

# Systematic Review of Neonatal Pain Management with 25% Dextrose Versus Direct Breast Feed Milk During Painful Procedure

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## Abstract

This systematic review is the product of 25 top published journals. The search engines adopted in this study were PubMed, Medline, CINHALL, Cochrane Library, Google Scholar, and Research gate. The inclusion criteria were: 1. Papers published between 2000-2020, 2. Top tier journal articles (High quality), 3. Term Healthy neonates and preterm neonates, 4. Neonates undergoing various painful procedures and Neonates receive different pain relief interventions. The key searching words were Neonates, Painful Procedures, BCG Vaccination, 25% Dextrose.

The present paper highlights that 25% dextrose and direct breastfeed milk relieves neonatal pain. The gate-control theory also discusses the idea of central control through modulation of nerve impulses in descending fibers from the brain. The gate tends to close when cognitive activities such as distraction (e.g., breastfeeding) are processed along these fibres, therefore preventing the transmission of pain through a “descending blocking action.” This mechanism also affects various pain entities such as anxiety, anticipation, and memory of prior experiences.

This paper shows the research gaps from different studies in the review of the literature. In this present study of systematic review, 25 recent multiple interventions based on RCTs studies between 2010 to 2020 were systematically reviewed using the keywords search method. The findings are discussed and research gaps related to the RCTs are listed accordingly.

**Keywords** – BCG immunization, dextrose 25%, direct breastfeed, Neonates, other pain relieving measures, painful procedure, Vaccination,

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## Introduction

Most of the neonates routinely undergo painful invasive procedures in the Hospital. It is now well recognized that even preterm neonates are anatomically and physiologically capable of feeling pain. Pain among neonates can evoke negative behavioral, physiologic, or metabolic responses and

may be associated with long-term consequences. As neonates cannot verbalize their pain, they depend on others to recognize, assess, and manage their pain.

BCG Vaccination is an important routine procedure in the pediatric health care system which brings down the mortality as well as morbidity among children. Even though the vaccine has its advantages it also has its adverse effects as well as complication such as swelling, pain, redness. Pain produced by this intentional vaccination procedure varies based on various factors such as the medications used, the quantity of the medications used, size of the gauge of the needle used, the position of the neonate, and the muscles used/handled by the health care providers during vaccination procedure. Vaccination does not produce pain alone but also causes anxiety and stress in neonates and among their parents.<sup>1</sup>

Neonates respond to painful stimuli differently which is difficult to identify and treat. Generally, there is a myth among people that a neonate does not feel pain as it has immature neural development; it is dangerous to give the neonates powerful analgesia because of the risk of addiction. In the year 2014 neonatal pain management review practice in the intensive care unit neonates, experience has highlighted an average of 11 painful procedures per day out of which 60% of neonates do not receive any kind of pain-reducing or management medication. There is a need for creating evidence for an intervention, which is safe, simple, practical, and effective in relieving the pain among neonates during intradermal vaccination. Various individual non-pharmacological interventions were reported effective in the alleviation of pain in newborns in various situations.<sup>2</sup>

Amy Marchant's (2014) study found that the nervous system of the newborn is underdeveloped for pain sensation. Pain amongst some of the neonates is hard to investigate because neonates are unable to communicate pain and there is no specific biological

marker of pain available to identify the pain. It can be identified only through behavioral and stress-related physiological parameters. Neonates only identify pain but do not experience pain due to cortical development. Pain-relieving measures to alleviate distress from 'painful' procedures for newborn needs further investigation.<sup>3</sup>

According to Tania Habib Mundol et al 2017, Neonates undergoing painful procedures can be given oral sucrose or glucose solutions combined with other pain relief protocols to manage their pain. Whenever sucrose or glucose is administered to manage the pain, it has to be administered and followed as a medication; evidence-based protocols have to be developed and implemented in nurseries, and more research can be conducted to better understand the effects of sucrose use for pain relief.<sup>4</sup>

Modarres, M, Jazayeri, A., Rahnama, P. et al 2013 study was a step forward among similar studies for 2 reasons, first, it was assured if breastfeeding was real by observing sucking movement, secondly, breastfeeding begun during & after immunization. Breastfeeding during vaccination was considered effective in relieving pain in neonates. Immunization causes pain while administering to neonates and is considered the most common source of pain among children. Their finding concludes that breastfeeding reduces pain & is an effective way for pain<sup>5</sup>

Saeed Zaman Khattak S. has done a study in the neonatal intensive care unit (NICU) of the military hospital (MH) Rawalpindi to assess neonatal pain with the use of a modified Behavioral pain scale (MBPS) 2 minutes before the painful procedure babies were given 10% dextrose and sterile water and neonates pain was assessed. The study concluded that 10% dextrose is easily available as a cheap solution that can be used for pain relief management in NICU during painful procedures including immunization.<sup>6</sup>

An RCT was conducted using Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library 2011, Issue 10), Medline (1966 to February 2011), annual meetings abstract of the society for pediatric research (1994 to 2011) to evaluate the effectiveness of breastfeeding or supplemental breast milk in reducing procedural pain in neonates. The author concluded that administration of breastfeeding or breast milk has to be used to relieve the pain of neonates who are undergoing a single painful procedure rather than placebo, positioning, or no intervention.<sup>7</sup>

A prospective, double-blind, randomized controlled trial study has been conducted to compare the effect of expressed breast milk (EBM), 25% dextrose (D25), and sterile water (SW) on procedural pain in neonates. A premature infant pain profile (PIPP), was used to assess the pain. and other physiological parameters such as changes in heart rate (HR), oxygen saturation (SPO2), and duration of crying were recorded. It was found 25% dextrose and expressed breast milk were effective interventions for a reduction in pain response in newborn babies during venipuncture. 25% dextrose was found to be superior to EBM for pain reduction.<sup>8</sup>

As per the Gate control theory *Substantia Gelatinosa* is a functional unit of densely packed cells that extends the length of the spinal cord, is the site of a transmission-blocking action that closes a gate to impulses entering the spinal cord on their way to the transmission cells. Non-nociceptive touch fibers are stimulated conversely when open, the gate permits sensory input to reach the transmission cells in the dorsal horn of the spinal cord allowing the perception of pain to get through, this potential blocking mechanism can result in little or no pain perception regardless of the intensity of the painful stimuli and can be activated through – touch –stimuli of the skin such as scratching, rubbing, etc. There is central

control through modulation of a nerve in descending fibers from the brain.<sup>9</sup>

According to Cheryl tansky, Claire E lidenberk (2009) conducted study on breastfeeding as a pain intervention when breastfeeding an infant in Riddle memorial hospital as per their study breast feeding decrease pain perception and the gate tends to close when cognitive activities like breastfeeding are processed along these fibers. Thereby preventing the transmission of pain through descending blocking action. This mechanism affects various pain entities such as anxiety, anticipation and memory of prior experiences.<sup>10</sup>

### Literature Analysis and Discussions

Table -1 provides a relevant literature survey of the present topic from India and Global locations. The papers were selected based on keywords as given in Table -1

**Table -1 Keywords search strategy with several papers**

Keywords	No of papers
25% Dextrose	9
Breast Milk	14
BCG Vaccination	6
Neonates Pain	14
Other pain-relieving measures	6

This table provides a set of papers extracted from scholarly Archives such as; PubMed, CINHALL, Cochrane, Google Scholar, Research gate. A total of 50 papers were located based on the inclusion criteria as given below

1. Period of published research (2000 – 2020)
2. Top tier journal articles (High quality)
3. Term Healthy neonates and preterm neonates
4. Neonates undergoing various painful procedures
5. Neonates receives different pain relief intervention

## Results

A total of 25 papers were qualified as secondary data for the systematic review. Table 2 presents the systematic review of different elements of effectiveness of 25% Dextrose and direct breast milk on clinical outcome of neonates during BCG vaccination.

**Mundol TH et al.(2018)** conducted a study on 80 neonates during their routine BCG vaccination and concluded that neonates in the experimental group who received 25% Dextrose were found to have fewer indicators of pain. The clinical outcome like oxygen saturation along with heart rate was not assessed in the study. The research recommended to have future study on increased sample size for obtaining a statistically significant conclusion.<sup>4</sup>

**Kavthekar S et al.(2016)** performed a double-blinded randomized placebo-controlled trial to compare the oral 12%, 24%, 25% Dextrose and placebo during DPT vaccination. The research gap in the study was that the researcher checked the duration of cry and behavioral state for only one group who received 24% dextrose. All the three groups were administered 12%, 24%, 25% Dextrose as per the randomization; if the researcher had checked duration of cry and other clinical outcomes. He would have been able to produce the evidence as to which solution is more effective to relieve the pain of neonates.<sup>11</sup>

**Gibbins S et al.(2002)** Reported from his study on preterm and term neonates who were subjected to many painful procedures and he compared the efficacy and safety of 3 interventions during heel lance procedure. Total 190 samples of newborns divided into 3 groups and administered sucrose & nonnutritive sucking for group 1, sterile water & nonnutritive sucking for group 2, only sucrose solution for group 3. The research gap in this study is that the author selected the samples of term and preterm neonates. Here the preterm sucking reflexes are not well developed and may not be effective to assess the pain with nonnutritive sucking. Hence it is insignificant to generalize.<sup>12</sup>

**Larry Gray MD et al(2015)** Carried out a RCT on 29 neonates. The authors administered 25% Dextrose for the experimental group, radiant warmer for the control group, 2 minutes before DPT vaccination. Oral dextrose reduced the crying time of infants experiencing procedural pain. The research gap in this study is the small sample size, hence insignificant for generalization. Therefore, a large sample size for this research for obtaining a statistically significant conclusion is needed.<sup>13</sup>

**Harrison D et al(2010)** conducted a study to find out the analgesic effects of sweet solution during the different painful procedures like heel lance, venipuncture and IM injection on preterm and term neonates. The research gap in this present study is that the intensity of pain varies for each procedure. The preterm and term neonate's pain also varies according to their gestational age. This study concluded that the effect of the sweet solution was no longer existed for only a single procedure among healthy preterm and term neonates.<sup>14</sup>

**Sujatha.S et al (2013)** studied 155 healthy neonates to relieve pain by using the simple non-pharmacological procedure of facilitated tucking position for the control group and 24 % oral sucrose solution for the experimental group during BCG

vaccination. The research gap is that author did not make any inclusion criteria of neonates who cried during the procedure due to diaper wet, and sick during the procedure.<sup>15</sup>

**Mitra S.E. et al(2013)** in a comparative study studied the vaccinated-related pain among 96 infants who received massage therapy or breastfeeding during Hepatitis B and DPT vaccination. The research gap from the above literature is the small sample size. A similar study can be carried out with more samples to generalize the outcome and separately with different vaccination procedures.<sup>16</sup>

**Hameed Uddin Ahmed, Praveen S, Sindhoor. et al( 2019)** The objective of the study was to compare the analgesic efficacy of expressed breast milk and 25% Dextrose solution at the time of Hepatitis B vaccination at birth on 70 neonates. In this study, only the duration of cry was observed and another clinical parameter was not checked and the sample size was also small. Therefore the research gap is: large sample size is required for the statistically significant conclusion.<sup>17</sup>

**Prakashkumar S Shah et al.(2012)** compared RCTs of breastfeeding or supplemental breast milk versus no treatment/other measures among the neonates. In this study, many interventions were compared and assessed on healthy neonates. The research gap in this study is that the preterm population was not studied. The effectiveness of breast milk for the painful procedure should be studied in the preterm population, as there are a limited number of studies in the literature.<sup>18</sup>

**Harrison D et al.(2016)** conducted a RCT to assess the effect of breastfeeding during the painful procedure. The study included an age limit of 28 days of the postnatal period to 12 months and different painful procedures like subcutaneous, intramuscular, intravenous IV line, venipuncture, heel lance, finger

lance were included. The research gap in this study is that the pain perceptions vary as the age increases and according to the type of procedure.<sup>19</sup>

**Jawad Yousaf Dar et al.(2019)** performed an RCT to assess the neonates' pain during BCG vaccination during breastfeeding vs. routine care. The breastfeeding group was found to have reduced pain, decreased physiological and behavioral response during BCG vaccination. The research gap is they have not mentioned the duration of breastfeeding.<sup>20</sup>

**Gaurav Goswami et al (2013)** studied a comparative randomized placebo-controlled trial to assess the analgesic effect of direct breastfeeding, 25% dextrose, and placebo on 120 children during DPT vaccination. The research gap in this study is that the clinical outcome of heart rate, respiratory rate, and oxygen saturation was not checked. It is recommended to check the duration of cry within 3 minutes of intervention instead of 1 minute and 3 minutes.<sup>21</sup>

**Luvana Rodrigues et al (2017)** conducted a RCT in 40 preterm neonates to compare 25% dextrose with breast milk analgesic effects during nasopharyngeal suctioning. The research gap in this study is the small sample size selection. The author concluded that there was no significant reduction in the pain level of neonates in both experimental group 25% and control group expressed breast milk group due to insignificant difference between the interventions. But the analgesic effect of breast milk was sustained needs further specification about the intervention administered.<sup>22</sup>

**Boronumandfa K et al (2009)** concluded that 25% dextrose or breast milk orally given to 40 babies had significantly reduced the pain. The research gap in this study is: The sample size for this study is very small size for obtaining a statistically significant conclusion.<sup>23</sup>

**SitiYuyunRahayaFitri, et al (2020)** conducted an RCT study to compare sensorial saturation with sucrose, sensorial saturation with breast milk, and sensorial saturation alone among 108 neonates during venipuncture procedure in Indonesia. The study was conducted between 3 groups did not make any difference in pain relief. The research gap in this present study is that the researcher has not specified the effect of sucrose alone. Further specification is needed about the effects of each intervention.<sup>24</sup>

**A.IqbalR.Malik, Msiddique, M Yaqub, T.Iqbal, H. Farrukh. (2014)** conducted an RCT on breastfeeding for pain relief 2 minutes before, during and after BCG vaccination on 150 full-term neonates. The breastfeeding group had a significantly lower level of pain score during the BCG vaccination. The research gap in this study is that the pain scale (Douleur Aigue Du Nouveau – ne scale) used in the study was a very elaborative one to assess the pain of neonates during BCG vaccination.<sup>25</sup>

**RaziehFallah, NaeimahNaserzadeh, Farad fedosianandFabribaBinesh (2017)** did a comparative study in shahidSadough University of medical sciences Iran. The author compared the effectiveness of kangaroo mother care (KMC), breastfeeding and swaddling during BCG vaccination for 120 neonates. The neonates were divided into 3 groups; one group was given breastfeed, the second group KMC, third group received swaddling. The research gap in this study is the group which was given breastfeed showed less pain compared to other group but the group which was kept on KMC also had chances for the suckling of the mother's breast and the smell of the mother which was not given attention. Further studies need to be done in this regard.<sup>26</sup>

**Sujaha S, Rebecca Samson, Sundarressan (2013)** conducted a double-blinded RCT in the postnatal ward of a tertiary care Hospital at Puducherry to assess the effect of expressed breast milk 1 ml and

facilitated tucking during BCG vaccination. The researcher checked the behavioral change, duration of cry and other physiological parameters. The research gap in this study is that 1 ml of breast milk is very little for the healthy term neonates. This should have been calculated according to the body weight, behavioral changes not specified the type of behavior checked in this study.<sup>27</sup>

**S.R Ravikiran, P.M Jagdeesh Kumar andAnand D, Manndi (2011)** studied 76 infants from the outpatient department of KVG Medical College in Karnataka, those who received BCG vaccination followed by Hepatitis B vaccination and their pain level was assessed with a 10 cm visual analog scale. In this present study the author wanted to find out the pain threshold is more in administration of BCG vaccination first followed by Hepatitis vaccination. The result of the study revealed that administer of BCG first followed with Hepatitis B vaccine lowers pain compared to administration of Hepatitis –B vaccination first followed by BCG vaccination. The research gap in this present study is that the Use of 10cm visual analog scale for the vaccination needs to be different because pain threshold differs in both the routes of administration of the vaccine. BCG given in 25-26 gauge needle intradermal and for Hepatitis –B given in 22-25 gauge needle intramuscular. Thus visual analog scale may not be appropriate to assess both the type of vaccination.<sup>28</sup>

**Aguilar Cordero Met al (2014)** performed a comparative study between oral glucose and breast milk as a strategy for pain reduction during the heel lance procedure in 93 neonates in San Cecilio University Hospital in Canada. The pain and discomfort decreased due to the presence of high content of beta-endorphin level in the breast milk. The research gap in this study is the large sample size for this research is needed to obtain a statistically significant conclusion.<sup>29</sup>

## Conclusion

In this paper, we reviewed the current RCTs of Indian and Global studies. Very limited studies were carried out in India. These studies also suggest the need to do further investigation to find the best doses, timing and ways of giving the 25% Dextrose and any side effects.

A review asking these questions found that there is too little evidence to answer it; breastfeeding was found to be a good way of relieving pain and better than sucking on a dummy, being held, or being swaddled and placed in a crib. This knowledge is only useful if parents and practitioners use it! The present systematic review highlights 20 research gaps. Researchers must identify these gaps and bring out the best result of RCTs in India as well as in the Global setup.

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## References

1. Batton DG, Barrington KJ, Wallman C. *Prevention and management of pain within the neonate: an update*. Pediatrics 2006; 118(5):2231–2241.
2. Melzack R, Wall PD. *Pain mechanisms: a new theory*. Science. 1965; 150:971-979.
3. Amy Marchant. *Neonates do not feel pain': a review of the evidence* The International Journal of Student Research, Volume 7, 2014, hzu006, <https://doi.org/10.1093/biohorizons/hzu006>
4. Mundol TH, Anitha S, Prabhu, Prakash R.M, Saldanha et al. *25% oral dextrose as analgesia during neonatal immunization with BCG*. Int J Contemp Pediatr 2018; 5:416-9. Retrieved March 5th, 2018, from <http://www.ijpediatrics.com>
5. Modarres M et al. *Breastfeeding and pain relief in full-term neonates during immunization injections: a clinical randomized trial*. BMC Anesthesiol 13, 22 (2013). Retrieved September 2013, from <https://www.biomedcentral.com/1471-2253-13-22>
6. Saeed Zaman Khattak S. *Neonatal Pain and preventive Strategies: An Experience in a Tertiary care Unit*. Retrieved 2017 from [https://www.Journal of Ayub Medical College Abbottabad, vol.29 No.1 \(2017\)](https://www.Journal of Ayub Medical College Abbottabad, vol.29 No.1 (2017))
7. Aliwalas L, Shah V, Shah P. *Breastfeeding or breast milk for procedural pain in neonates*. Cochrane Database of Systematic Reviews.
8. Sahoo J et al. *Expressed breast milk Vs 25% Dextrose in procedural pain in neonates: A double-blind randomized controlled trial*. Indian Pediatrics. 2012;50(2):203-207.
9. Siegele D. *The gate control theory*. Am J Nurs. 1974; 74:498-502.
10. Cheryl Tansky, Claire Lindberg. *Breastfeeding as a pain Intervention when immunizing infants*. The Journal of Nurse Practitioners <https://doi:10.1016/j.nurpra.2009.09.014>.
11. Kavthekar S et al. *Comparison of Analgesic effect of oral 25% Dextrose, 12% Sucrose, 24% Sucrose, and placebo during 1st DPT Vaccination in healthy term infants*. Retrieved May 2016, from <https://www.Indian Journal of Applied Research, vol.6, Issue: 5 DOI: 10:36106/ijar>.
12. Gibbins S et al. *Efficacy and safety of sucrose for procedural pain relief in preterm and term neonates*. Nursing Res. 2002; 51(6):375-82. Retrieved December 2002 from <https://www.Pubmed.ncbi.nlm.nih.gov>
13. Larry Gray et al. *Sucrose and Warmth for Analgesia in Healthy Newborn: An RCT*. Pediatrics. 2015

- Mar; 135(3):e607-e614. Retrieved March 2014, from <https://www.ncpi.nim.nih.gov>.
14. Harrison D et al. *Analgesic effects of sweet-tasting solutions for infants: current state of equipoise*. 10.1542/Peds 2010-1593. Retrieved July 26th, 2010 from <https://www.pediatrics.org/egi/doi/10.1542/peds 2010-1593>.
  15. Sujatha S et al. *Sucrose and facilitated Tucking for pain among Neonates Receiving vaccination, in Puducherry*. *International journal of pharmaceutical and clinical Research* 2017; from <http://www.ijpcr/doi 10.25258/ijpcr.v9i3.8329>.
  16. Mitra Savabi E et al. *A comparative study on vaccination pain in the methods of massage therapy and mothers breastfeeding during injection of infants referring to Navabsafavi Health care center in Isfahan*. Retrieved Nov-Dec. 2013 from *Iran JNurs Midwifery Research* [https://www.ISNMR 2013 Nov-Dec. 18\(6\) 494-498](https://www.ISNMR 2013 Nov-Dec. 18(6) 494-498)
  17. Hameed Uddin Ahmed, Praveen S, Sindhoor. *Comparison of the analgesic efficacy of expressed breast milk and 25% dextrose during the first hepatitis B vaccination*. *Indian journal of child health* 2019 Volume 6/Issues 2/61 – 04 Retrieved 14th February 2019 from doi10.32677/ijch 2019.v06.i 02.003.
  18. Prakeshkumar S Shah et al. *Breastfeeding or breast milk for procedural pain in neonates*. *Cochrane Database System Rev*. Retrieved December 2012, from <https://www.DOI:10.1002/4651858.CD004950.pub3>
  19. Harrison D et al. *Breastfeeding for procedural pain in infants beyond the neonatal period*. Retrieved October 28, 2016, from <https://doi.org/10.1002/14651858.CD011248.pub2>.
  20. Jawad Yousaf Dar et al. *Analgesic effect of direct breastfeeding during BCG vaccination in healthy neonates*. *Jayub med coll Abbottabad* 2019; 31(3):379-82 Retrieved May 163, 2017, from <https://jmc.ayubmed.edu.pk>.
  21. GauravGoswami 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*. Retrieved July 15, 2013, from [https://www.indian Paediatr.2013 jul; 50\(7\):649-53.doi:10.1007/s13312-013-0196-8](https://www.indian Paediatr.2013 jul; 50(7):649-53.doi:10.1007/s13312-013-0196-8).
  22. Luvena Rodrigues et al. *Analgesic Efficacy of Oral Dextrose and Breast Milk during nasopharyngeal Suctioning of Preterm Infants on CPAP: A Blinded Randomized Controlled Journal of Tropical Pediatrics*, Volume 63, Issue 6, December 2017, Pages 483–488, Retrieved December 2017, from <https://doi.org/10.1093/tropej/fmx017>
  23. Khadijeh B et al. *Comparison of fascination-related pain in infants who receive vapor coolant spray and breastfeeding during the injection*. Retrieved January 2013 from [https://www.IranjnursMidwifery Res.2013 Jan-Feb; 18\(1\):33-37.\)](https://www.IranjnursMidwifery Res.2013 Jan-Feb; 18(1):33-37.))
  24. SitiYuyun R F et al. *Modified sensory stimulation using breast milk for reducing pain intensity in neonates in Indonesia: A randomized controlled trial*. Volume 53, July August 2020, pages e 199 – e 203. Retrieved August 2020 from <https://doi.Org/ 10.1016/j.pedn.2020.04.004>
  25. A.Iqbal, R et al. *Breastfeeding for pain relief during Bacillus Calmette – Guerin (BCG) vaccination in term neonates*. *Pakistan journal of medical and Health Sciences* 8(2): 403-406. Retrieved Jan 2014 from [https://www.pjmhs.8\(2\):403-406](https://www.pjmhs.8(2):403-406).
  26. Razieh Fallah et al. *Comparison of the effect of kangaroo mother care, breastfeeding and swaddling on Bacillus Calmette – Guerin Vaccination pain score in healthy term neonates*



- by a clinical trial, *the journal of maternal-fetal neonatal medicine*, 30:10, 1147 – 1150, DOI:10.1080/14767058.2016.1205030
27. Sujatha S, Rebecca Samson, Sundarressan. *Breast milk for neonatal vaccination pain*. Retrieved 2013 from [https:// www.nursezone.in/nurses zone/breast milk-for-neonatal-vaccination-pain/156.html](https://www.nursezone.in/nurseszone/breast-milk-for-neonatal-vaccination-pain/156.html)
28. S.R.Ravikiran et al. *Pain response in Newborns to the order of injecting BCG and Hepatitis-B vaccine: A Randomized Trial. The Indian Journal of Pediatrics* 78, 693-697 Retrieved 31st December (2010) from <https://doi.org/10.1007/812098-010-0327-3>
29. Aguilar cordero M J et al. *Oral glucose and breast milk as a pain strategy for pain reduction during the heel lance procedure in newborns*.2014 Nov1;30(5):1071-6.Retrieved November 2014, from [https://Nutr Hosp.2014;30\(5\):1071-1076](https://Nutr Hosp.2014;30(5):1071-1076)
30. Adedemy JD et al. – *Perception and management of induced pain through vaccination injection in infants aged 0 – 11 months in para ko immunization sites* 2019. *AdvPediatr Res*
31. MunevverErkul, EmineEfe. *Efficacy of Breastfeeding or Babies’ pain during vaccinations*. Retrieved January 2017 from [https://www.Breastfeeding Medicine](https://www.BreastfeedingMedicine) DOI: 10.1089/bfm.2016.0141.
32. Eden L et al. *Minimizing pain during childhood vaccination injections: improving adherence to vaccination schedules*. Retrieved 30th September (2014) from *pediatric health, medicine and therapeutics* DOI [https:// doi.org, 10.2147/ PHMT.S50510.vol.5 pg.127-140](https://doi.org,10.2147/PHMT.S50510.vol.5pg.127-140).