REDUCING IMMUNIZATION PAIN IN INFANTS: A SYSTEMATIC REVIEW

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ABSTRACT

Background: Pain after vaccination injection is one of the most common reasons for parents to reject child immunization. Minimizing pain during childhood vaccination can help to prevent distress, development of needle fears, and subsequent health care avoidance behavior, such as non-adherence with vaccination schedule. This study aimed to review systematically reduction of immunization pain in infants.
Subject and Method: A systematic review was conducted by searching the following data bases: ProQuest, Scopus, Clinical Key, EBSCO Host, Science Direct, and PubMed, from 2014 to 2019. The keywords for this review "breastfeeding AND (reduce pain) AND (Immunization OR Vaccination) AND (child OR infant OR newborn)". There were 5 articles were obtained after implementing inclusion criteria.
Result: Pain score among infants who received breastfeeding during immunization was lower than control group ($p<0.001$). The duration of crying in infants who received breastfeeding was shorter than the control group ($p<0.001$).
Conclusion: Breastfeeding is an effective non-pharmacological intervention to reduce pain during immunization.

Keywords: pain, immunization, pain management, breastfeeding

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BACKGROUND

Immunization is the most common painful procedure for toddlers (Taddio et al., 2015). The experience of pain that occurs when infants and toddlers are immunized has long-term effects such as distress, reduced analgesic effectiveness, intense reaction to future procedures, and syringe phobia. Distress will increase pain during injection procedure, and 10% of syringe phobia that occur as adult caused by this experience.

Phobias on syringes can cause various problems such as avoiding similar procedure, caused unconsciousness or rejection, generalizing fear of all actions, events, and objects related to the needle and avoiding to get health care. Adults who experience stress during childhood immunization tend to be unwilling to receive treatment, avoid health checks, and tend not to support preventive health checks. Breastfeeding can reduce this distress through a variety of mechanisms, including providing physical comfort, breastfeeding distraction, and feeling the sweet taste and various other substances contained in breastfeeding that can reduce the effects of stress. Breastfeeding is an easy and inexpensive cost-effective intervention for babies (Taddio et al., 2015).

Directly educating parents how to deal with pain during immunization with family-centered service procedures can improve pain care for babies. Reducing pain during immunization can encourage people to immunize and reduce the perception of immunization that is wrong. Involving families in immunization procedures by suggesting

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breastfeeding can also increase bonding and trust between parents and health workers (Taddio et al., 2015).

SUBJECTS AND METHOD

1. Study Design

A systematic search was performed with PRISMA flow diagram (Figure 1). Various health articles were used to identify the effect of breastfeeding on pain in infants during simple invasive actions (injections). The search was done manually on five online data bases accessed through an online database for University of Indonesia students. Five data bases used are: ProQuest, Scopus, Clinical Key, EBSCO Host, and PubMed. The keywords used for data search are breastfeeding AND (reduce pain) AND (immunization OR Vaccination) AND (child OR infant OR newborn) with boundaries in Indonesian language journals and published in the last 5 years (2019 – 2014).

2. Inclusion and Exclusion Criteria

Article inclusion criteria used were: 1) having a healthy toddler subject; 2) patient-focused interventions; 3) actions in the form of simple invasive actions (immunization or blood drawing); 4) use at least one pain measurement tool. The exclusion criteria used were theses, articles, and case studies that have not been published and publications that do not use English and Indonesian.

3. Data Extraction

After the identification, elimination was carried out in duplicated articles and 106 articles were obtained. Then the abstract was adjusted to the theme " breastfeeding reduces injection pain in infants" title and abstract.

Nine articles were obtained from screening at this stage. From the nine articles that can be accessed, free full paper was 5 articles. Data from five eligible articles were extracted individually into tables and the results were compared with other studies and then reviewed by researchers in the conclusion tables.

RESULTS

A total of 106 articles obtained from the database, there were 5 articles that fulfill the criteria with three types of interventions, namely Randomized Control Trial (RCT), Quasi experimental, and Prospective non-randomized unmasked cohort study. The conclusions of all articles can be seen in Table 1.

Subjects were toddlers aged 0-12 months old, 2 studies used newborn neonates. Three articles used neonatal subjects and two articles conducted on infants less than 12 months old. The sample size was to 31 to 1,000 babies.

Four articles were carried out during BCG, Hepatitis B, and basic immunization using injection procedures and one article was carried out when blood was taken with the heel prick technique at birth.

Pain measurement was done by four types of scoring, using the Neonatal Facial Coding System (NFCS), Neonatal Infant Pain Scale (NIPS), AND Scoring System, LLANTO Scale, and other pain score measurements namely oxygen saturation, heart rate, crying duration, and blood pressure. All studies compared the results of measurements of infant pain scores when performed between breast-fed infants and the control group by using different pain measurement scoring scales. The conclusions of pain measurement are in Table 1.

The results (Table 1) showed that there were significant differences in NFCS measurements shortly after injection between the breastfeeding groups with the control group and other experimental groups. Significant differences occurred in the pain score 15 seconds after vaccination (p= 0.003) and changes in heart rate after injection (p= 0.002).

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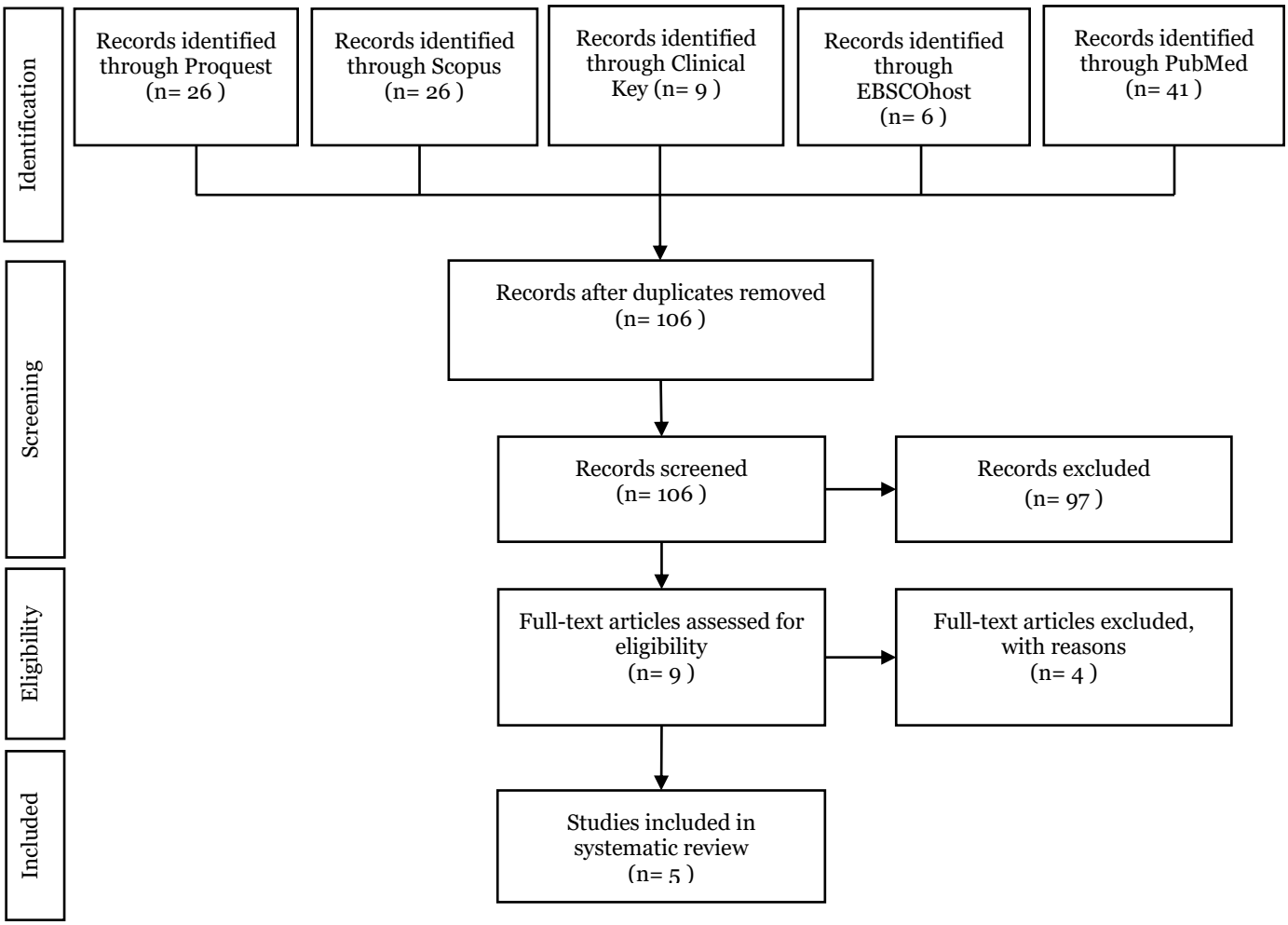

Figure 1. PRISMA Flow diagram

In measurements with NIPS, there were significant differences between the experimental and control groups on facial expressions (p <0.001), cry (p <0.001), arms (p <0.001), legs (p <0.001), and state of arousal (p <0.001). In the measurement with AND Score, there was a significant difference between the direct breastfeeding group with the control and other experimental groups, a significant difference in the parameters of crying duration (p= 0.006), face grimace (p= 0.001), limb movement (p= 0.001) , and vocal responses (p= 0.001).

By measuring with LLANTO scoring, in infants aged 2 months, there was a significant difference in the mean LLANTO score between infants who got breastfeeding with the control group (p= 0.025) and given dextrose (p= 0.024), in infants aged 6 months old, there was a significant difference in LLANTO measurements between the breastfeeding group with glucose (p= 0.001) and control (p <0.001). A significant difference was also seen in the duration of crying in 4 months old infants between breast-fed infants and the control group (p= 0.013) and between breast-fed infants and dextrose (p= 0.017).

In heel prick action, there was a significant difference in the duration of crying between the control group and the breastfeeding group (p <0.05) and there was a significant difference in heart rate between the neonates who were breastfed with the control group (p<0.03).

DISCUSSION

Direct breastfeeding for the infants can be used as a non-pharmacology analgesic that was effective enough to reduce pain trauma

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during immunization procedure. Breastfeeding also has no side effects and was easy and efficient to administer.

This study showed that breastfeeding before, during and after the injection procedure can reduce pain scores in the NFCS scoring, Neonatal Infant Pain Scale, and Scoring System, LLANTO Scale, and other pain score measurements namely oxygen saturation, heart rate, crying duration, and blood pressure, and reduce the duration of crying experienced by babies. Breastfeeding was also effectively given for invasive actions that cause pain to a moderate scale.

The conclusion of this systematic review was in accordance with several articles which stated that there was a reduction in the duration of crying, reduction in crying sounds, changes in heart rate with lower pain score values when breastfeeding was given (Zeller and Giebe, 2014). Breastfeeding contains tryptophan, which precurses melatonin and increases beta endorphins so that it can reduce pain.

However, only giving breastfeeding did not provide the same analgesic effect as direct breastfeeding. The combination of breastfeeding, kissing, feeling, sucking, touching, seeing, and hearing as well as skin to skin contact with mother, enhances the baby's senses thereby reducing pain (Appleyard, 2014). Adequate breastfeeding prior to the action must also be done before injection (Taddio et al., 2010).

Limitation

The constraints in this review were the limited research on interventions with breastfeeding, the small sample size, the age range that is too small and the scoring of pain in different infants used, making it difficult to compare the results.

Subjects in this study were limited to Neonates in accordance with a healthy birth pregnancy with an invasive action that is not too painful. So, the effectiveness of breastfeeding in sick toddlers or in invasive measures with a higher pain scale were unknown.

This study also did not explain the place settings in the exposed group, because parents need good privacy when breastfeeding was done and the gender selection of health personnel who provide the action.

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Table 1. The association between control and exposed groups

No	Study (Year)	Subjects	Parameter	Control Group		Group Exposed		p
				Baseline	After Baseline	Baseline	After Baseline	
1	Hashemi et al. (2016)	Neonates < 3 days	Pain score	n/a	6 (86.74)	n/a	• Breastfeed : 4 (57.48) • Swaddling : 4 (61.65) • Combined : 4 (57.76)	0.003
			heart rate	n/a	12 (85.94)	n/a	• Breastfeed : 4 (63.02) • Swaddling : 3.5 (63.72) • Combined : 1 (50.45)	0.002
			O_2 saturation	n/a	1 (66.92)	n/a	• Breastfeed : 2 (67.77) • Swaddling : 2 (59.57) • Combined : 1 (70.18)	0.693
2	Pradhan et al. (2016)	Children < 12 months	Facial Expression	n/a	0.96±0.18	n/a	0.28 ±0.45	<0.0001
			Cry	n/a	1.78 ±0.42	n/a	0.58 ± 0.59	<0.0001
			Breath pattern	n/a	0.88 ±0.32	n/a	0.23 ± 0.46	1
			Arms	n/a	0.95 ±0.22	n/a	0.51 ±0.57	<0.0001
			Legs	n/a	0.96 ±0.18	n/a	0.41 ±0.497	<0.0001
			state of arousal	n/a	0.81 ±0.39	n/a	0.18 ±0.39	<0.0001
3	Bavarsad et al. (2018)	Neonates (2 hours - 1 day)	crying duration	38.2 ±8.9	56.2 ±6.5	• Breastfeeding : 9.2 ±3.9 • Bottle feeding mother milk: 16 ± 4.3 • Formula milk : 30.0 ± 4.4	• Breastfeeding : 11.8 ±3.4 • Bottle feeding mother milk: 20.6 ± 5.1 • Formula milk : 49.8 ±9.6	Baseline : 0.003 After baseline: 0.006
			pulse rate	150.6 ± 8.6	158.2 ±7	• Breastfeeding : 123.3 ±6.8 • Bottle feeding mother milk: 144.4 ± 9.9 • Formula milk : 93.5 ± 2	• Breastfeeding: 128 ±6 • Bottle feeding mother milk: 146.9 ± 1 • Formula milk : 157 ± 9.7	Baseline : 0.63 After baseline 0.63
			arterial O2 saturation	91.9 ±1.3	89.04 ±6.07	• Breastfeeding : 93.6 ±2.6 • Bottle feeding mother milk: 94.4 ± 1.3 • Formula milk : 93.5 ± 1.5	• Breastfeeding : 96.08 ± 0.009 • Bottle feeding mother milk: 93.5±1.5 • Formula milk : 92 ±1.8	Baseline : 0.08 After baseline 0.1
			face grimace	3	2.92 ± 0.276	• Breastfeeding : 1.24 ±1.16 • Bottle feeding mother milk: 2.24 ± 0.723	• Breastfeeding : 0.44 ±0.51 • Bottle feeding mother milk: 1.76 ± 0.597	Baseline : 0.0001 After baseline : 0.0001

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			limb movement	2.84 ±0.374	2.72 ± 0.458	• Formula milk : 2.48 ± 0.714 • Breastfeeding : 1.36 ± 0.86 • Bottle feeding mother milk: 2.4 ± 0.577	• Formula milk : 2.03 ± 0.789 • Breastfeeding : 0 • Bottle feeding mother milk: 2.04 ±0.538	Baseline : 0.0001 Afer baseline : 0.0001
			vocal responses	2.72 ±0.458	2.56 ±0.506	• Formula milk : 2.64 ±0.489 • Breastfeeding : 0.92 ±0.996 • Bottle feeding mother milk: 2.12 ±0.832 • Formula milk : 2.32 ±0.69	• Formula milk : 2.12 ± 0.781 • Breastfeeding : 0.48 ±0.585 • Bottle feeding mother milk: 1.93 ±0.64 • Formula milk : 2.16 ±0.746	Baseline : 0.0001 After baseline : 0.0001
4	García et al. (2019)	2 months	LLANTO Score	n/a	8.60 ± 1.2	n/a	• Breastfeeding: 7.72±1.89 • Dextrose+NNS: 8.53±1.73	• BF vs. Dextrose : 0.024 • BF vs. control : 0.025
			duration of crying	n/a	45.60 ±24.08	n/a	• Breastfeeding: 45.49±33.15 • Dextrose+NNS: 52.35±32.80	NS
		4 months	LLANTO Score	n/a	9.19 ± 1.12	n/a	• Breastfeeding: 8.51 ±1.98 • Dextrose+NNS:9.09 ±1.34	• BF vs. Dextrose : 0.21 • BF vs. control : 0.27
			duration of crying	n/a	72.6 ±35.55	n/a	• Breastfeeding:64.60±35.59 • Dextrose+NNS: 68.84±35.37	NS
		6 months	LLANTO Score	n/a	6.28 ± 2.65	n/a	• Breastfeeding: 3.88 ±2.50 • Dextrose+NNS:5.81 ±6.28	• BF vs. Dextrose : 0.001 • BF vs. control : <0.001
			duration of crying	n/a	26.14 ±30.99	n/a	• Breastfeeding: 11.58 ±10.75 • Dextrose+NNS:16.56 ±11.58	• BF vs. Dextrose : 0.017 • BF vs. control : 0.013
5	Sigh et al. (2016)		crying duration	n/a	40.04 ±56.31	n/a	69.09 ±66.33	<0.05
		Neonates	heart rate	134.9 ±9.85	21.78 ±21.74	125.5 ±10.61	34.46 ±25.10	<0.03
			oxygen saturation	93.42 ±3.32	1.96 ±2.51	93.26 ±3.31	2 ±2.56	NS
			Systolic blood pressure	81.40 ±21.28	9.41 ±12.22	83.70 ±16.72	14.9 ±14.56	NS
			Diastolic Pressure	51.75 ±28.93	0.94 ±8.9	47.30 ±14.38	1.86 ±9.5	NS

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