Evidence-based nursing intervention to reduce skin integrity impairment in children with diaper dermatitis: A systematic review

Prihatini Dini Novitasari,[1] Dessie Wanda[2]

[1]Faculty of Nursing; [2]Department of Pediatric Nursing, Faculty of Nursing, Universitas Indonesia, Depok, Indonesia

Abstract

Diaper dermatitis often occurs in children. In Indonesia, the guidelines for managing this health problem are issued by each hospital in Indonesia, but there are no guidelines for formal prevention and management released by the Indonesian Health Ministry. This study aimed to propose the Air, Barrier, Cleansing, Diapering, Education (ABCDE) approach as an evidence-based independent nursing intervention to prevent and treat impaired skin integrity, particularly diaper dermatitis, in children by nurses. This systematic review was derived from multiple databases using the following keywords: "child," "diaper dermatitis," "diaper-free time," "air," "barrier," "cleansing," "diaper," and "education." From these keywords, 393 articles were collected and then filtered using inclusion and exclusion criteria to obtain the final articles to be analyzed. Thirty-one articles passed the criteria. The study found that the ABCDE approach was effective in preventing and treating diaper dermatitis in children. Its indicators of the approach were preventing or decreasing inflammation, repairing damage to the skin, and preventing reoccurrence. Based on the review and analysis of multiple aspects in Indonesia, the authors proposed a modification of the sequence to CBAD-E to implement the approach in Indonesian children. The intervention of the ABCDE approach matches Indonesian children's situation, and therefore it can be implemented in Indonesia. Accordingly, this recommendation may be useful and feasible to be implemented by nurses in preventing and treating diaper dermatitis in children, thus decreasing its prevalence.

Correspondence: Dessie Wanda, Department of Pediatric Nursing, Faculty of Nursing, Universitas Indonesia, 16424, Depok, Indonesia.
Tel.: +62 21 78849120, Fax: +62 21 7864124.
E-mail: dessie@ui.ac.id

Key words: Air; barrier; cleansing; diaper dermatitis; education.

Contributions: PDN and DW conceived the idea and plan of research as well as contributed to the design and implementation of the research and verified the analytical method. PDN wrote the manuscript under DW's advice and suggestion. All authors discussed the results and reviewed the final manuscript.

Conflict of interest: The authors have no conflict of interest.

Conference presentation: This final manuscript has been presented at 7th Virtual Biennial International Nursing Conference, Faculty of Nursing, Universitas Indonesia on September 24th, October 30th, November 16th 2020.

Availability of data and materials: All data generated or analyzed during this study are included in this published article.

Ethics approval and consent to participate: Not applicable.

Consent for publication: Not applicable.

Received for publication: 10 November 2020.
Accepted for publication: 1 February 2021.

Licensee PAGEPress, Italy
La Pediatria Medica e Chirurgica 2021; 43(s1):265
doi:10.4081/pmc.2021.265

Introduction

Skin integrity in children is of great concern because skin is the protective barrier against physical, chemical, and biological threats. One of the skin problems, particularly infection that damages skin integrity, is Diaper Dermatitis (DD) or diaper rash. DD is an acute and episodic inflammation, mainly around the diaper area, indicated by the presence of erythema, papules, and pustules.[1] If such conditions are ignored and become infected by *Candida albicans*, they may cause open and moist wounds.[2] This may happen due to repeated friction between skin and diaper, overhydration, excess moisture, urine exposure, frequent bowel movement, changes in skin pH, poor hygiene, or allergy to diaper materials.[3,4]

The prevalence of DD in children around the world was 7%–43.8% in 2012,[5] and it significantly increased to 16%–65% in 2019.[1] Although many cases were not reported by dermatologists or parents,[3,6] DD could cause pain, increased risk for infection, increased healthcare costs, and stress in children, parents, and health workers.[7] In Indonesia, the prevalence of DD in 2005–2009 was 7%–35%.[8] However, there is still no updated research or survey to determine its latest prevalence in Indonesia.

Based on the literature review, DD has several risk factors, namely children with diarrhea,[9] inadequate nutrition,[10] diaper changing of less than three times in one night, history of DD, use of talcum powder in the area covered by diaper, and use of certain diapers.[5] In the hospitalization context, children, especially infants, who are treated in a hospital have a higher risk for this health problem.[11] DD is related to some additional risk factors from the hospital environment, which makes infants more at risk of experiencing this health problem.[7,12] Children who were diag-

nosed with having an infectious disease and hospitalized for eight days or more also have an increased risk for DD.

As care management for children prioritizes the treatment of the main problem concerning the medical diagnosis, DD has become less of a concern, and family-centered care is required. Family-centered care emphasizes the important role a family plays in every intervention and decision for child care.[13] The management of children with DD can be pharmacological and nonpharmacological. In this case, nurses play an important role in implementing the nonpharmacological intervention, one of which is the Air, Barrier, Cleansing, Diapering, Education (ABCDE) approach, and they are still concerned with the family-centered care principle. According to previous studies, this approach is considered effective in preventing and treating DD in children.[10,14,15] The key points of effectivity here are preventing or decreasing inflammation, repairing damage to skin, and preventing reoccurrence.[2] The ABCDE approach was briefly recommended by PERDOSKI for DD treatment by physicians, and every hospital has its own guidelines for preventing and managing this health problem.[16] To date, no formal guideline has been made by the Indonesian Health Ministry to be implemented in the hospital, specifically by nurses. Thus, the authors conducted this systematic study to propose an intervention recommendation of the ABCDE approach, which can be implemented as an independent nursing intervention in children with DD in Indonesia.

Materials and Methods

Eligibility criteria

This scientific work is a systematic review of the ABCDE approach, and it was conducted from April 2020 to July 2020. The research method adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.[17] The components of the PICO framework are presented in Table 1.

The authors used inclusion and exclusion criteria in filtering the literature. The inclusion criteria were as follows: i) an experimental study of the ABCDE approach, ii) implemented directly to children who wore diapers and/or their mothers or through a laboratory experiment, iii) exclusion of skin barriers used in the intervention from the pharmacological therapy, iv) use of the English or Indonesian language, and v) published in the past 10 years. The exclusion criteria were as follows: i) only the abstract was available in the publication, and ii) the research was not completed.

Information sources and search strategy

The selected databases for searching were Clinical Key, EBSCOhost, ScienceDirect, PubMed, and Wiley Online Library. Google Scholar was the database used to browse the national literature. The search began on June 16, 2020 and used the following keywords: "child," "diaper dermatitis," "diaper-free time," "air," "barrier," "cleansing," "diaper," and "education."

Extraction and data analysis

Based on the search in multiple databases and the keywords, a total of 393 articles were collected. As some articles were duplicated in each database, the number was reduced to 310 articles. After these articles were filtered using the inclusion criteria, 54 articles were left. However, 24 articles were excluded because only their abstracts were available, and they were not yet completed. The final filtering resulted in 30 articles, as shown in Figure 1.

Results

According to the literature search, the ABCDE approach for the nonpharmacological intervention for DD in children was proposed by Boiko in 1999. This approach was then continuously developed and studied by modifying one or more interventions that were integrated into the ABCDE approach. Among the 30 studies that passed the criteria, only one study examined the concept of ABCDE in general, while the others studied one or two approaches. Furthermore, the discussion of the research findings from the other 29 articles was described in sequence, namely Air, Barrier, Cleansing, Diapering, and Education, in accordance with the supporting references from each approach. Table 2 presents the detailed information about the articles and their findings about the prevention and management of DD.

Discussion

ABCDE approach

Based on the literature review, the ABCDE approach is one of the alternative interventions recommended in the nonpharmacological intervention for impaired skin integrity in children with DD. Each point of this approach is considered effective in treating impaired skin integrity in children.[18] The effectiveness of this approach was proved in neonates in accordance with the condition of the research location. Therefore, the ABCDE approach is also recommended for managing impaired skin integrity in children who have DD in Indonesia, with several modifications adjusted for Indonesia's conditions, including human resources, natural resources, economy, and facility.

Table 1. Description of the PICO components in the study.

PICO component	PICO in the study
Population	The research was conducted on children and/or mothers directly or through laboratory experiments.
Intervention	Implementation of the ABCDE approach: A: diaper-free time B: various types of barriers that can be used on children C: how to perform perineal hygiene and clean the diaper area using various tools and materials D: type of diaper to use E: education for the family to implement the family-centered care principle
Comparison/control	DD management with pharmacological intervention only, without the implementation of the ABCDE approach
Outcome	Reduced scale of DD Decreased prevalence of DD in the intervention group

As an integrated intervention, the ABCDE approach can be implemented simultaneously, although the education aspect can be adjusted to the field condition in relation to the family's ability to receive education. Although this approach is known as ABCDE in this intervention recommendation, the order of the implementation is actually CBAD-E. However, as CBAD-E is more difficult to remember, ABCDE is then used with some modifications in the sequence, as presented in Figure 2.

As previously mentioned, the implementation of this approach was applied in the CBAD-E sequence. Cleansing was implemented first because, during the intervention, the first thing to do in diaper changing is cleaning the area covered by the diaper and measuring the DD scale.[19–21] In this approach, the tools and materials used to clean the diaper area are sublimated cotton and warm water because they are easy and inexpensive and have no side effects that may affect the child's skin.[22]

Cleaning this area, especially the perineal area, is similar to the existing perineal hygiene procedure. In females, cleansing starts from the labia majora, labia minora, and clitoris by cleaning it from the top (urethra area) to the bottom (anal area), followed by cleaning the surrounding area. In males, cleansing starts from the tip of the penis to the anal area and the surrounding diaper area.[13] To dry this area, the family is suggested to not use a hairdryer or a heating lamp, as it may cause burns on the child's skin.[2] The suggested way is to air-dry it naturally.[22]

After air-drying the area, the barrier is applied in the rash area or the whole area covered by the diaper.[23–26] Concerning the barrier used, Virgin Coconut Oil (VCO) is more recommended than other barriers.[27–30] The other barriers that can be used are sunflower seed oil,[31] extra virgin olive oil,[32] petroleum jelly/vaseline,[33] zinc oxide,[34] magnesium,[35] calendula,[36–38] aloevera,[39] and baby oil.[40] Baby oil can also be used as a barrier; it is made of natural ingredients but combined with other ingredients during processing.[41] Each barrier has different effectiveness, with VCO and sunflower seed oil being more effective than others. However, Ananingsih, Hasiholan, and Wahyono in 2018 found that families preferred to use baby oil over other oils, and that the nurses should ensure that baby oil does not contain any irritants. These barriers can be more optimal if the application is accompanied by a gentle massage to enhance their absorption and to make the children feel more comfortable.[42]

The next step is diaper-free time, in which the children do not wear a diaper for at least 10 min. This intervention enables the children's skin to recondition, such as in transepidermal water loss and skin pH in the area covered by the diaper.[43] Nurses and family members can discuss ideas related to the duration and frequency of diaper-free time in children and write down a schedule on or some notes.[43] Furthermore, the family is required to give information on whether they performed the intervention at the agreed time and not just note it on paper to help the nurses evaluate and conduct a follow-up.

The children were then put-on diapers. The diaper should have superabsorbent powder[44] and be one size larger than the children's actual size.[45–47] Diaper choice is adjusted to the family's financial capability, particularly in relation to the brand and the model,

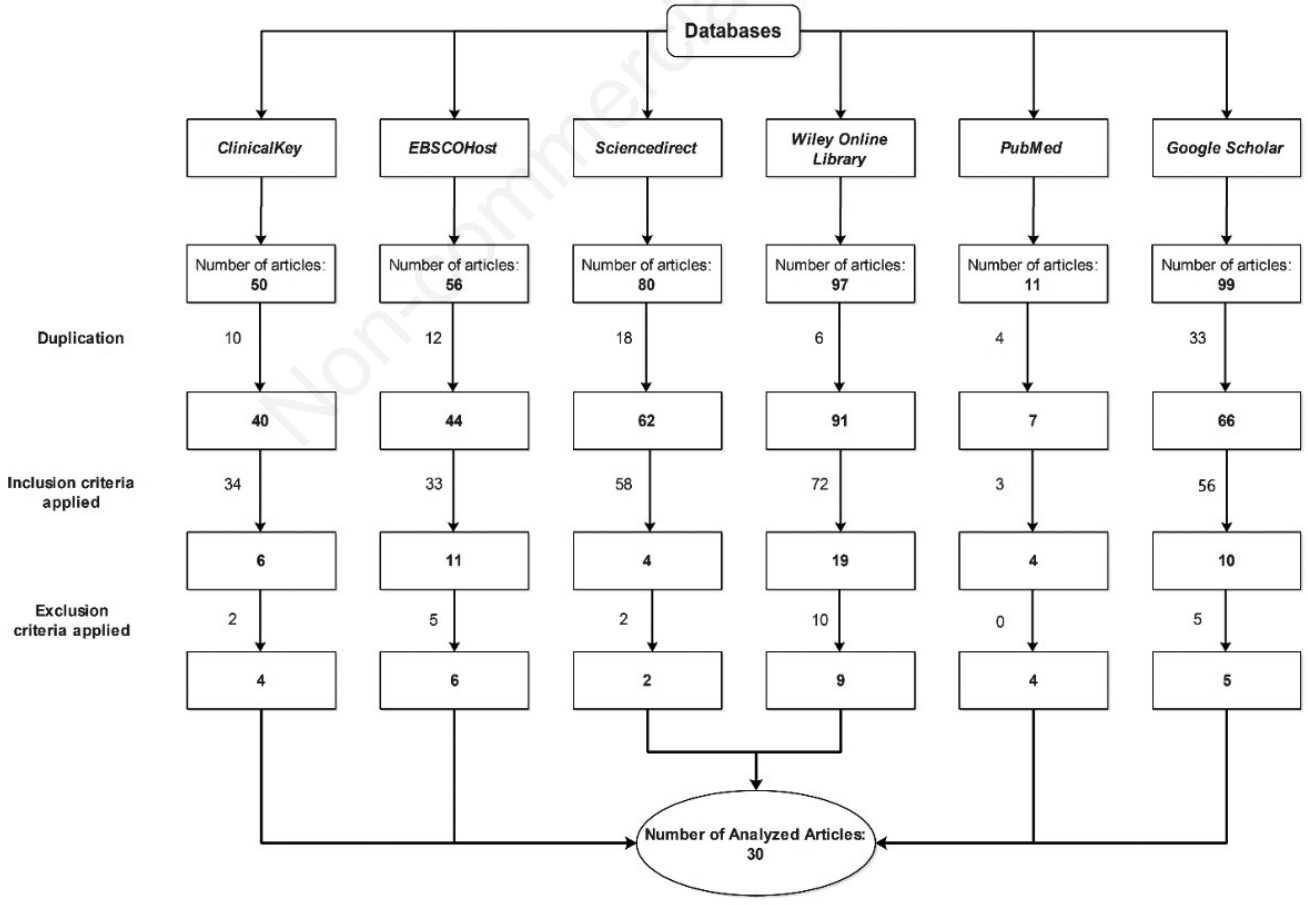

Figure 1. Literature filtering.

whether it is a taped diaper or pant diaper. The diaper is used for a maximum of 3 hours for children and 2 hours for babies. The diaper should also be changed immediately if the children have bowel movement or diarrhea, or if the diaper looks full.[2,48]

Lastly, education can be given before the implementation of the CBAD approach or during the education of the CBAD approach, and it can be conducted twice, adjusting to the family's ability to receive education. Before the intervention, the nurses should give a pre-orientation, in which they assess the knowledge, culture, and intervention that had been done by the family.[49] During the intervention, education is given simultaneously with the demonstration of CBAD intervention by the nurses. After the CBAD intervention, education is given to strengthen the understanding of the implementation and complemented with education related to stress management and DD prevention.[11,50] This intervention was evaluated independently by the family.

Nursing implication

Currently, DD is not much of a concern even though this health problem causes inconvenience in children, and the infection may worsen if it transpires in the dermatitis area and is not immediately cleaned. According to systematic studies, DD occurs frequently, although the number of reported cases is lower than the actual number of incidences. However, the management of this intervention is not officially established by the government. Moreover, hospitals do not have guidelines for this nonpharmacological management. Therefore, the intervention recommendation for implementing the ABCDE approach to treat DD in children was proposed in this study.

This recommendation is a result of a systematic study and has not been practiced directly. Nevertheless, this approach is an independent nursing intervention that can be done without involving or waiting for instructions from other health professionals. Therefore, by implementing this intervention, nurses are expected to be more competent in providing nursing care to impaired skin integrity in children, particularly to those who have DD. The tools and materials used are also adjusted to the condition in Indonesia, and thus the intervention can be implemented easily. Nevertheless, nurses should still be critical in implementing the intervention to optimize nursing care.

Table 2. Summary of the corresponding literatures.

Name, Year	Country	Intervention				
		A	B	C	D	E
Amer *et al.*, 2017[18]	Egypt	√	√	√	√	√
Furber *et al.*, 2012[20]	England	√		√		
Roy *et al.*, 2017[43]	Bangladesh	√				
Chaithirayanon *et al.*, 2016[34]	Thailand		√			
Sharifi-heris *et al.*, 2018[36]	Iran		√			
Panahi *et al.*, 2012[38]	Iran		√			
Firmansyah, Asnaniar, & Sudarman, 2019[29]	Indonesia		√			
Watt *et al.*, 2015[32]	Indonesia		√			
Evangelista *et al.*, 2014[28]	Philipines		√			
Gozen *et al.*, 2013[24]	Turkey		√			
Mahmoudi, Adib-hajbaghery, & Mashaiekhi, 2015[37]	Iran		√			
Badelbuu *et al.*, 2018[39]	Iran		√			
Nourbakhsh *et al.*, 2016[35]	Iran		√			
Seifi, Jalali, & Heidari, 2017[25]	Iran	√	√	√		
Yonezawa *et al.*, 2018[23]	Japan		√	√		
Cahyati, Indriansari, & Kusumaningrum, 2015[30]	Indonesia		√			
Alonso *et al.*, 2013[33]	Spain		√	√		
Summers *et al.*, 2019[31]	Nepal		√			
Keshavarz *et al.*, 2016[26]	Iran		√			
Bartels *et al.*, 2014[21]	Germany		√	√		
Lavender *et al.*, 2012[19]	England			√		
Bartels *et al.*, 2012[22]	Germany			√		
Sujatni, Hartini, & Kusumo, 2013[48]	Indonesia			√	√	
Connor *et al.*, 2019[46]	USA				√	
Kusliayana & Mardiyah, 2019[44]	Indonesia				√	
Yuan *et al.*, 2018[45]	China				√	
Gustin *et al.*, 2018[47]	USA				√	
Shee & Jagtap, 2019[11]	India					√
Maya, Pai, & D'Souza, 2015[50]	India					√
Sari & Altay, 2020[49]	Turkey					√

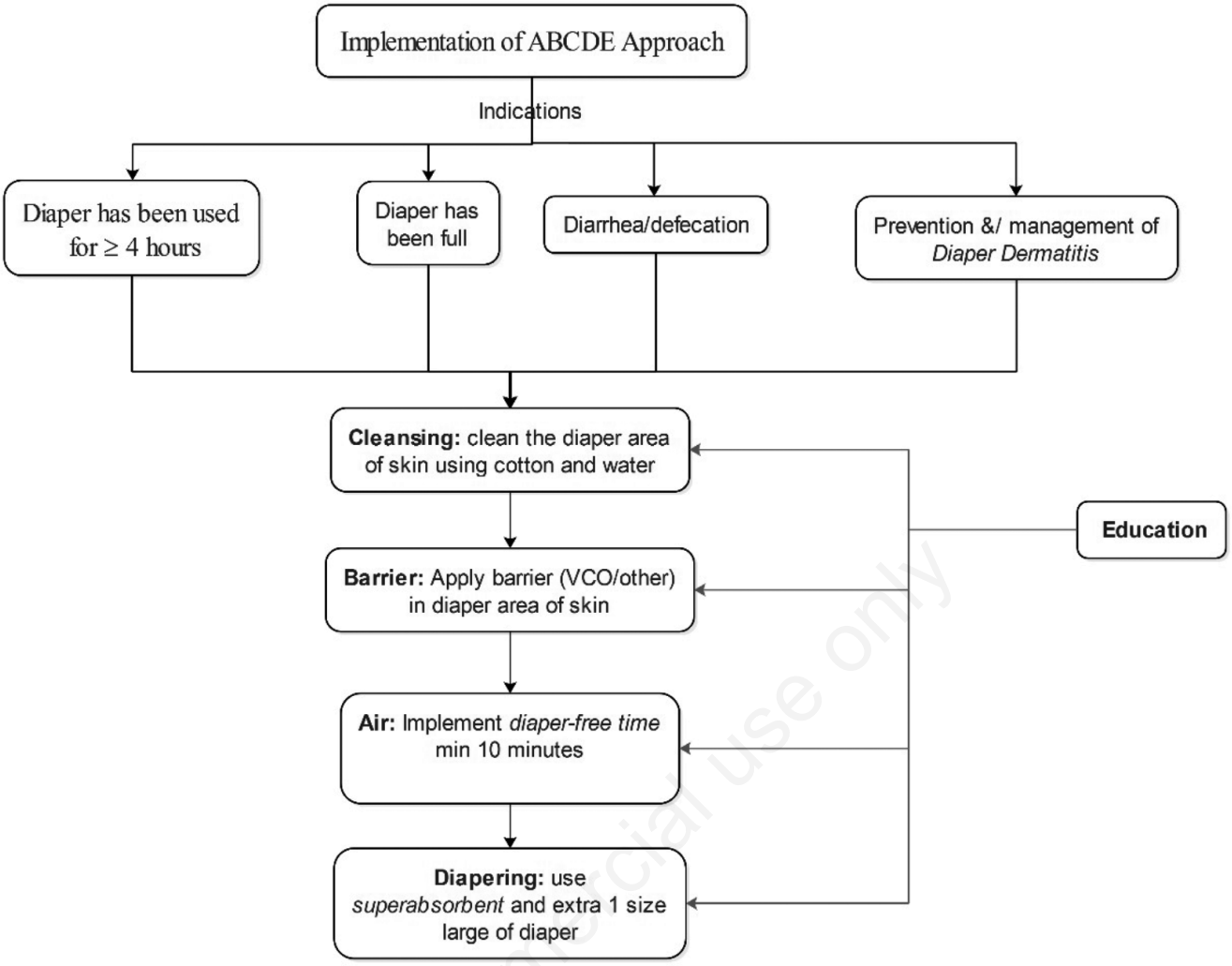

Figure 2. Flowchart of the ABCDE approach.

Conclusions

Based on the analysis of 30 articles, the ABCDE approach was the recommended nonpharmacological prevention and treatment for DD. This approach is the integration of air, barrier, cleansing, diapering, and education, although, in the actual implementation, the sequence is modified to CBAD-E. This intervention recommendation is expected to be the guideline for nurses in implementing the prevention and management of DD in children. Further research should be conducted on experimental studies and to modify the components of ABCDE to compare and evaluate the effectiveness of the existing theory related to the ABCDE approach.

References

1. Carr AN, Dewitt T, Cork MJ, et al. Diaper dermatitis prevalence and severity: global perspective on the impact of caregiver behavior. Pediatr Dermatol 2019; 37:130–6.
2. Merrill L. Prevention, treatment, and parent education for diaper dermatitis. Nursing for Women's Health 2015; 19:324–37.
3. Pogačar MŠ, Maver U, Varda NM, Mičetić-Turk D. Diagnosis and management of diaper dermatitis in infants with emphasis on skin microbiota in the diaper area. Int J Dermatol 2018; 57:265–75.
4. Tüzün Y, Wolf R, Bağlam S, Engin B. Diaper (napkin) dermatitis: a fold (intertriginous) dermatosis. Clin Dermatol 2015; 33:477–82.
5. Sukhneewat C, Chaiyarit J, Techasatian L. Diaper dermatitis: a survey of risk factors in Thai children aged under 24 months. BMC Dermatology 2019;19: 4-9.
6. Yaduwanshi D, Kumari C. Frequency and prevalence of nappy rash in indian infant's population. Int J Pharmaceut Erudition 2012;1: 25–32.
7. Esser M. Diaper dermatitis: what do we do next? Adv Neonat Care 2016;16: S21–5.
8. Sekarani AA, Febriani DA, Wangi NM, et al. Pengetahuan ibu ibu mengenai diaper rash pada anak usia batita. Jurnal Farmasi Komunitas 2017; 4:26–30.
9. Li CH, Zhu ZH, Dai YH. Diaper dermatitis: a survey of risk factors for children aged 1–24 months in China. J Int Med Res 2012;40: 1752–60.
10. Shin HT. Diagnosis and management of diaper dermatitis. Pediatr Clin N Am 2014;61: 367–82.
11. Shee K, Jagtap V. Effect of health teaching on knowledge and

practice of postnatal mother admitted in selected hospital regarding using diaper in children to prevent systemic bacterial infection. Int J Health Sci Res 2019;9: 95–101.
12. Esser MS, Johnson TS. An integrative review of clinical characteristics of infants with diaper dermatitis. Adv Neonat Care 2020; 20:276–85.
13. Hockenberry MJ, Wilson D. Wong's nursing care of infants and children. 10th ed. Missouri: Elsevier Mosby; 2015.
14. Klunk C, Domingues E, Wiss K. An update on diaper dermatitis. Clin Dermatol 2014;32: 477–87.
15. Wesner E, Vassantachart JM, Jacob SE. Art of prevention: the importance of proper diapering practices. Int J Womens Dermatol 2019;5: 233–4.
16. Persatuan Dokter Spesialis Kulit dan Kelamin Indonesia. Panduan praktik klinis bagi dokter spesialis kulit dan kelamin di Indonesia [Internet]. Jakarta: Persatuan Dokter Spesialis Kulit dan Kelamin Indonesia; c2017. Available from: https://www.perdoski.id/uploads/original/2017/10/PPKPERDOSKI2017. Pdf
17. Moher D, Shamseer L, Clarke M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. BMJ 2015;4.
18. Amer M, Diab N, Soliman M, Amer A. Neonatal skin care: What should we do? a four-week follow-up randomized controlled trial at Zagazig University Hospitals. Int J Dermatol 2017;56: 1198–203.
19. Lavender T, Furber C, Campbell M, et al. Effect on skin hydration of using baby wipes to clean the napkin area of newborn babies: assessor-blinded randomised controlled equivalence trial. BMC Pediatr 2012;12.
20. Furber C, Bedwell C, Campbell M, et al. The challenges and realties of diaper area cleansing for parents. JOGNN 2012;41: E13-25.
21. Bartels NG, Lünnemann L, Stroux A. Effect of diaper cream and wet wipes on skin barrier properties in infants: a prospective randomized controlled trial. Pediatr Dermato 2014; 31:683–91.
22. Bartels NG, Massoudy L, Scheufele R, et al. Standardized diaper care regimen: a prospective, randomized pilot study on skin barrier function and epidermal IL- 1α in newborns. Pediatr Dermatol 2012; 29:270–6.
23. Yonezawa K, Haruna M, Matsuzaki M, et al. Effects of moisturizing skincare on skin barrier function and the prevention of skin problems in 3-month-old infants: a randomized controlled trial. J Dermatol 2018; 45:24–30.
24. Gozen D, Caglar S, Bayraktar S, Atici F. Diaper dermatitis care of newborns human breast milk or barrier cream. J Clin Nurs 2014; 23:515–23.
25. Seifi B, Jalali S, Heidari M. Assessment effect of breast milk on diaper dermatitis. Dermatol Reports 2017;9.
26. Keshavarz A, Zeinaloo AA, Mahram M, et al. Efficacy of traditional medicine product henna and hydrocortisone on diaper dermatitis in infants. Iran Red Crescent Med J 2016;18.
27. Ariffin NHM, Hasham R. Potential dermatological application on Asian plants. Biotechnol Bioproc E 2016; 21:337–54.
28. Evangelista MTP, Abad-Casintahan F, Lopez-Villafuerte L. The effect of topical virgin coconut oil on SCORAD index, transepidermal water loss, and skin capacitance in mild to moderate pediatric atopic dermatitis: a randomized, double-blind, clinical trial. Int J Dermatol 2014; 53:100–8.
29. Firmansyah F, Asnaniar WOS, Sudarman S. Pengaruh pemberian virgin coconut oil (VCO) terhadap ruam popok pada bayi. Celebes Health Journal 2019; 1:31–9.
30. Cahyati D, Indriansari A, Kusumaningrum A. Pengaruh virgin coconut oil terhadap ruam popok pada bayi. Jurnal Keperawatan Sriwijaya 2015; 2:57–63.
31. Summers A, Visscher MO, Khatry SK, et al. Impact of sunflower seed oil versus mustard seed oil on skin barrier function in newborns: a community-based, cluster-randomized trial. BMC Pediatr 2019;19.
32. Watti AWW, Alfiyanti D, Purnomo E, Hartini S. Efektivitas minyak kelapa dan minyak zaitun terhadap pencegahan diaper dermatitis pada anak usia 3-24 bulan di RSUD Tugurejo Semarang. (Unpublished Thesis). Semarang: Sekolah Tinggi Ilmu Kesehatan Telogorejo; 2015. Available from: http://garuda.ristekbrin.go.id/documents/detail/318257
33. Alonso C, Larburu I, Bon E, et al. Efficacy of petrolatum jelly for the prevention of diaper rash: a randomized clinical trial. J Spec Pediatr Nurs 2013; 18:123–32.
34. Chaithirayanon S, Aroonchit S, Chalermchai T, et al. Comparative study between talcum and zinc oxide cream for the prevention of irritant contact diaper dermatitis in infants. J Med Assoc Thailand 2016;99.
35. Nourbakhsh SMK, Rouhi-boroujeni H, Kheiri M, et al. Effect of topical application of the cream containing magnesium 2% on treatment of diaper dermatitis and diaper rash in children: a clinical trial study. J Clin Diagn Res. 2016;10: WC04–WC06.
36. Sharifi-Heris Z, Farahani LA, Haghani H, et al. Comparison the effects of topical application of olive and calendula ointments on children's diaper dermatitis: a triple-blind randomized clinical trial. Dermatol Ther 2018;31.
37. Mahmoudi M, Adib-hajbaghery M, Mashaiekhi M. Comparing the effects of bentonite & calendula on the improvement of infantile diaper dermatitis: a randomized controlled trial. Indian J Med Res 2015; 142:742–6.
38. Panahi Y, Sharif MR, Sharif A, et al. A randomized comparative trial on the therapeutic efficacy of topical aloe vera and calendula officinalis on diaper dermatitis in children. Sci World J 2012;2012.
39. Badelbuu SG, Javadzadeh Y, Jabraeili M, et al. Evaluation of the effect of aloe vera ointment with chamomile ointment on severity of children's diaper: a randomized, double-blind clinical trial. Tabriz University of Medical Science 2018; 16:47–51.
40. Chasanah NF, Umamah F. Perawatan perianal dengan baby oil menurunkan kejadian diaper dermatitis pada neonatus di ruang neonatus RSUD Sidoarjo. Jurnal Ilmiah Kesehatan 2013;6.
41. Ananingsih T, Hasiholan LB, Wahyono EH. Pengaruh kualitas produk, promosi, harga dan saluran distribusi terhadap keputusan pembelian produk johnson and johnson Indonesia. J Manag 2018;4.
42. Summers A, Visscher MO, Khatry SK, et al. Indicators of skin barrier integrity among newborns massaged with mustard oil in rural Nepal. J Perinatol 2018; 38:64–70.
43. Roy S, Mollah AH, Mannan MA, et al. Hazards of wearing diaper among infants. J Bangladesh Coll Physicians Surgeons 2017; 35:170–3.
44. Kusliayana I, Mardiyah S. Uji daya serap diapers anti ruam (diapers rash) modifikasi sabut kelapa (cocosnucifera). J Muhammadiyah Med Lab Thecnol 2019; 2:47–55.
45. Yuan C, Takagi R, Yao XQ, et al. Comparison of the effectiveness of new material diapers versus standard diapers for the prevention of diaper rash in Chinese babies: A double-blinded, randomized, controlled, cross-over study. Biomed Res Int 2018;2018.
46. O'Connor RJ, Sanchez V, Wang Y, et al. Evaluation of the impact of 2 disposable diapers in the "natural" diaper category on diapered skin condition. Clin Pediatr 2019; 58:806–15.

47. Gustin J, Gibb R, Maltbie D, et al. The impact of diaper design on mitigating known causes of diaper dermatitis. Pediatr Dermatol 2018; 35:792–5.
48. Sujatni RA, Hartini S, Kusuma MAB. Pengaruh lamanya pemakaian diapers terhadap ruam diapers pada anak diare usia 6-12 bulan di RSUD Tugurejo Semarang. [Unpublished Thesis] Semarang: Stikes Telogorejo; 2013.
49. Sari C, Altay N. Effects of providing nursing care with web-based program on maternal self-efficacy and infant health. Public Health Nurs 2020; 37:380–92.
50. Maya KS, Pai SM, D'Souza A. Effectiveness of awareness programme on prevention and management of diaper dermatitis among mothers of children of age 0 to 1 year. Nitte University J Health Sci 2015; 5:77–81.