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Review

Non-pharmacological interventions to reduce vaccination-related pain in infants: an integrative review

Intervenções não farmacológicas para redução da dor relacionada à vacinação em lactentes: revisão integrativa

Intervenciones no farmacológicas para reducir el dolor relacionado con la vacunación en lactantes: una revisión integradora

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Abstract

Objective: To identify scientific evidence related to non-pharmacological interventions used to reduce vaccination-related pain in infants. **Methods:** This is an integrative review carried out using the PICo strategy, in the IBECS, MEDLINE and Scopus databases, from February to June 2022, which aimed to answer the following question: what is the scientific evidence regarding non-pharmacological interventions used to reduce pain associated with vaccination in infants? The descriptors combined with the OR and AND Booleans were infant, vaccination, pain. Articles from 2011 to 2021 and published in Portuguese, English or Spanish were included. **Results:** The final sample consisted of 32 studies. Non-pharmacological intervention measures proposed for pain relief in infants submitted to vaccination were: breastfeeding and oral sugar solutions; professional assistance in the vaccine room; and sensory stimulation measures. **Conclusion:** Using these strategies evidenced in the scientific literature is able to favor the most adequate management of pain related to vaccine administration and, therefore, increase infants' comfort and well-being, in addition to favoring families' compliance with vaccination.

Descriptors: Pain; Vaccination; Infant; Non-Pharmacological Interventions.

Whats is already known on this?
Vaccination is a painful moment in infants' life. Suffering leads to low adherence by parents and, consequently, low vaccination coverage, which favors the reappearance of vaccine-preventable diseases.

What this study adds?
The study presents effective non-pharmacological strategies to reduce pain in infants resulting from vaccination, such as breastfeeding, sugary solutions, professional care during vaccination and sensory stimulation measures.

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Resumo

Objetivo: *Identificar evidências científicas relacionadas às intervenções não farmacológicas utilizadas para redução da dor relacionada à vacinação em lactentes.* ***Métodos:*** *Revisão integrativa, realizada com emprego da estratégia PICo nas bases de dados IBECS, MEDLINE e Scopus, no período de fevereiro a junho de 2022, que visou responder ao seguinte questionamento: quais as evidências científicas em relação às intervenções não farmacológicas utilizadas para redução da dor associada à vacinação em lactentes? Os descritores combinados com os booleanos OR e AND foram lactente, vacinação, dor, infant, vaccination e pain. Foram incluídos artigos no recorte temporal de 2011 a 2021, publicados nos idiomas português, inglês ou espanhol.* ***Resultados:*** *A amostra final foi composta por 32 estudos. As medidas de intervenção não farmacológicas propostas para o alívio da dor em lactentes submetidos à vacinação foram: aleitamento materno e soluções orais de açúcar; assistência profissional em sala de vacina; e medidas de estimulação sensorial.* ***Conclusão:*** *A utilização dessas estratégias evidenciadas na literatura científica é capaz de favorecer o manejo mais adequado da dor relacionada à administração de vacinas e, por conseguinte, aumentar o conforto e bem-estar do lactente, além de favorecer a adesão das famílias à vacinação.*

Descritores: *Dor; Vacinação; Lactente; Intervenções Não Farmacológicas.*

Resumén

Objetivo: *Identificar evidencias científicas relacionadas con intervenciones no farmacológicas utilizadas para reducir el dolor relacionado con la vacunación en lactantes.* ***Métodos:*** *Revisión integradora, realizado utilizando la estrategia PICo en las bases de datos IBECS, MEDLINE y Scopus, de febrero a junio de 2022, que tuvo como objetivo responder a la siguiente pregunta: ¿cuál es la evidencia científica sobre las intervenciones no farmacológicas utilizadas para reducir el dolor asociado a la vacunación en lactantes? Los descriptores combinados con los booleanos OR y AND fueron lactante, vacunación y dolor y infant, vaccination y pain. Se incluyeron artículos en el período de 2011 a 2021, publicados en portugués, inglés o español.* ***Resultados:*** *La muestra final estuvo compuesta por 32 estudios. Las medidas de intervención no farmacológicas propuestas para el alivio del dolor en lactantes sometidos a vacunación fueron: lactancia materna y soluciones azucaradas orales; asistencia profesional en la sala de vacunas; y medidas de estimulación sensorial.* ***Conclusión:*** *El uso de estas estrategias evidenciadas en la literatura científica es capaz de favorecer el manejo más adecuado del dolor relacionado con la administración de vacunas y, por lo tanto, aumentar el confort y el bienestar del lactante, además de favorecer la adherencia de las familias a la vacunación.*

Descriptores*: Dolor; Vacunación; Lactante; Intervenciones No Farmacológicas.*

INTRODUCTION

The vaccination process is one of the most important ways to prevent and control vaccine-preventable diseases. Among the immunobiological agents offered in the basic vaccination schedule of the Ministry of Health, injectable vaccines are among the main causes of adverse events, which can lead to an increase in their rejection and suffering of children, family members and health professionals involved in this process.[1]

Reaching the vaccine targets established by government agencies has become a major obstacle for health workers, since the lack of information or the publication of erroneous information has contributed to non-vaccination and, consequently, to the reintroduction of previously eradicated infectious diseases.[2] Moreover, the vaccines offered by the Brazilian National Immunization Program (*Programa Nacional de Imunização*) are considered safe, since most of the reactions presented after their application are benign, transient and with mild or moderate manifestations at the site of their administration.[3-4]

Among the reactions caused by injectable vaccines, there is the presence of pain, which is considered the fifth vital sign and needs to be evaluated so that effective strategies are instituted for its control and even prevention.[3,5] One of the interventions that can be adopted is non-pharmacological therapy, i.e., without the use of medication, as this is an intervention capable of minimizing the discomfort caused by the immunobiological, implying a decrease in fear of vaccines.[6]

Non-pharmacological interventions, such as tactile, sound, smell and taste stimuli, have proven to be effective practices with an antinociceptive effect, which is the decrease in pain perception.[7] However, there are still doubts among health professionals regarding the types of non-pharmacological therapies that can be used in the vaccine room, when to use them and the effectiveness of each one, a reality that requires scientific studies to fill this gap.

In this sense, this research is justified because the impact of pain resulting from injectable vaccine application requires measures capable of promoting greater comfort to patients, which can favor families' compliance with vaccines.[8] Therefore, this study was carried out with the objective of identifying scientific evidence related to non-pharmacological interventions used to reduce pain in infants resulting from vaccination.

METHODS

This is an integrative review, produced from February to June 2022, which sought to answer the following guiding question: what is the scientific evidence regarding non-pharmacological interventions used to reduce pain associated with vaccination in infants?

In order to conduct the method systematically, this research went through six stages: theme selection and guiding question elaboration; definition of inclusion and exclusion criteria; identification of information to be collected for subsequent categorization; analysis of included studies; appreciation of results; and dissemination of results with a summary of the main evidence.[9]

To formulate the guiding question, the PICo strategy was used, which represents the acronym for Population or Problem, Interest and Context of the study, in the order in which they appear.[10] In this regard, the acronym selected for this study was: P - infant; I - non-pharmacological interventions; Co - related to vaccination-related pain reduction.

Articles that addressed non-pharmacological interventions to control vaccination-related pain, available in full in selected databases, published in Portuguese, English or Spanish, and in the time frame of the decade between 2011 and 2021 were included, in order to search for evidence that allow observing the evolution of interventions related to vaccine administration. Studies from editorials, comments, theses, dissertations, books or book chapters, newspaper articles, literature reviews, reflective studies, letters to the reader, experience reports and those that did not respond to the guiding question were excluded. Duplicate articles between databases were counted only once.

The databases consulted were *Index Bibliográfica Español en Ciencias de la Salud* (IBECS) Medical Literature Analysis and Retrievel System Online (MEDLINE/PubMed) and Scopus (Elsevier). To guide the search, Descriptors in Health Sciences (DeCS) (infant, vaccination and pain) and Medical Subjects Headings (MeSH) (Infant, Vaccination and Pain) were used. The search for indexed publications was guided by the selected descriptors, used alone or combined with Boolean AND and OR, as shown in Figure 1.

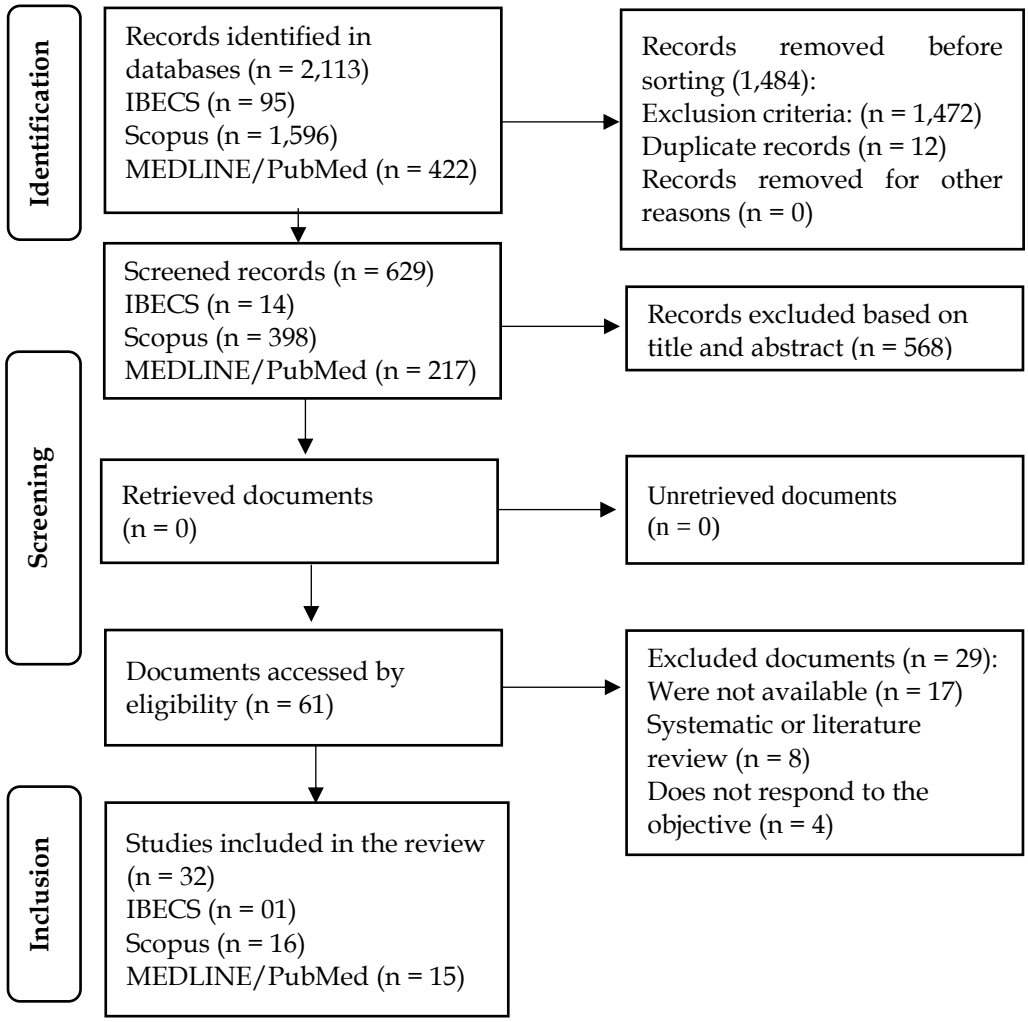
Figure 1. Search strategy in databases based on descriptors. Teresina, Piauí, Brazil, 2022.

IBECS	((mh:(lactente)) OR (lactentes)) AND ((mh:(vacinação)) OR ("Imunização Ativa")) AND ((mh:(dor)) OR ("Sofrimento Físico")) AND (fulltext:("1") AND db:("IBECS") AND la:("en" OR "es" OR "pt")) AND (year_cluster:[2011 TO 2020])
MEDLINE	((("infant"[MeSH Terms]) OR ("infants"[All Fields])) AND (("vaccination"[MeSH Terms]) OR ("immunization active"[All Fields]))) AND (("pain"[MeSH Terms]) OR ("physical suffering"[All Fields]))
Scopus	(TITLE-ABS-KEY (infant) OR TITLE-ABS-KEY (infants)) AND (TITLE-ABS-KEY (vaccination) OR TITLE-ABS-KEY ("Immunization Active")) AND (TITLE-ABS-KEY (pain) OR TITLE-ABS-KEY ("Physical Suffering"))

Source: authors' elaboration (2022).

The initial selection was carried out in a double and independent way, by two researchers, who followed the steps of identification, screening and eligibility, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol.[11] After these stages, and with the presence of a third researcher, the disagreements that emerged during study selection were analyzed in order to seek a consensus. Thus, the sample consisted of 32 articles (Figure 2).

Figure 2. Flowchart of the study selection process. Teresina, Piauí, Brazil, 2022.



Source: adapted from PRISMA.

Subsequently, the articles were analyzed based on an instrument previously validated and used by other authors[12] to identify the general characteristics of the publications, establish levels of evidence and results.

For study analysis, the hierarchical classification of evidence into seven levels was used: level I - evidence from systematic reviews or meta-analysis of multiple controlled and randomized studies; level II - from at least one well-designed randomized controlled clinical trial; level III - evidence from well-designed clinical trials without randomization; level IV - well-designed cohort and case-control studies; level V - systematic reviews from studies with descriptive and qualitative methodologies; level VI - evidence resulting from only one descriptive or qualitative study; level VII - point of view of recognized authorities or opinion of expert committees.[13]

RESULTS

Initially, 2,113 articles were found, of which 32 were included in this review[14-45]. Most articles were published between 2016 and 2018[15-20,27-28,32-37,43-45] (68%), and presented, according to the hierarchical classification of evidence, level II as predominant[14-15,17,20-21,23,25-26,28-36,38-39,41,44-45] (68.75%). The studies were published in pediatric journals, specific journals on pain, on vaccination and specific nursing.

Regarding the continent where these researches were carried out, most of them were in Asia[14-17,19-21,23-24,29-33,35-38,40,42-43,45] (68.75%), and the others were held in America[18,25-26,28,34,39,41] (21.88%) and Europe[22,27,44] (9.37%). The age of participants in these studies ranged from newborns[14-16,19-21,24-25,28,30,37,39-

[40,43] (43.75%) to infants aged up to two years[17-18,22-23,26-27,29,31-36,38,41-42,44-45] (56.25%), and the studies' sample sizes ranged from 29 to 537 subjects.

Measures of non-pharmacological interventions proposed for pain relief in infants undergoing vaccination were: breastfeeding and oral sugar solutions (Chart 1); professional assistance in the vaccine room (Chart 2); and sensory stimulation measures (Chart 3). Study appreciation was done descriptively, with the identification of the most important scientific evidence of each publication.

Chart 1 shows breastfeeding and oral sugar solutions as non-pharmacological methods for reducing vaccination-related pain in infants.

Chart 1. Breastfeeding and oral sugar solutions as a non-pharmacological intervention to reduce vaccination-related pain. Teresina, Piauí, Brazil, 2022.

Main author/title/year	Country/participant/study design/level of evidence	Contributions and/or implications
Breastfeeding		
Goswami G *et al*. Comparison of analgesic effect of direct breastfeeding, oral 25% dextrose solution and placebo during 1st DPT vaccination in healthy term infants: a randomized, placebo controlled trial. 2013.[14]	India. 120 newborns. Randomized controlled trial. Level II	Breastfeeding and oral dextrose decrease the perception of pain during intramuscular pentavalent vaccination.
Hashemi F *et al*. Comparing the effect of swaddling and breastfeeding and their combined effect on the pain induced by BCG vaccination in infants referring to Motahari Hospital, Jahrom, 2010-2011. 2016.[15]	Iran. 131 newborns. Randomized intervention study. Level II	Breastfeeding and swaddling methods or both combined decrease behavioral pain responses.
Erkul M *et al*. Efficacy of breastfeeding on babies' pain during vaccinations. 2017.[16]	Turkey. 100 newborns. Randomized controlled experimental study. Level VI	Breastfeeding prevented alteration of physiological parameters and contributed to reducing pain during vaccination.
Karimi Z *et al*. Saturation on physiological parameters of infants after administration of pentavalent vaccine at four and six months of age: a field trial. 2017.[17]	Iran. 171 infants. Randomized controlled trial. Level II	Breastfeeding and sensory stimulation resulted in the stability of babies' physiological parameters after vaccination.
Zurita-Cruz JN *et al*. *Lactancia materna para control del dolor agudo en lactantes: ensayo clínico controlado, ciego simple*. 2017.[18]	Mexico. 144 infants. Randomized clinical trial. Level III	Breastfeeding is effective for managing the pain caused by vaccination when compared with milk substitutes.
Gajbhiye M *et al*. Comparative study between analgesic effect of breast feeding and oral sucrose in full term newborns. 2018.[19]	India. 150 newborns. Interventional case-control study. Level IV	Breastfeeding reduces the painful response to intramuscular injection and provides superior analgesia to oral sucrose.
Hatami BZ *et al*. Effects of breast milk on pain severity during muscular injection of hepatitis B vaccine in neonates in a teaching hospital in Iran. 2018.[20]	Iran. 100 newborns. Randomized clinical trial. Level II	Breastfed babies had differences in pain intensity compared to formula-fed babies.
Dar JY *et al*. Analgesic effect of direct breastfeeding during BCG vaccination in healthy neonates. 2019.[21]	Pakistan. 60 newborns. Randomized clinical trial. Level II	Breastfeeding during BCG vaccination in newborns has analgesic effects compared to no intervention.
García AN *et al*. *Evaluación del dolor en niños de 2, 4 y 6 meses tras la aplicación de métodos de analgesia no farmacológica durante la vacunación*. 2019.[22]	Spain. 387 infants. Non-randomized cohort study. Level IV	Breast milk lessens the pain when given one or two vaccines.

Sugar oral solutions		
Yilmaz G *et al*. Oral sucrose administration to reduce pain response during immunization in 16–19-month infants: a randomized, placebo-controlled trial. 2014.[23]	Turkey. 537 infants. Randomized controlled trial. Level II	Sucrose solution reduces the infants' distress, and pain was greater among those who received 25% oral sucrose solution compared to 75%.
Suhrabi Z *et al*. A comparative study on the efficacy of glucose and sucrose on the vaccination pain: a randomized controlled clinical trial. 2014.[24]	Iran. 90 newborns. Randomized controlled trial. Level IV	Glucose or sucrose administration decreased vaccination-related pain intensity.
Gray L *et al*. Sucrose and warmth for analgesia in healthy newborns: an RCT. 2015.[25]	USA. 29 newborns. Randomized and controlled clinical trial. Level II	The association of sucrose with radiant heat, in newborns, promotes pain reduction more effectively than sucrose alone.
Taddio A *et al*. A randomized trial of rotavirus vaccine versus sucrose solution for vaccine injection pain. 2015.[26]	Canada. 120 infants. Randomized clinical trial. Level II	There was no evidence of pain reduction between oral human rotavirus vaccine and sucrose solution when given before injections.
Despriee ÅW *et al*. The effect of sucrose as pain relief/comfort during immunisation of 15-month-old children in health care centres: a randomised controlled trial. 2016.[27]	Norway. 114 infants. Randomized clinical trial. Level IV	The 30% sucrose solution proved to be more satisfactory in terms of pain relief and comfort compared to water.
Lima AGCF *et al*. Glucose solution is more effective in relieving pain in neonates than non-nutritive sucking: a randomized clinical trial. 2016.[28]	Brazil. 78 newborns. Randomized clinical trial. Level II	Using 25% glucose two minutes before painful procedures was more effective than using a pacifier.
Kassab M *et al*. Efficacy of sucrose in reducing pain during immunization among 10-to 18-month-old infants and young children: a randomized controlled trial. 2020.[29]	Jordan. 63 infants. Randomized controlled trial. Level II	Sucrose administration helps to reduce pain during injectable immunization.

Source: authors' elaboration (2022).

The strategies used by professionals working in vaccine rooms have a considerable impact on reducing pain and discomfort associated with vaccination, as observed in Chart 2.

Chart 2. Professional care in the vaccination room as a non-pharmacological intervention to reduce vaccination-related pain. Teresina, Piauí, Brazil, 2022.

Main author/title/year	Country/participant/study design/level of evidence	Contributions and/or implications
Ravikiran SR *et al*. Pain response in newborns to the order of injecting BCG and Hepatitis-B vaccines: a randomized trial. 2011.[30]	India. 76 newborns. Randomized clinical trial. Level II	Pain was reduced when the BCG vaccine was given before the hepatitis B vaccine.
Girish GN *et al*. Vaccination related pain: comparison of two injection techniques. 2014.[31]	India. 200 infants. Randomized clinical trial. Level II	Rapid injection without aspiration followed by rapid withdrawal is less painful and takes less time to administer.
Fallah R *et al*. Evaluation of vaccines injection order on pain score of intramuscular injection of diphtheria, whole cell pertussis and tetanus vaccine. 2016.[32]	Iran. 70 infants. Randomized clinical trial. Level II	The pain of vaccination was less when the measles, mumps and rubella vaccine was given before pentavalent vaccine.

Kumar M *et al*. Effect of change in sequence of administration of DTwP and Hepatitis B vaccines on perception of pain in infants: a randomized control trial. 2016. [33]	India. 130 infants. Randomized trial. Level II	Babies feel less pain when hepatitis B is given before pentavalent vaccine.
Taddio A *et al*. A randomized trial of the effect of vaccine injection speed on acute pain in infants. 2016.[34]	Canada. 120 infants. Randomized clinical trial. Level II	Rapid injections are recommended when administering vaccines due to pain reduction potential, feasibility, and practicality.
Göl İ *et al*. Effects of rapid vaccine injection without aspiration and applying manual pressure before vaccination on pain and crying time in infants. 2017.[35]	Turkey. 128 infants. Randomized controlled trial. Level II	Manual pressure and rapid injection without aspiration promote a reduction in pain and crying time associated with vaccination.
Yin HC *et al*. Comparison of iatrogenic pain between rotavirus vaccination before and after vaccine injection in 2-month-old infants. 2017.[36]	China. 352 infants. Randomized clinical trial. Level II	Oral human rotavirus vaccine administration prior to injection is most effective in reducing pain.
Yin HC *et al*. Comparative survey of holding positions for reducing vaccination pain in young infants. 2017.[37]	China. 282 newborns. Prospective cohort study. Level IV	Holding babies in the supine position was more effective in relieving pain than the upright position.
Güngör T *et al*. Analysis of two non-pharmacological pain management methods for vaccine injection pain in infants: a randomized controlled trial. 2021.[38]	Turkey. 96 infants. Randomized controlled trial. Level II	Applying cold and hot compresses to the vaccine administration site has an analgesic effect, with cold compresses being more effective.

Source: authors' elaboration (2022).

Sensory stimulation of babies during vaccination is one of the methods used to reduce pain related to this procedure, as shown in Chart 3.

Chart 3. Sensory stimulation as a non-pharmacological measure to reduce vaccination-related pain. Teresina, Piauí, Brazil, 2022.

Main author/title/year	Country/participant/study design/level of evidence	Contributions and/or implications
Gray L *et al*. Warmth is analgesic in healthy newborns. 2012.[39]	USA. 44 newborns. Randomized clinical trial. Level II	Warmer babies cried less than sucrose-flavored or sucking pacifiers after vaccination.
Gedam DS *et al*. Effect of distraction technique during immunization to reduce behaviour response score (FLACC) to pain in toddlers. 2013.[40]	India. 350 newborns. Quasi-experimental study. Level VI	Using toys that produce light and noise as well as children's movies, distracts babies during vaccination.
Taddio A *et al*. A randomized controlled trial of clinician-led tactile stimulation to reduce pain during vaccination in infants. 2014.[41]	Canada. 121 infants. Randomized clinical trial. Level II	Pain was not reduced when tactile stimulation was added to the vaccination process.
Koç T *et al*. The effect of foot reflexology on acute pain in infants: a randomized controlled trial. 2015.[42]	Turkey. 60 infants. Randomized controlled trial. Level IV	Pressure stimulation on foot points (foot reflexology) was effective in pain, physiological parameters and periods of crying in vaccinated babies.
Kucukoglu S *et al*. Effect of white noise in relieving vaccination pain in premature infants. 2016.[43]	Turkey. 75 premature newborns. Experimental study. Level IV	Using white noise (a type of sound that reduces intense auditory stimuli) is an effective method of controlling the pain caused by vaccination.

Bos-Veneman NGP *et al*. Using feeding to reduce pain during vaccination of formula-fed infants: a randomised controlled trial. 2018.[44]	Netherlands. 48 infants. Randomized clinical trial. Level II	Formula feeding reduced vaccination-related pain.
Pandita A *et al*. kangaroo mother care effective in alleviating vaccination associated pain in early infantile period? A RCT. 2018.[45]	India. 61 infants. Randomized clinical trial. Level II.	The kangaroo mother care reduced the pain associated with vaccination in infants.

Source: authors' elaboration (2022).

DISCUSSION

Scientific evidence regarding non-pharmacological interventions used to reduce pain associated with vaccine administration leads to the present discussion.

Breastfeeding has been shown to be effective in managing pain in babies and should be used in painful procedures such as vaccination.[16,21] When compared with methods that substitute breast milk or not using intervention, breastfeeding was more effective in reducing pain intensity,[18,20] possibly because it is a source of proteins and other components capable of reducing this discomfort.

However, researchers have shown that the effectiveness of breastfeeding to decrease pain intensity can only be observed in the administration of up to two injectable vaccines.[22] In association with other intervention methods, such as swaddling and sensory saturation, breastfeeding also resulted in a decrease in pain intensity and stability of babies' physiological parameters.[15,17]

Also in this regard, intervention studies carried out with infants have shown the superiority of the analgesic effect of breastfeeding and sugar solution administration performed minutes before intramuscular vaccine application, when compared to not using any intervention.[14,19] Physiological parameter values such as heart rate and oxygen saturation as well as crying duration were significantly lower in infants who breastfed or who received 25% oral sucrose.[19]

Most studies have shown the antinociceptive effect of oral sugar solutions when administered about one to two minutes before injectable vaccines.[14] Regarding oral sucrose, research has identified that using sugar solutions before intramuscular vaccine administration decreases pain intensity and infants' crying time.[23,27,29] It is noteworthy that studies have investigated the effectiveness of oral solutions with concentrations ranging from 24 to 75%, and that solutions with higher sugar concentrations have shown more significant efficacy in older babies.[23]

Researchers have proven that the associated use of sucrose with exposure to radiant heat has a greater analgesic effect on newborns than sucrose alone. The combined use of these interventions significantly reduced pain intensity and crying time, and showed a greater ability to self-regulate the stress of vaccination.[25] Comparison between oral human rotavirus vaccine and sucrose solution administration in reducing injection-induced pain showed similar efficacy; in this sense, it is recommended that the vaccine against rotavirus precede injectable vaccine administration.[26]

Another important finding was the greater effectiveness of 25% oral glucose in reducing vaccination-related pain when compared to sucrose at the same concentration or not using any intervention.[24] In another study, the comparison between using 25% glucose and a pacifier showed that using sugar solution before vaccination alleviated infants' acute pain up to two times, showing that glucose is effective in reducing pain stimulus during procedures that cause pain.[28]

Some practices of health professionals can increase or reduce patient discomfort during vaccination. In this way, the practice of quick injection without aspiration reduces pain in babies and takes less time for administration.[31,34-35] Another intervention that can be used is to place babies in supine position during vaccination, since this attitude proved to be more effective in reducing algesia compared to vertical position.[37]

It was also evident that vaccines administered intradermally, subcutaneously, and orally showed a lower overall pain score when administered before intramuscular vaccines.[30,32,36] Comparison of the level of pain caused by hepatitis B and pentavalent vaccine administration showed that babies felt less pain when the hepatitis B vaccine was given first.[33]

Another study showed the effectiveness of using compresses immediately before administering injectable vaccines. Cold and hot compresses were effective in relieving pain, with cold compresses being more effective when compared to hot compresses.[38]

Using white noise, the Kangaroo Mother Care method, foot reflexology and formula before/during/after vaccination was also considered effective methods to control pain caused by invasive procedures.[42-45] Another important strategy found in this review was using toys that produce light and sound, in addition to the reproduction of cartoons as entertainment elements for babies during vaccination.[40]

Regarding the analgesic effect of heat, it was identified that newborns who received natural heat during a painful procedure cried significantly less than those who received sucrose solution or pacifier sucking after vaccination.[39] On the other hand, assessing the analgesic efficacy of tactile stimulation in babies submitted to vaccination did not show a reduction in pain intensity and, therefore, there was no recommendation for its use in the vaccination room.[42]

Therefore, it is important for vaccine room workers to know the methods available and evidenced in scientific literature capable of reducing pain related to the application of these immunobiological agents, since they are simple, accessible, non-invasive procedures and can contribute to parents' compliance with childhood vaccination. However, the choice of the best strategy as well as its use must be based on technical-scientific knowledge and on the careful and individualized evaluation of infants.

The weaknesses identified in some methods used in original studies made it difficult to understand the effectiveness of the strategies used in research for clinical practice. Associated with this, there is the fact that pain is a subjective and personal experience and, therefore, its intensity is difficult to assess, especially in babies.

Regarding contributions to practice, the identification of successful strategies aimed at reducing pain in babies undergoing vaccination can contribute to improving families' compliance with vaccines and, therefore, increase the coverage rates of these immunobiological agents. These strategies are also capable of improving professional practice in vaccination rooms, in addition to promoting more adequate management of vaccination-related pain and, therefore, increasing the comfort and well-being of infants and their family.

CONCLUSION

This review identified non-pharmacological interventions that were effective in reducing vaccination-related pain in infants. Among these interventions, the following stand out: breastfeeding; use of sugar solutions, such as combining sucrose solutions with radiant heat and administering the oral human rotavirus vaccine before injectable vaccines; practices related to professional assistance in the vaccine room, such as giving a quick injection without aspiration, baby positioning in supine position, and using cold compresses before vaccine administration; and sensory stimulation measures, such as the use of white noise, Kangaroo Mother Care Method, foot reflexology, use of toys that produce light and sound, reproduction of cartoons and exposure to natural heat during the procedure.

These results show important implications of this review for clinical practice, in the sense of directing professionals who work in the vaccine room, parents and caregivers in using interventions to be implemented to reduce and control pain resulting from injectable vaccine application in infants.

CONTRIBUITIONS

Contributed to the conception or design of the study/research: Costa LMA, Costa RS. Contributed to data collection: Costa LMA. Contributed to the analysis and/or interpretation of data: Costa LMA, Costa RS. Sales MCV, Gouveia MTO, Moura MAP. Contributed to article writing or critical review: Costa LMA, Costa RS. Sales MCV, Gouveia MTO, Moura MAP. Final approval of the version to be published: Costa LMA, Costa RS. Sales MCV, Gouveia MTO, Moura MAP.

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