

Meta-Analysis Predictors of Sufficient Pain Management among Children at Pre-hospital Medical Service

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ABSTRACT

Background: Safely treating pain in children is a critical but challenging task for emergency medical teams. Few studies have focused on pain management guidelines at the hospital or department level. This study aimed to examine predictors of good pain management in children in prehospital health services.

Subject and Method: This research is a systematic review and meta-analysis study using PRISMA diagrams. The article search was conducted based on the PICO Model eligibility criteria. P: children with pre-hospital acute Pain. I: analgesic administration and male. C: no analgesic administration, and female. O: pain reduction. The articles used were from 5 databases: EBSCO, Pubmed, ProQuest, Scopus, and Science Direct. The search keywords for articles were as follows "pain management" OR "pain reduction" AND "predictors" AND "pre-hospital care" AND "children". The inclusion criteria in this study include full-text articles with observational study designs, full-text available articles, the relationship size used is the adjusted Odds Ratio, articles published in the 2010-2022 range, and the research outcome is sufficient pain management or efficient pain reduction. Articles were analyzed using the Review Manager 5.3 application.

Results: There are 8 articles in this study, 2 from Australia, 1 from the United States, 1 from Switzerland, and 4 articles from the United Kingdom. The article was analyzed using the PRISMA flow diagram. The study results show that analgesic administration has increased the odds of 3.36 times greater for pain reduction than without analgesic administration. This result was statistically significant (aOR= 3.36; 95% CI = 1.94 to 5.82; p<0.001). However, no significant results from the gender that showed there is no different between male and female patients for pain reduction (aOR= 1.12; 95% CI= 0.98 to 1.27; p= 0.100).

Conclusion: Analgesic administration is sufficient pain management for children with acute Pain in pre-hospital medical care.

Keywords: children, pre-hospital care, pain management, predictors

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BACKGROUND

Pain is an ugly sensory and emotional revel in related with, or comparable to that related with, real or ability tissue damage (Raja et al., 2020). Prehospital acute Pain is a common symptom and frequently inadequately managed (Galinski et al., 2010; Jennings, Cameron, and Bernard, 2011; Albrecht et al., 2013). Access to ache control is taken into consideration a essential human right (Brennan et al., 2019). Effective ache control has lately been diagnosed as a key first-class final results degree for ambulance services (Turner et al., 2019).

Pre-medical institution care carriers have historically targeted on time-touchy acute ailments and main traumas, representing best a small quantity of sufferers. However, withinside the prehospital setting, big organizations of sufferers enjoy loads of ailments and accidents with common signs and signs, inclusive of Pain (Friesgaard et al., 2018). When kids go through Pain via clinical infection or annoying injury, they're frequently assessed, treated, and transported to the medical institution through ambulance (Lord et al., 2016). Approximately 20% of kids attended through ambulance go through acute Pain (Whitley et al., 2020). Pre-medical institution ache control in kids is terrible, with 61% receiving suboptimal ache control. Consequences of terrible ache control consist of the threat of growing post-annoying pressure ailment and changed ache perception (Samuel et al., 2015; Lord et al., 2016; Murphy et al., 2016).

National suggestions emphasize the significance of recording ache rankings earlier than and after analgesia and endorse early intervention to alleviate Pain (Fisher and Brown, 2006). Pain control withinside the prehospital surroundings is an essential determinant of Pain withinside the emergency department (Siriwardena et al., 20-10). The manner ambulance offerings manage. Pain is clinically essential, a key indicator of the nice of care, an essential location for improvement (McManus and Sallee, 2005), and a concern for research (Snooks et al., 2015).

A few small-scale and systematic critiques of prehospital ache control had been conducted, however those both involved the person age organization and trauma aetiologies or had been particular to 1 analgesic agent only (Park et al., 2010; Whitley and Pilbery, 2019). Little has been finished to research the elements related to powerful ache control. Therefore, we aimed to pick out predictors which have an effect on the coolest control of pre-health facility acute Pain in children.

SUBJECTS AND METHOD

1. Study Design

The study was conducted by using systematic review and meta-analysis during the period of 2010 to 2022. Article searching employed databases such as Ebsco, Pub-Med, ProQuest, Scopus, and Science Direct. Keywords in searching through the databases were "ache control" OR "ache reduction" AND "predictors" AND "pre-medical institution care" AND "children".

2. Steps in Conducting Meta-Analysis

Meta-analysis was conducted through five steps, as follow:

- a. Formulate research questions in PICO (Population, Intervention, Comparison and Outcome)
- b. Search for primary study articles from various databases (Google Scholar, Pubmed and Springerlink)
- c. Perform screening and conduct critical quality primary studies
- d. Perform data extraction and enter the estimated effect of each primary study into the RevMan 5.3 application
- e. Interpret the result and draw conclusion.

3. Inclusion Criteria and Exclusion Criteria

The inclusion standards on this observation consist of full-textual content articles with observational observation designs, fulltextual content to be had articles, the dimensions of the connection used is the adjusted Odds Ratio, the 12 months the object used is withinside the 2010-2022 range, and the studies final results is ache discount or enough ache management.

Exclclusion criteria in this study

include published articles in languages other than English, experimental studies, and articles used before 2010.

4. Study Variables

The independent variables are analgesic administration and gender. The dependent variable is pain reduction or sufficient pain management.

5.Operational Definition of Variables Good pain management or pain redu-

ction is the reduction of 50% extra of the preliminary ache stage scored at the numerical scale within 1 hour after receiving the number one analgesic.

Analgesic administration is Administered via Intravenous analgesics (fentanyl, morphine, and ketamine), and sedation (benzodiazepines) modified into extracted from the internet database.

6. Study Instrument

The instrument used in the study was the Critical Appraisal Checklist from an observational study survey) from the Center for evidence-based management (CEBMa)

(2014). The following are indicators in critical appraisal:

- 1. Can the study research method answer the research question?
- 2. Did the subject matter enough to determine that the findings did not occur by chance?
- 3. Was the cohort selection based on objective and validated criteria?
- 4. Is the cohort representative of the defined population?
- 5. Were the observations made in sufficient time?
- 6. Are objective and unbiased outcome criteria used?
- 7. Are effect sizes practically relevant?
- 8. Is there a belief intervention provided?
- 9. Have confounding factors been taken into account?

- 10. Does this research address a focused problem?
- 11. Can the results be applied to your research?

7. Data Analysis

The study used RevMan 5.3 for data analysis to determine the effect size and study heterogeneity. The result of meta-analysis data processing was presented in the forms of forest plot and funnel plot.

RESULTS

Research at the predictors of exact ache control amongst kids at pre-health center clinical carrier incorporates eight articles. Two articles come from Australia, 1 from the United States, 1 from Switzerland, and 4 from the United Kingdom united article review process is carried out using a PRISMA flow diagram, with the search flow as follows.

Article search were conducted using 5 data based. The databased are; Ebsco, PubMed, ProQuest, Scopus, and Science Direct. Key words for article search were "pain management" OR "pain reduction" AND "predictors" AND "pre-hospital care" AND "children".

The researcher limits the articles, namely articles published from 2010 to 2022. Research limit English articles limits English articles to locations worldwide. After an initial search of the database, 1068 articles were found, then 391 published duplicate articles were deleted to obtain 677 articles. Followed by the article selection process by issuing as many as 555 so that there are still 122 full-text articles considered feasible. Then as many as 114 full-text articles were issued, leaving 8 final articles that will be included in a qualitative synthesis. This is shown in Figure 1 PRISMA flow.







Figure 2. Distribution map of primary studies

Table 1. Assessment of the quality of research	articles on the predictors of sufficient	t pain management among children in
emergency medical service		

		Studies							
No	Questions	Bendall et al., (2011)	Jennings et al., (2015)	Johnson et al., (2014)	Murphy et al., (2015)	Oberholzer et al., (2017)	Siriwardena et al., (2019)	Whitley et al., (2020)	Whitley et al., (2019)
1	Can the research method answer the research question?	1	1	1	1	1	1	1	1
2	Did the subject matter enough to determine that the findings did not occur by chance?	1	1	1	1	1	1	1	1
3	Was the selection based on objective and validated criteria?	1	1	1	1	1	1	1	1
4	Is the study representative of the defined population?	1	1	1	1	1	1	1	1
5	Were the observations made in sufficient time?	1	1	1	1	1	1	1	1
6	Are objective and unbiased outcome criteria used?	1	1	1	1	1	1	1	1
7	Are effect sizes practically relevant?	1	1	1	1	1	1	1	1
8	Is there a belief intervention provided?	1	1	1	1	1	1	1	1
9	Have confounding factors been taken into account?	1	1	1	1	1	1	1	1
10	Does this research address a focused problem?	1	1	1	1	1	1	1	1
11	Can the results be applied to your research?	1	1	1	1	1	1	1	1
	Total	11	11	11	11	11	11	11	11

¹⁼Yes; 0= No

Author (year)	Study Design	Country	Sample	Population	Intervention	Comparison	Outcome	aOR; 95% CI
Bendall et al., (2011)	Retrospective cross-sectional	Australia	3,504	Children with pre- hospital acute Pain	Male patients	Female patients	Sufficient pain reduction	1.42 (1.19–1.71)
Jennings et al., (2015)	Retrospective cross-sectional	Australia	92,378	Children with pre- hospital acute Pain	Administered analgesia	Not administered	Sufficient pain reduction	6.6 (5.9-7.3);
Johnson et al. (2014)	Retrospective cross-sectional	USA	5,057	Children with pre- hospital acute Pain	Male patients	Female patients	Sufficient pain reduction	1.02 (0.89–1.18)
Murphy et al. (2015)	Prospective cross-sectional	Ireland	1,422	Children with pre- hospital acute Pain	Administered analgesia Male patients	Not administered Female patients	Sufficient pain reduction	2.910 (2.180- 3.885); 1.086 (0.951– 1.240)
Oberholzer et al., (2017)	Retrospective cross-sectional	Switzerland	778	Children with pre- hospital acute Pain	Administered analgesia	Not administered	Sufficient pain reduction	4.25 (2.67–6.76)
Siriwardena et al., (2019)	Retrospective cross-sectional	UK	9,574	Children with pre- hospital acute Pain	Male patients	Female patients	Sufficient pain reduction	0.89 (0.67 -1.17)
Whitley et al. (2020)	Retrospective cross-sectional	UK	2,312	Children with pre- hospital acute Pain	Administered analgesia Male patients	Not administered Female patients	Sufficient pain reduction	2.26 (1.87-2.73); 1.16 (0.97-1.39)
Whitley et al. (2019)	Retrospective cross-sectional		2,312	Children with pre- hospital acute Pain	Administered analgesia	Not administered	Sufficient pain reduction	2.35; (1.94-2.84)

Table 2. Description of Primary Studies included in Meta-analysis

				Odds Ratio	Odds Ratio Odds Ratio			tio	
Study or Subgroup	log[Odds Ratio]	SE	Weight	IV, Random, 95% CI		IV, Random, 95% CI		95% CI	
Jennings et al., (2015)	1.8871	0.0572	20.8%	6.60 [5.90, 7.38]					
Murphy et al., (2015)	1.0682	0.1474	19.9%	2.91 [2.18, 3.88]					
Oberholzer et al., (2017)	1.4469	0.2372	18.3%	4.25 [2.67, 6.77]					
Whitley et al., (2019)	0.8154	0.0966	20.5%	2.26 [1.87, 2.73]				•	
Whitley et al., (2020)	0.8544	0.0978	20.5%	2.35 [1.94, 2.85]				+	
Total (95% CI)			100.0%	3.36 [1.94, 5.82]				◆	
Heterogeneity: Tau² = 0.37; Chi² = 145.00, df = 4 (P < 0.00001); l² = 97%						-			400
Test for overall effect: Z = 4.33 (P < 0.0001)						0.1	No Ye	10	100

1. Pooled Analysis of the Association between Analgesic Administration and Sufficient Pain Management





Figure 4. Funnel Plot Analysis of the Associationbetween Analgesic Administration and Sufficient Pain Management

a. Forest Plot

The Forest plot in Figure 3 indicates an analgesic administration effect on sufficient pain management. Children given analgesic had an odds 3.36 times higher to have sufficient pain management compared with a not given analgesic, and the effect was statistically unsignificant (aOR= 3.36; 95% CI= 1.94 to 5.82; p< 0.001). The distribution of effect estimates between studies in this meta-analysis was high (I² = 97%).

b. Funnel Plot

The funnel plot in figure 4 shows that the bullets represent the effect estimates distributed symmetrically around the mean vertical line of effect estimates. Thus the funnel plot shows that there may be no bias.

2. Pooled Analysis of the Association between Gender and Sufficient Pain Management

a. Forest Plot

The Forest plot in Figure 5 indicates that there was no effect of gender on sufficient pain management. Male children had an odds 1.12 times higher to have sufficient pain management compared with a female, and the effect was statistically insignificant (aOR = 1.12; 95% CI= 0.98 to 1.27; p<0.10). The distribution of effect estimates between

studies in this meta-analysis was high ($I^2 = 65\%$).

b. Funnel Plot

The funnel plot in figure 6 shows that the distribution of effect estimates tends to be more to the left of the mean vertical line of effect estimates than to the right. Thus the

funnel plot indicates that there is publication bias. Because the distribution of effects in the funnel plot lies to the left of the vertical line in the same direction as the average effect estimate on the forest plot image, the publication bias indicates an underestimation (true effect).







Figure 6. Funnel Plot Analysis of the Association between Gender and Sufficient Pain Management

DISCUSSION

This take a look at diagnosed numerous predictors with proposed strategies of improvement. These had been blended with preceding proof to expand a plan to enhance the pleasure of take care of youngsters struggling acute Pain withinside the prehealth center setting. Observation with the aid of using Lord et al. (2019) defined that youngsters Receiving analgesia had a reduction of pain severity of or more elements in advance than the intervention, with 94.2 attaining this benchmark after the intervention. The odds of a reduction in pain of or more elements increased with the resource of the usage of 1.01 in keeping with month straight away in advance than and 2.33 after the intervention. Biological, psychological, and social factors and interactions a few of the child, clinician, and figure complicate pre-sanatorium pain manipulate in youngsters. Pain control might be advanced with the aid of using growing analgesic management costs and lowering the concern and tension felt by using youngsters and clinicians (Eccleston et al., 2021).

Evidence-primarily based totally pointers are to be had to guide the secure and powerful care of sufferers with Pain, along with steering for assessing, measuring, and coping with P, ain in children (Gausche-Hill et al., 2014). Four pointers exactly proposed commands on pre-health facility control of moderate pain.

According to symptoms and symptoms, decision and manipulate of ache withinside the presence of slight ache, use slight ache remedy or prescribe intramuscular paracetamol at a dose of 10-20 mg/kg and ibuprofen at a dose of 4-10 mg/kg. Eight symptoms and symptoms offer clues to slight ache remedy situations in pre-fitness facilities. Rarely authorized capsules for treating and handling slight ache in children. These six rupture marks roll out the utility of intravenous (IV), intranasal (IN), or intra-osseous (IO) fentanyl. Also, 5 symptoms and symptoms are proposed to be used of paracetamol at 15 mg/kg levels, and 4 symptoms and symptoms goal twin presence as a remedy option (National Association and others, 2014)

It is really well worth bringing up that the only perception doctrine recommends intranasal ketamine at a degree of 0.five mg/kg previous to breaking via. Mild ache. Ten proposals have been given guidelines for the edge of pre-scientific authority. Intense ache turned into the edge. The preliminary remedy for sciatica withinside the control of weight ache earlier than the health facility for ache comfort turned into prescribing opium and fentanyl. Nine advices display the usage of fentanyl (reservoir serving-ban g/kg IV/IN/IO or the only 25-50 g IN) earlier than breaking via the ache threshold of the pitcher. Also, eight proposals challenged opium (0.05-0, reservoir serving mg/kg) as remedy desire. Three proposals proposed intravenous, intranasal, or intra-osseous ketamine as desire over ache power. In addition, the perception that the use of the only brief intravenous ketamine (0.25 mg/kg) determined appealing depressive ache withinside the indoors of the leg, which now not accepts opioids (Yousefifard et al., 2019).

Receiving analgesia is a predictor of powerful ache control in youngsters tormented by acute Pain withinside the preclinic setting. Meanwhile, being male and class extreme of preliminary ache rating is unsignificantly related to of powerful ache control. A obstacle changed into the low self assurance stage withinside the cumulative evidence; extra studies is possibly to alternate the conclusions. This evaluation must be up to date to mirror new evidence.

AUTHORS CONTRIBUTION

Arief Wahyudi Jadmiko as the main character of the research who chooses the topic, conducts searches and collects data in this study. Sang Ayu Made Adyani played a role in conducting data analysis and reviewing research documents

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CONFLICT OF INTEREST

There is no conflict of interest in the study.

REFERENCES

- Albrecht E, Taffe P, Yersin B, Schoettker P, Decosterd I, Hugli O (2013). Undertreatment of acute pain (oligoanalgesia) and medical practice variation in prehospital analgesia of adult trauma patients: a 10 yr retrospective study. Br J Anaesth. 110(1):96-106. Doi: 10.10-93/bja/aes355.
- Brennan F, Lohman D, Gwyther L (2019). Access to Pain Management as a Human Right. Am. J. Public Health. 109(1): 61–65. Doi: 10.2105/AJPH.20-18.304743.
- Eccleston C, Fisher E, Howard RF, Slater R, Forgeron P, Palermo TM, Birnie KA, et al. (2021). Delivering transformative action in paediatric pain: a Lancet Child and Adolescent Health Commission. Lancet Child Adolesc Health. 5(1):47-87. Doi: 10.1016/S2352-4642-(20)30277-7.
- Friesgaard KD, Riddervold IS, Kirkegaard H (2018). Acute pain in the prehospital setting: a register-based study of 41,-241 patients. Scand J Trauma Resusc Emerg Med. 26:53. Doi: 10.1186/s1-3049-018-0521-2
 - Galinski M, Ruscev M, Gonzalez G, Kavas J, Ameur L, Biens D, Lapostolle F, et al.(2010). Prevalence and management of acute pain in prehospital emergency medicine. Prehosp Emerg Care. 14(3):334-339. Doi: 10.31-09/10903121003760218.
 - Gausche-Hill M, Brown KM, Oliver ZJ, Sasson C, Dayan PS, Eschmann NM, Weik TS, et al. (2014). An Evidencebased Guideline for prehospital analgesia in trauma. Prehosp Emerg Care. 1: 25-34. Doi: 10.3109/10903-

127.2013.844873.

- Jennings PA, Cameron P, Bernard S (20-11). Epidemiology of prehospital pain: an opportunity for improvement. Emerg Med J. 28(6): 530–531. Doi: 10.1136/emj.2010.098954.
- Lord B, Jennings PA, Smith K (2016). The epidemiology of pain in children treated by paramedics. Emerg. Med. Australas. 28(3): 319–324. Doi: 10.-1111/1742-6723.12586.
- McManus JGJ, Sallee DRJ (2005). Pain management in the prehospital environment. Emerg. Med. Clin. N. Am. 23(2): 415–431. Doi: 10.1016/j.emc.2004.12.009.
- Murphy A, McCoy S, O'Reilly K, Fogarty E, Dietz J, Crispino G, Wakai A, et al. (2016). Prevalence and Management Study of Acute Pain in Children Attending Emergency Departments by Ambulance. Prehosp Emerg Care. 20(1):52-8. Doi:10.3109/-10903127.2015.1037478.
- Oberholzer N, Kaserer A, Albrecht R, Seifert B, Tissi M, Spahn DR, Maurer K, et al.(2017). Factors Influencing Quality of Pain Management in a Physician Staffed Helicopter Emergency Medical Service. Anesth Analg. 125(1):200-209. Doi: 10.12-13/ANE.00000000002016.
- National Association of State EMS Officials (2014). National model EMS clinical guidelines.
- Park CL, Roberts DE, Aldington DJ, Moore RA (2010). Prehospital analgesia: systematic review of evidence. J
 R Army Med Corps. 4:(1):295-300. Doi: 10.1136/jramc-156-04s-05.
- Raja SN (2020). The revised International Association for the Study of Pain definition of pain: concepts,

challenges, and compromises. Pain. 161(9): 1976–1982. Doi: 10.1097/j.pain.-00-000000001939.

- Samuel N, Steiner IP, Shavit I (2015). Prehospital pain management of injured children: a systematic review of current evidence. Am. J. Emerg. Med. 33(3): 451–454. Doi: 10.1016/j.ajem.2014.12.012.
- Siriwardena AN, Shaw D, Bouliotis G (20-10). Exploratory cross-sectional study of factors associated with prehospital management of pain. J. Eval. Clin. Pract. 16(6): 1269–1275. Doi: 10.1111/j.1365-2753.2009.0131-2.x.
- Snooks HA, Evans BA, Wells B, Peconi J (2015). What are the highest priorities for research in pre-hospital care? Results of a review and Delphi consultation exercise. Australas. J. Paramed. 6(4). Doi: 10.33151/ajp.6.-4.471.
- Sokoloff C, Daoust R, Paquet J, Chauny JM (2014). Is adequate pain relief and time to analgesia associated with emergency department length of stay? A retrospective study. BMJ Open. 4(3):e004288. Doi: 10.1136/bmjopen-2013-004288.

- Turner J, Siriwardena AN, Coster J, Jacques R, Irving A, Crum A, Gorrod HB, et al. (2019). Developing new ways of measuring the quality and impact of ambulance service care: the PhOEBE mixed-methods research programme. Doi: 10.3310/pgfar07030.
- Whitley GA, Pilbery R (2019). Pre-hospital intranasal analgesia for children suffering pain: a rapid evidence review. Br. paramed. j. 4(3): 24–34. Doi: 10.29045/14784726.2019.12.4.-3.24.
- Yousefifard M, Askarian-Amiri S, Madani Neishaboori A, Sadeghi M, Saberian P, Baratloo A (2019). Pre-hospital pain management; a systematic review of proposed guidelines. Arch Acad Emerg Med. 7(1): e55