Parental factors influencing postoperative pain in children: a systematic review

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Abstract

***Context*:** Postoperative pain after surgery in children is an underestimated and complex problem. Several predictors which contribute to this poor outcome are linked to child, system, medication or parental factors. Parents are important partners in an efficient postoperative pain management.
Objective: To examine which specific parental factors might be associated with postoperative pain of children.
***Data sources*:** Pubmed/MEDLINE, Web of Science, Cochrane database, Embase and PsycARTICLES
Study selection: Inclusion of studies written in english which examine specific parental related predictors for increased postoperative pain in children aged up to 18 years. Randomized controlled trials, observational, cohort, case-control, case series, cross sectional were included from January 1995 up until April 2021.
Data extraction* and *Data synthesis: A data extraction form was used and due to clinical and methodological heterogeneity the findings are presented in a narrative form.
***Results*:** Out of 647 search results, 22 studies were withheld in the final analysis. The parental related predictors can be grouped in five categories: culture; lack of knowledge; attitude; anxiety and parental pain catastrophizing.
***Limitations*:** The results indicate a high level of heterogeneity.
***Conclusions*:** Parental related risk factors found seem to be associated with worse child postoperative pain scores but additional studies are needed.

Keywords

Pain, parent, child, analgesics

Introduction:

Despite the recent advances made in children's postoperative pain management, it still remains a challenging problem. Incidences up to 86% of severe postoperative pain after different kinds of surgery, have been reported [1-2]. Children are a vulnerable group that are dependent on their parents for care.

In children inadequate pain management has been associated with a slower postoperative recovery, increased morbidity, maladaptive behaviors, sleeping problems [3-4] and development of chronic pain[5]. Further untreated pain is linked to greater pain sensitivity in future [6] and might increase health care costs [1].

Parents are important partners in order to achieve good postoperative pain management, nevertheless parents often undertreat the child's pain at home [7]. The fact that child surgery is nowadays mostly ambulatory, the role of the parents in good pain management has been increased [8].

Dorkham et al. [9] identified some parental barriers in postoperative pain management: attitudes and misconceptions, knowledge deficits, culture, poor assessment of pain and sociodemographic status. Furthermore psychological factors such as parental anxiety and pain catastrophizing thoughts might be relevant [10].

The aim of this study is to examine these factors or barriers with regard to child postoperative pain. So we formulated our research question as follows: Which specifically related parental factors might contribute or might be associated with increased pain in children after surgery?

Methodology

Eligibility criteria

From our research question inclusion criteria were created. English studies (randomized controlled trials, observational, cohort, case-control, case series and cross sectional cohorts) published between January 1995 and April 2021 were included which: 1. examined parental factors in regard to the child's postoperative pain; 2. included children aged between 0-18 year olds; 3. assessed pain by different scales or tools. We excluded case reports, reviews, PhD dissertations and articles from journals that are not peer reviewed.

Search strategy

We searched pubmed/MEDLINE database using a combination of the following search terms: '*pain, postoperative, parental, children, cultural, catastrophizing, anxiety, religion, parent-child relation, education, parental misconceptions, medication adherence, temperament, parental personality and perception'.* Boolean operators (OR/AND) were applied and the search included both Mesh terms and subject headings. We searched Pubmed/MEDLINE, Web of Science, Cochrane database, Embase and PsycARTICLES. Reference lists from relevant studies were examined.

Selection of studies

The search was conducted according to the PRISMA guidelines [11]. Two independent authors (LVL and JB) assessed these articles based on title and abstract. After comparison of the results, articles that did not match were discussed for possible inclusion.

Data extraction

Data extraction was undertaken by one of two reviewers (LVL). Single data extraction with verification by a second reviewer was used for all included studies. Empirical evidence demonstrates that single data extraction results in an acceptably low rate of additional errors, when compared with optimal double data extraction. In particular, the likelihood of error relating to primary outcomes, as opposed to minor data inconsistencies, has been found to be low[12]. After extraction the second author (JB) verified the data. Risk of bias was assessed for each study using the cochrane assessment tool or the Newcastle-Ottawa Scale.

Data Synthesis

Systematic reviews that lack data amenable to meta-analysis, alternative synthesis methods are commonly used. Reasons for inappropriateness of statistical data pooling may include the lack of a common effect measure and instances in which the heterogeneity of methodologies or outcomes makes it difficult to synthesize the data from the included studies. For this reason we present the findings in a narrative form.

Results

Pubmed/MEDLINE database using the above search string yielded 390 results. Searching the other databases yielded another 552 results. Using a snowball method 4 more articles were added. After removal of duplicates 647 studies remained, from this list we did a first screening using title and/or abstract whereby we discarded 521 studies and collected 122 for full text review. Exclusion criteria: 1. no method to measure pain (n=42), 2. no parent population (n=15), 3. no parental factors studied (n=17), 4. no full text available (n=18) and 5. systematic reviews (n=9). After a full text review 22 articles were withheld for data extraction (7 RCT and 15 prospective cohorts). Results are presented in different subcategories: 1. parental–culture aspects (4 studies), 2. improving knowledge and knowledge deficits (7 studies), 3. attitude towards pain and analgesics (5 studies), 4. anxiety (4 studies) and 5. parental-pain catastrophizing (2 studies). A summary of the results can be found in the table 1 and 2 below.

(Fig 1)

Culture

Culture has been mostly investigated in the United States of America (USA) and mainly focused on parents with Hispanic origins. Brown et al. [13] followed a cohort of 105 parents and children after tonsillectomy. They found significant postoperative pain and suboptimal pain management at home. Language, low access to health determinants or cultural stoicism were proposed as barriers. Another study evaluating the effect of culture on pain followed a cohort of 254 children after tonsillectomy [14]. Hispanic parents rated their children having significantly higher levels of postoperative pain compared to parents of non-Hispanic white patients. However, no difference was found in pain medication adherence. In contrast with previous findings Rosales et al. [15], a study of 161 children aged 2-15 years undergoing outpatient surgery, reported that parental cultural attitudes and beliefs regarding children's pain did not significantly predict postoperative child pain. They did find that these cultural attitudes and beliefs, being higher levels of fear and avoidance of analgesic use, predicted pain management. A final study [16] found that African American children compared to American Caucasian children experienced more postoperative pain then. Outside the USA, little literature is available regarding the impact of culture.

Parental preoperative knowledge and knowledge deficits

All included studies are RCTs and focused on improving parental preoperative knowledge in pain management of their child, e.g. informational booklet. Some studies showed a significant improvement in the child's pain at home [17-19]. Examining a postoperative information sheet to increase parental knowledge was associated with better pain scores when compared to routine care [17]. Furthermore, using a DVD education programme that increased parental knowledge of non-pharmacological methods after day-care surgery also decreased postoperative pain in children [18]. Kristinsson et al. [19] further supported the importance of parent education with their cohort of children undergoing day care surgery. In contrast, 4 studies showed that an increase in parental knowledge of postoperative pain did not result in an improvement of their child's pain scores [20-23]. No studies were found in which parental education level was linked to postoperative pain in children.

Attitude towards pain and analgesics

Beliefs and misconceptions about pain medication may be associated with parental adherence to prescribed postoperative pain medication for their child and this might lead to poor pain management in their children. Rony et al. [24] found a high discrepancy between parent ratings of children's pain severity and parental pain management. Parents with more misconceptions about pain medication, provided fewer doses of analgesics. Furthermore pain attitudinal barriers were not associated with a poor parental pain assessment at home. In contrast Yu et al. reported that postoperative pain intensity (day 0 and day 1) was not significantly correlated with parental misconceptions about pain medication [25]. Moreover, attitude is not only related to misconceptions about medication as is illustrated recently by a study which examined the impact of parental health mindsets on postoperative pain management. The study included 1005 children and parents and found that parents with the growth mindset had a positive impact on the recovery of children undergoing surgery. On the other hand parents with a fixed mindset reported higher pain scores in their child but no difference in the child reported pain was found [26]. Another study found higher levels of pain intensity in parents with a higher need for information [27]. Kankkunen et al. demonstrated that parents who expected their child to cope with the pain by themselves had more postoperative pain [28].

Parental anxiety

Parental anxiety has been identified as a risk factor for postoperative pain in children [29-30]. One study [29] found an association between higher parent preoperative anxiety and the child's postoperative pain scores at day 1 after craniofacial surgery. They used the Hospital Anxiety and Depression scale (HADS) which measures fear and depression related psychological distress and does not measure trait anxiety. Another study [30] supported these findings. They used the PASS-20 (used to assess fear related to pain) to measure anxiety after different surgical procedures and concluded that parental state anxiety was associated with higher pain intensity levels in children who also endorsed higher levels of pain anxiety in comparison with low parental state anxiety. In contrast with these findings one study [31] found no relation between Visual Analogue Scale (VAS) scores and parental state or trait

anxiety after controlling for surgery severity. They used both state and trait parts of the STAI. Similar results were obtained by Lamontagne et al. [32].

Pain catastrophizing

Only two studies regarding parental pain catastrophizing and the child's postoperative pain could be identified. No relation was found, in a multicentric cohort study [33] after spinal fusion, between parental pain catastrophizing and the child's postoperative pain during 6 weeks postoperatively. In contrast Rabbits et al. [34] found a significant association between parental pain catastrophizing levels and the child pain intensity after spinal fusion surgery or pectus repair.

(table 1)

(table 2)

Discussion

In this study several parental factors were identified to be associated with the child's increased postoperative pain: culture, knowledge and knowledge deficits, attitude towards pain and analgesics, parental anxiety and pain catastrophizing.

Supporting evidence as well as negative results were found in relation to the identified factors and their associations with the child postoperative pain. Factors like (e.g. knowledge) seemed to have more evidence than others (e.g. pain catastrophizing). The obtained results show significant overlap and interplay between each identified factor and points towards the complexity of a good postoperative child pain management, especially at home when parents are of key-importance. In order to gain a better understanding of these relations the biopsychosocial model [35] might be useful. This model considers the interaction of biological, psychological and sociocultural processes in relation to aspects of health (e.g. pain).

Children of parents of Hispanic and Latino origin appear to be at increased risk of postoperative pain and poor pain management when compared to a non-Hispanic population. To explain this phenomenon the authors propose barriers like language, low socio-economic status, limited access to health care, mistrust of health providers or cultural stoicism [21,23]. These ethnic differences could also be seen in the context of the biopsychosocial model. Furthermore, racial inequalities in acute pain management also have been documented in other settings such as the emergency department and in the African American population [16, 36, 37]. Moreover, a strong connection between culture and attitude towards pain medication/knowledge might exist. Values and beliefs could be moderated by culture and this might have an influence on good parental pain management. Lastly, low education and socio-economic status associated with some cultures (e.g. Hispanics) might result in less understanding of prescribed pain management [38-39].

Improving knowledge or enhancing knowledge defects could effectively be of benefit to decrease postoperative pain in children. Enhancing knowledge is defined as providing

information about their condition, treatment and potential side effects of medication. A lot of different tools exist to deliver knowledge: information pamphlets, smartphone applications, text messages, video or internet resources. However, a systematic review finds that education modalities, which use smartphone apps or text messages, are consistently more beneficial for patient outcomes than others [40] – maybe because these devices are more accessible and portable in our society nowadays. Overall, these studies, which relate to improving knowledge, show contradictory results. An explanation for these mixed results might be that in studies showing an increase in knowledge but no effect on the child's postoperative pain intensity, a so-called *high floor effect* may be present [28]. This *high floor effect* refers to parents who already had substantial knowledge regarding pain medication for their child with consequently limited effect when providing additional information. Increasing parental knowledge can be considered as an important tool for anesthesiologists, through which we might be able to improve the child's postoperative pain management at home.

Furthermore, a large number of parents have different attitudes, beliefs and misconceptions towards pain medication for their child with a negative impact on postoperative pain management and these might result in higher pain intensity scores. One study [24] reveals that 52% of parents indicate that analgesics are addictive, 73% report worries concerning adverse effects and 37% of parents even think that 'the less often children receive analgesics, the better they work'. Other frequently reported misconceptions are that children are not yet developed well enough to feel pain and are less sensitive towards pain. Some parents even supposed that their child should be able to cope with the pain by themselves while other parents even respect their children more if the child does not complain of pain [28]. An important association between these misconceptions and lower levels of education has been found [39]. As already stated above, culture also has an influence on these attitudes. In addition, a parental fixed health mindset [26] (the belief that individuals cannot change their health) or a high need for information seems to have a negative effect on postoperative pain [27].

Parental anxiety also appears to be an important factor in the child's acute postoperative pain and pain management. Studies show that high state anxiety in children has been associated with higher levels of postoperative pain [41]. Furthermore, higher parental anxiety was linked to higher anxiety levels in children [32]. Only two studies were found which showed a relation between parental anxiety and higher postoperative pain in children. Parental pain catastrophizing is a factor related to anxiety and could also be of importance. Only one study supports the link with postoperative pain.

Association between parental state anxiety and pain catastrophizing exists. Several studies find that pain catastrophizing has an effect on anxiety and anxiety, in turn, has an effect on pain catastrophizing [42-43]. Both factors are part of the fear avoidance model, which specifies the way how acute pain might develop into chronic pain [33] and also a relation is described between these two in the chronic pain setting [44-45]. For both factors it is important to differentiate between trait and state anxiety, because this determines therapeutic options regarding pain therapy. State anxiety and catastrophic thoughts can be controlled for

example through information or therapeutic play [46]. In contrast, trait parental anxiety and baseline pain catastrophizing are factors difficult to moderate. Identifying these parental risk factors will help us to identify children who are at risk for increased postoperative pain.

Improvement of postoperative pain and pain management should be seen in the context of a more holistic viewpoint. Because family oriented perioperative preparation and guidance could modify the psychological environment, it could consequently have a beneficial impact on the child's postoperative pain management [47]. It is important to identify vulnerable and at risk parents therefore anesthesiologists should be aware of predictors like culture, parental knowledge, attitude towards medication, parental anxiety and parental pain catastrophizing. Assessment of these threats could become a tool to reduce the child's postoperative pain and improve its pain management.

Limitations

This systematic review has several limitations. A high level of heterogeneity was found between studies and this presents as follows:

- Included studies often investigate children of different ages ranging from infants to adolescents. Children in different developmental stages might have different needs. That is why it is difficult to compare a cohort of adolescents with a cohort of infants.
- Most studies included are cohorts of children after tonsillectomy, because this is a common but very painful procedure with high morbidity. Nevertheless it is important to note that different surgical procedures have different pain profiles and functional recovery in the postoperative period. [48]
- A lot of different assessment tools were used which made it difficult to compare.

In some cases parents might have a high level of agreement in the assessment of their child's pain measurement, while other parents do not [49-50]. This might lead to unreliable pain scores in some studies used. Furthermore the child's needs change with their development stage and the large age range in some studies might question their validity or reliability. Some factors have not been thoroughly investigated which makes interpreting results very difficult and might create a high risk for bias. Most studies related to culture are USA studies and one must be careful to translate the conclusion to different non-USA situations. Furthermore, also a reporting bias might be an important issue in the current literature whereby factors have been examined but not published and lastly, some studies were not available to us in full text which may have influenced the results of our review. In any case more research is necessary to unravel the interplay between the studied parental factors and to evaluate their effect in regard to acute postoperative pain management in children.

Conclusion

Due to the limited number of studies, the heterogeneity in population and the conflicting results on the effect of the parental factors with regard to child postoperative pain, it is difficult to draw any firm conclusions. However, the current literature does indicate the importance of certain risk factors in its relation to postoperative pain. Addressing these

factors in the setting of family centered care may improve postoperative pain and anesthesiologists should be aware of their existence.

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Tables

Table 1.

FPS-R: faces pain scale revised, SES: socio-economic status, PPPM: parental postoperative pain measurement, NRS: numeric rating scale, FLACC: Face, Legs, Activity, Cry, Consolability scale, MAQ: medication attitude questionnaire , VAS: visual analogue scale, HBS: health beliefs scale, VRS: Visual rating scale, APAIS: Amsterdam Preoperative Anxiety and Information Scale, PCS-P: Pain Catastrophizing Scale - Parent, HADS: Hospital Anxiety and Depression Scale, PASS-20: Pain Anxiety Symptoms Scale , STAI: state and trait anxiety index

Author	Year of publication	Factor	Type of study	Population	Factor parameter	Pain score	Outcome
Brown et al.[13]	2016	Culture	Cohort study	N: 105 Age: 2-15 years Surgery: (adeno)tonsillectomy	Hispanic	FPS-R	Hispanic children of lower SES experienced significant pain
Donaldson et al.[14]	2020	Culture	Cohort study	N: 254 Age: 2-15 years Surgery: (adeno)tonsillectomy	Hispanics	NRS	Hispanic parents were shown to rate their children as significant higher levels of postoperative pain
Rosales et al.[15]	2016	Culture	Cohort study	N: 161 Age: 2-15 Surgery: Outpatient surgery	Hispanics	PPPM	Parent cultural attitudes and beliefs regarding children's pain did not significantly predict child's pain
Sadhasivam et al.[16]	2012	Culture	Cohort study	N: 161 Age: 6-15 years Surgery: (adeno)tonsillectomy	African American	NRS and FLACC	African American children showed significant higher FLACC scores
Rony et al. [24]	2010	Attitude	Cohort study	N: 132 Age: 2-12 years Surgery: different procedures	MAQ	PPPM	Pain attitudinal barriers were not a significant predictor of parental pain assessment at home
Yu et al. [25]	2020	Attitude	Cohort study	N: 124 Age: 4-9 years Surgery: tonsillectomy	MAQ	FPS-R	Pain intensity in the first 24 hours postoperative was not significantly correlated with MAQ

Kain et al. [26)]	2020	Attitude	Cohort study	N: 1005 Age: 2-15 years Surgery: (adeno)tonsillectomy	MAQ, HBS	PPPM, FPR-S, VRS	Parents who reported a fixed mindset of health reported their children as suffering more pain.
Berghmans et al. [27]	2018	Attitude	Cohort study	N: 160 Age: 1,5-5 years Surgery: adenotonsillectomy	APAIS	PPPM	Parental need for information is significantly associated with pain scores at home.
Kankkunen et al. [28]	2012	Attitude	Cohort study	N: 315 Age: 1-6 Years Surgery: different procedures	Pain questionnaire	VAS and PPPM	The intensity of pain was lowest among children whose parents did not expect their child to cope with their pain by themselves
Rosenberg et al.[29]	2017	Anxiety	Cohort study	N: 71 Age: under 18 months Surgery: cleft lip repair	HADS	FLACC	Significant at 24h Postoperative
Pagé et al.[30]	2013	Anxiety	Cohort study	N: 83 Age: 8-18 Surgery: different surgical procedures	PASS-20	NRS	Parent anxiety were associated with higher pain intensity
Logan et al.[31]	2005	Anxiety	Cohort study	N: 65 Age: 12-18 years Surgery: different surgical procedures	STAI	VAS	No relation after controlling for surgery severity
Lamontagne et al.[32]	2001	Anxiety	Cohort study	N: 74 Age: 11-18 years Surgery: spinal fusion	STAI	VAS	No significant relation
Birnie et al.[33]	2017	Pain Catastrophizing	Cohort study	N: 167 Age: 10-18 years Surgery: spinal fusion	PCS-P	VAS	No significant result at 6 weeks postoperative
Rabbits et al.[34]	2014	Pain Catastrophizing	Cohort study	N: 60 Age: 10-18 years Surgery: spinal fusion of pectus repair	PCS-P	VAS	Significant at 2 weeks postoperative

Table 2.

RCT: Randomised controlled trial, FLACC: Face, Legs, Activity, Cry; FPS: faces pain scale,, mCHEOPS: Children's Hospital of Eastern Ontario Pain Scale, NRS: numeric rating scale, VAS: visual analogue scale, MIM: mobile instant messaging, HMPC: Home Pain Management for Children

Author	Year of publication	Factor	Type of study	Population	Intervention	Comparator	Pain score	Outcome
Bailey et al. [17]	2015	Knowledge	RCT	N: 58 Age: 2-16 years Surgery: (adeno)tonsillectomy	An information sheet	Routine care	FLACC, FPS	Significant higher knowledge and significant improved postoperative pain control.
Chartrand et al.[18]	2016	Knowledge	RCT	N: 123 Age: 3-10 years Surgery: ENT or dental	DVD education	Routine care	mCHEOPS	The pain of was significantly lower, parental knowledge increased
Kristensson et al.[19]	1997	Knowledge	RCT	N: 180 Age: 4m - 18 years Surgery: day care surgery	Pain information and education	Routine care	FPS	Children have significant less pain, parents education about post-operative care increased
Zhu et al.[20]	2018	Knowledge	RCT	N: 152 Age: 6-14 years Surgery: Elective surgery	Face to face training, educational booklet and dvd	Routine care	NRS	No difference in groups
Chambers et al.[21]	1997	Knowledge	RCT	N: 82 Age: 2-12 years Surgery: different surgery	Pain education booklet	Routine care	VAS	There were no group differences in parents' pain assessments
YU et al. [22]	2019	Knowledge	RCT	N: 52 Age: 3-7 years Surgery: Tonsillectomy	Postdischarge education + MIM	Routine care	FPS	Higher knowledge however no difference in pain intensity
Vincent et al. [23]	2012	Knowledge	RCT	N: 108 Age: 7-17 years Surgery: different procedures	HMPC	Routine care	NRS, FPS	No difference in Child's pain.

Illustrations

Figure 1.