	23	12.50
Normal saline solution	20	10.87
Wound care spray	8	4.35
Other	6	3.26

*Questions with more than 1 answer.

Topical wound solutions, such as povidone iodine solution, have been found to be most effective in the early phases of wound healing to reduce the bacterial load and act as a cleansing agent to prevent the maceration of healthy tissue by removing necrotic tissue in the wound [34]. Antimicrobial agents, including povidone-iodine, polyhexamethylene biguanide, and acrinol are sometimes used in wound dressing for the management of wounds and the prevention of infection [35-37]. Normal saline solution is also used to cleanse the wound in order to eliminate dead tissue and any dissolved polymer dressings that may have remained in the wound [38]. Furthermore, normal saline solution can aid in irrigating dry wounds so that dressings can be removed with minimal or no pain during wound dressing changes [39, 40]. The liquid dosage forms offer the advantage of having a rapid onset in delivering the drug [41]. However, the notable issue with liquid dosage forms is the short residence period, leading to easy loss from the injured skin area. This subsequently results in short action and difficulty in penetrating deep skin layers. Therefore, it can slow down the wound-healing process [31, 34].

Semi-solid dosage forms, including ointments, gels, and creams, are commonly used for wound care due to their numerous benefits [42]. In comparison to liquid dosage forms, semi-solid dosage forms allow for longer drug contact on the wound surface [34]. Moreover, semi-solid dosage forms spread quickly on the skin and provide effective protection against external contamination. In addition, gel preparations possess moisturizing and cooling properties and can penetrate the skin easily, leading to a beneficial wound-healing effect [43]. Gel preparations are also excellent for treating burn wounds, which are a type of wound that is less hydrated. These semi-solid dosage forms can contain antiseptics or antibiotics [34]. For instance, silver nitrate ointment is a semi-solid dosage form that contains antiseptics, while semi-solid dosage forms containing antibiotics are silver sulfadiazine cream and neomycin sulfate gel [44-46]. Besides the advantages, semi-solid dosage forms for wound care have limitations including stickiness to the skin, which can diminish the action of active substances, induce cross-infection, and drugs are difficult to penetrate deep skin layers [31]. Additionally, semi-solid dosage forms are ineffective at remaining in the wound area, that are highly exuding because they absorb liquid rapidly and lose their rheological characteristics, becoming mobile and difficult to maintain in the wound area [34].

Transdermal dosage forms can be in the form of patches or gels (semi-solids) that are administered topically to provide controlled systemic drug delivery. These dosage forms are commonly used in wound care today [47, 48]. They have evolved from ancient formulations, including ointments applied to the skin to modern microneedle patches [49, 50]. Transdermal dosage forms have gained popularity due to several advantages over conventional topical dosage forms, including controlled drug release, the potential to prevent first-pass metabolism in the liver, long duration of action, and stable plasma profiles that ameliorate therapeutic efficacy by reducing systemic adverse effects [51, 52]. The transdermal patch is a type of drug delivery system that combines the drug and adhesive into a single layer, eliminating the need for spreading the formulation. This feature makes it a cleaner, simpler, and safer application. Moreover, transdermal patches offer convenience by reducing the frequency of application to only once a week [53]. However, transdermal dosage forms have limits that can result in agglomeration and skin irritation [31]. Transdermal patches allow residue to remain and dose adjustments are low. Meanwhile, semi-solid transdermal dosage forms can be sticky, oily, and messy to use [54].

In wound management, plasters are used as wound dressing. Adhesive plaster, also known as bandage, consists of a base layer of plain fabric that has been covered with an adhesive substance. Plaster is used for dressing minor wounds, such as cuts in the skin [55]. The application of plaster as a wound dressing is typically used to cover wounds that have been treated with topical wound medications (liquid or semi-solid drugs) [23]. Apart from being used as a wound dressing, plaster is also one of the pharmaceutical dosage forms for wound care. In ancient times, plaster was originally made from a combination of herbs, plants, and clay or mud. Plaster was applied to wounds to protect them and absorb exudate [56].

Nowadays, medicated plasters are developed by incorporating wound medication into the base layer of plain fabric for easier application. An example is a wound care plaster containing natural ingredients of brown algae *Turbinaria ornata* extract, which can provide faster wound healing effects [23, 57].

Film-forming spray is a novel approach that can be used as an alternative to traditional topical and transdermal dosage forms in wound care. Film-forming spray is a sprayable solution that produces a thin film after spraying. This thin film can increase the contact time and permeability of the drug [54, 58]. The development of wound drugs in spray form has the potential to reduce the disadvantages of other topical dosage forms so as to improve patient compliance [31]. Topical preparations in the form of spray are products that are easily applied to the skin and are suitable for fresh wounds such as burns or minor injuries, including cuts, lacerations, abrasions, and so on. In addition, this technique allows drug treatment of wounds without contact, thereby reducing the possibility of contamination and infection [59,60]. Moreover, spray preparations may have less cytotoxic properties on the skin and are less likely to inhibit the wound-healing process [31].

Besides the pharmaceutical dosage forms for wound care that have been mentioned, the drug delivery system for wound care is still being investigated in order to find effective and satisfactory therapies. One drug delivery system that is currently getting more attention is nanotechnology drug delivery. Nanotechnology drug delivery can bind bioactive molecules into the applied area, maintain drug release, and increase the efficacy of therapy, resulting in a positive effect on skin regeneration [33]. Nanotechnology drug delivery offers a great possibility to improve drug therapy, standard care, and wound management currently used [61]. Nanotechnology drug delivery has demonstrated non-toxicity, skin compatibility, and the ability to produce a moist environment that is beneficial for activating and hastening the wound-healing process [62].

Limitations and recommendations

There were some limitations to this study. Although researchers have attempted to develop a comprehensive research strategy, bias in the selection process cannot be eliminated. The majority of participants had a high level of education and socio-economic status. Furthermore, participants with constraints, such as being unable to use the internet and complete online questionnaires using technology, were excluded from the study, which may have influenced the results. Local and global data on wound prevalence are also lacking, so further study on wound care is required to close the gap and avoid potential consequences. Further research should be undertaken based on the findings of this study to investigate the impact of wound care practices at home. In addition, there is a need for educational programs related to wound care that can be carried out by various stakeholders and concerned institutions to increase public awareness, such as by conducting wound and wound care awareness campaigns.

CONCLUSION

The majority of mothers in the Greater Bandung Area, West Java have an average level of knowledge, and some even have a good level of knowledge on wound care. However, there are still quite a lot of mothers who have a lack of knowledge related to wound care. Based on information about wound and wound care, plasters with wound care solutions were still the mothers' main choice in wound care. Nonetheless, several pharmaceutical dosage forms for wound care have been developed in recent years to maximize the wound healing process. Hence, educational programs need to be developed to raise awareness about wound care and management, as well as knowledge about pharmaceutical dosage forms for wound care.

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AUTHORS CONTRIBUTIONS

All the authors contributed equally.

CONFLICT OF INTERESTS

Declared none

REFERENCES

- Harding K. Understanding healing after skin breakdown. Skin breakdown—the silent epidemic. Hull: Smith & Nephew Foundation; 2007. p. 13-6.
- Lindholm C, Searle R. Wound management for the 21st century: combining effectiveness and efficiency. *Int Wound J*. 2016;13 Suppl 2:5-15. doi: 10.1111/iwj.12623, PMID 27460943.
- Tsala DE, Amadou D, Habtemariam S. Natural wound healing and bioactive natural products. *Phytopharmacology*. 2013;4:532-60.
- Kujath P, Michelsen A. Wounds-from physiology to the wound dressing. *Dtsch Arztebl Int*. 2008. doi: 10.3238/arztebl.2008.0239.
- Onyekwelu I, Yakkanti R, Protzer L, Pinkston CM, Tucker C, Seligson D. Surgical wound classification and surgical site infections in the orthopaedic patient. *J Am Acad Orthop Surg Glob Res Rev*. 2017;1(3):e022. doi: 10.5435/JAAOSGlobal-D-17-00022, PMID 30211353.
- Wilkins RG, Unverdorben M. Wound cleaning and wound healing: a concise review. *Adv Skin Wound Care*. 2013;26(4):160-3. doi: 10.1097/01.ASW.0000428861.26671.41, PMID 23507692.
- Kemenkes RI. Hasil utama riset kesehatan dasar 2018 [in Bahasa Indonesia]. Jakarta: Kementrian Kesehatan Republik Indonesia; 2018.
- Jørgensen SF, Nygaard R, Posnett J. Meeting the challenges of wound care in Danish home care. *J Wound Care*. 2013;22(10). doi: 10.12968/jowc.2013.22.10.540, PMID 24142076.
- Malaekah HM, Alotaibi AE, Alsebaill RA, Alelawi GT, Alsarrani RH, Banjar WM. Wound care knowledge and perception of the Saudi general population in Riyadh region. *Adv Wound Care*. 2021;10(6):293-300. doi: 10.1089/wound.2020.1210, PMID 32602817.
- Karren KJ, Hafen BQ, Mistovich JJ, Limmer DJ. First aid for colleges and universities. 10th ed. 10th ed. San Francisco: Benjamin-Cummings; 2012.
- Mathew S, Salman P, Khurshid S, Luke AM. Awareness of first aid among undergraduate students in Ajman, UAE. *IOSR JDMS*. 2016;15:30-8.
- Erci B, Polat S, Ozyazicioglu N. Mothers' decision-making processes regarding their children's health care. *Int J Caring Sci*. 2016;9.
- Kumar BA, Rao AVS. Family purchase decision making—a review. *Osmania J Manag*. 2019. p. 40-50.
- Kuan YT, Wang TF, Guo CY, Tang FI, Hou IC. Wound care knowledge, attitudes, and practices and mobile health technology use in the home environment: a cross-sectional survey of social network users. *JMIR mHealth uHealth*. 2020;8(3):e15678. doi: 10.2196/15678, PMID 32213478.
- Pieper B, Sieggreen M, Nordstrom CK, Freeland B, Kulwicki P, Frattaroli M. Discharge knowledge and concerns of patients going home with a wound. *J Wound Ostomy Continence Nurs*. 2007;34(3):245-54. doi: 10.1097/01.WON.0000270817.06942.00, PMID 17505242.
- Song H, Omori K, Kim J, Tenzek KE, Morey Hawkins JM, Lin WY. Trusting social media as a source of health information: online surveys comparing the United States, Korea, and Hong Kong. *J Med Internet Res*. 2016;18(3):e25. doi: 10.2196/jmir.4193, PMID 26976273.
- Pew Research Center. IV. Sources of information on health and health care. Pew Research Center's hispanics and health care project; 2008. Available from: <https://www.pewresearch.org/hispanic/2008/08/13/iv-sources-of-information-on-health-and-health-care>. [Last accessed on 22 Jun 2023].
- Prosedur Penelitian AS. Suatu pendekatan praktik [Research procedures: a practical approach] [in Bahasa Indonesia]. Jakarta: Rineka Cipta; 2006.
- Chen YC, Wang YC, Chen WK, Smith M, Huang HM, Huang LC. The effectiveness of a health education intervention on self-care of traumatic wounds. *J Clin Nurs*. 2013;22(17-18):2499-508. doi: 10.1111/j.1365-2702.2012.04295.x, PMID 23121467.
- Pieper B. Vulnerable populations: considerations for wound care. *Ostomy Wound Manage*. 2009;55(5):24-37, PMID 19471046.
- Eng JJ, Noonan VK, Townson AF, Higgins CE, Rogers J, Wolfe DL. Impact of an online medical internet site on knowledge and practice of health care providers: a mixed methods study of the spinal cord injury rehabilitation evidence project. *J Med Internet Res*. 2014;16(12):e296. doi: 10.2196/jmir.3453, PMID 25537167.
- Jordan DN, Jordan JL. Foot self-care practices among Filipino American women with type 2 diabetes mellitus. *Diabetes Ther*. 2011;2(1):1-8. doi: 10.1007/s13300-010-0016-2, PMID 22127764.
- Widiyastuti S, Oktaviani DJ, Dewi AU, Zuhrotun A. *Turbinaria ornata* (Turner) J. Agardh Plaster is a Solution for Healing the Infection Wound. 2020;13:597-609.
- Zimmermann C, Troeltzsch D, Gimenez Rivera VA, Galli SJ, Metz M, Maurer M. Mast cells are critical for controlling the bacterial burden and the healing of infected wounds. *Proc Natl Acad Sci USA*. 2019;116(41):20500-4. doi: 10.1073/pnas.1908816116, PMID 31548430.
- Powden K, Powden P. Wound dressings: principles and practice. *Surg (UK)*. 2017;35. doi: 10.1016/j.mpsur.2017.06.005.
- Baranoski S, Ayello EA. Wound dressings: an evolving art and science. *Adv Skin Wound Care*. 2012;25(2):87-92. doi: 10.1097/01.ASW.0000411409.05554.c8, PMID 22258219.
- Negut I, Grumezescu V, Grumezescu AM. Treatment strategies for infected wounds. *Molecules*. 2018;23(9):1-23. doi: 10.3390/molecules23092392, PMID 30231567.
- Murray CK, Obremskey WT, Hsu JR, Andersen RC, Calhoun JH, Clasper JC. Prevention of Infections Associated With Combat-Related Extremity Injuries. *Journal of Trauma*. 2011;71(2):S235-57. doi: 10.1097/TA.0b013e318227ac5f.
- Junker JPE, Kamel RA, Catterson EJ, Eriksson E. Clinical impact upon wound healing and inflammation in moist, wet, and dry environments. *Adv Wound Care*. 2013;2(7):348-56. doi: 10.1089/wound.2012.0412, PMID 24587972.
- Hurd T. Evaluating the costs and benefits of innovations in chronic wound care products and practices. *Ostomy Wound Manag*; 2013.
- Chamsai B, Soodvilai S, Opanasopit P, Samprasit W. Topical film-forming chlorhexidine gluconate sprays for antiseptic application. *Pharmaceutics*. 2022;14(6):1124. doi: 10.3390/pharmaceutics14061124.
- Garg T, Rath G, Goyal AK. Comprehensive review on additives of topical dosage forms for drug delivery. *Drug Deliv*. 2015;22(8):969-87. doi: 10.3109/10717544.2013.879355, PMID 24456019.
- Wang W, Lu KJ, Yu CH, Huang QL, Du YZ. Nano-drug delivery systems in wound treatment and skin regeneration. *J Nanobiotechnology*. 2019;17(1):82. doi: 10.1186/s12951-019-0514-y, PMID 31291960.
- Boateng JS, Matthews KH, Stevens HNE, Eccleston GM. Wound healing dressings and drug delivery systems: a review. *J Pharm Sci*. 2008;97(8):2892-923. doi: 10.1002/jps.21210, PMID 17963217.
- Misra A, Nanchahal J. Use of gauze soaked in povidone-iodine for dressing acute open wounds. *Plast Reconstr Surg*. 2003;111(6):2105-7. doi: 10.1097/01.PRS.0000057076.71217.B2, PMID 12711982.
- Dydak K, Junka A, Dydak A, Brozyna M, Paleczny J, Fijalkowski K. *In vitro* efficacy of bacterial cellulose dressings chemisorbed with antiseptics against biofilm formed by pathogens isolated from chronic wounds. *Int J Mol Sci*. 2021;22(8). doi: 10.3390/ijms22083996, PMID 33924416.
- Motta GJ, Milne CT, Corbett LQ. Impact of antimicrobial gauze on bacterial colonies in wounds that require packing. *Ostomy Wound Manage*. 2004;50(8):48-62. PMID 15356368.
- Nowak M, Mehrholz D, Baranska Rybak W, Nowicki RJ. Wound debridement products and techniques: clinical examples and literature review. *Postepy Dermatol Alergol*. 2022;39(3):479-90. doi: 10.5114/ada.2022.117572, PMID 35950126.
- Riza A, Bukit GA. Comparison of effectiveness of normal saline, aquades and mineral water as an irrigation solution in odontectomy of impacted mandibular third molar in University

- of Sumatera Utara Hospital. *J Dentomaxillofac Sci.* 2022;7(2). doi: 10.15562/jdmfs.v7i2.1387.
40. Kavitha KV, Tiwari S, Purandare VB, Khedkar S, Bhosale SS, Unnikrishnan AG. Choice of wound care in diabetic foot ulcer: a practical approach. *World J Diabetes.* 2014;5(4):546-56. doi: 10.4239/wjcd.v5.i4.546, PMID 25126400.
 41. Awad A, Madla CM, Gavins FKH, Allahham N, Trenfield SJ, Basit AW. Chapter 20-liquid dosage forms. Remington. 23rd ed; 2021.
 42. Salguero Y, Valenti L, Rojas R, Garcia MC. Ciprofloxacin-intercalated layered double hydroxide-in-hybrid films as composite dressings for controlled antimicrobial topical delivery. *Mater Sci Eng C Mater Biol Appl.* 2020;111:110859. doi: 10.1016/j.msec.2020.110859, PMID 32279819.
 43. Stan D, Tanase C, Avram M, Apetrei R, Mincu NB, Mateescu AL. Wound healing applications of creams and "smart" hydrogels. *Exp Dermatol.* 2021;30(9):1218-32. doi: 10.1111/exd.14396, PMID 34009648.
 44. Hoang TPN, Ghori MU, Conway BR. Topical antiseptic formulations for skin and soft tissue infections. *Pharmaceutics.* 2021;13(4). doi: 10.3390/pharmaceutics13040558, PMID 33921124.
 45. Hosny KM, Naveen NR, Kurakula M, Sindi AM, Sabei FY, Al Fatease AA. Design and development of neomycin sulfate gel loaded with solid lipid nanoparticles for buccal mucosal wound healing. *Gels.* 2022;8(6). doi: 10.3390/gels8060385, PMID 35735729.
 46. Fatima Q, Ahmed N, Siddiqui B, Rehman A, Haq I, Khan GM. Enhanced antimicrobial activity of silver sulfadiazine cosmetotherapeutic nano lotion for burn infections. *Cosmetics.* 2022;9(5). doi: 10.3390/cosmetics9050093.
 47. Singhal P, Singhal R, Kumar V, Goel K, Jangra A, Yadav R. Transdermal drug delivery system: a novel technique to enhance therapeutic efficacy and safety of drugs. *Am J PharmTech Res.* 2012;2.
 48. Sabbagh F, Kim BS. Recent advances in polymeric transdermal drug delivery systems. *J Control Release.* 2022;341:132-46. doi: 10.1016/j.jconrel.2021.11.025, PMID 34813879.
 49. Pastore MN, Kalia YN, Horstmann M, Roberts MS. Transdermal patches: history, development and pharmacology. *Br J Pharmacol.* 2015;172(9):2179-209. doi: 10.1111/bph.13059, PMID 25560046.
 50. Jiang X, Xia W, Pan J, Yang W, Zhang S, Li C. Engineered microneedle systems for topical cancer therapy. *Appl Mater Today.* 2023;31. doi: 10.1016/j.apmt.2023.101774.
 51. Sonawane PR, Katti SA. Natural polymers: carriers for transdermal drug delivery system. *Int J Res Pharm Chem.* 2016;6:534-42.
 52. Fox LT, Gerber M, Du Plessis JD, Hamman JH. Transdermal drug delivery enhancement by compounds of natural origin. *Molecules.* 2011;16(12):10507-40. doi: 10.3390/molecules161210507.
 53. Vaz MB, Vitorino C, Sousa JJS. Safe-by-design development of a topical patch for drug delivery. *Braz J Pharm Sci.* 2020;56. doi: 10.1590/S2175-97902020000118629.
 54. Kathe K, Kathpalia H. Film forming systems for topical and transdermal drug delivery. *Asian J Pharm Sci.* 2017;12(6):487-97. doi: 10.1016/j.ajps.2017.07.004, PMID 32104362.
 55. El Gholmy SH. Performance and testing of adhesive bandage tape. *Journal of Engineered Fibers and Fabrics.* 2019;14:1-5. doi: 10.1177/1558925019843712.
 56. Shah JB. The history of wound care. *J Am Coll Certif Wound Spec.* 2011;3(3):65-6. doi: 10.1016/j.jcws.2012.04.002.
 57. Oktaviani DJ, Widiyastuti S, Maharani DA, Amalia AN, Ishak AM, Zuhrotun A. Artikel review: potensi turbinaria ornata sebagai penyembuh luka dalam bentuk plester [in Bahasa Indonesia]. *Farmaka.* 2019;18:1-15.
 58. Umar AK, Butarbutar M, Sriwidodo S, Wathoni N. Film-forming sprays for topical drug delivery. *Drug Des Devel Ther.* 2020;14:2909-25. doi: 10.2147/DDDT.S256666, PMID 32884234.
 59. Jauregui KMG, Cabrera JCC, Cenicerros EPS, Hernandez JLM, Ilyina A. A new formulated stable papin-pectin aerosol spray for skin wound healing. *Biotechnol Bioproc E.* 2009;14(4):450-6. doi: 10.1007/s12257-008-0268-0.
 60. Sawatdee S, Choochuay K, Chanthorn W, Srichana T. Evaluation of the topical spray containing Centella asiatica extract and its efficacy on excision wounds in rats. *Acta Pharm.* 2016;66(2):233-44. doi: 10.1515/acph-2016-0018, PMID 27279066.
 61. Elviri L, Bianchera A, Bergonzi C, Bettini R. Controlled local drug delivery strategies from chitosan hydrogels for wound healing. *Expert Opin Drug Deliv.* 2017;14(7):897-908. doi: 10.1080/17425247.2017.1247803, PMID 27732106.
 62. Tiwari R, Pathak K. Local drug delivery strategies towards wound healing. *Pharmaceutics.* 2023;15(2). doi: 10.3390/pharmaceutics15020634, PMID 36839956.