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Pediatric Abusive Head Trauma Prevention Initiatives: A Literature Review

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Abstract

Abusive head trauma (AHT) is a serious form of child maltreatment that needs to be prevented. The aim of this study was to summarize the main AHT prevention strategies described in literature, aiming to identify evidence of their efficiency, as well as strengths and limitations. International databases were reviewed from 2005 to 2015 using the key words *Shaken Baby Syndrome* or *abusive head trauma* or *nonaccidental head trauma* or *abusive head injury* or *nonaccidental head injury* and *prevention*. A total of 1,215 articles were found and 34 complete articles were selected for this study. Five initiatives with the main objective of reducing infant crying in the first months of life were found, three aimed at caregiver's emotional regulation and 12 aimed at raising parents and caregivers awareness on AHT. Among them, parental education about infant crying and risks of shaking a baby stands out for its empirical evidence.

Keywords

child abuse, physical abuse, prevention of child abuse

Pediatric abusive head trauma (AHT) is a form of child abuse occurring when a child younger than 5 is shaken violently or subjected to an abrupt impact, resulting in injuries to the skull or to intracranial contents (Parks, Annest, Hill, & Karch, 2012). Given the gravity of this form of child maltreatment, developing actions toward its prevention is fundamental.

Barr (2012) indicates that AHT has some features that make it a special candidate for prevention strategies in the realm of public health. AHT carries a significant financial cost for a multitude of governmental sectors, such as health, social security, education, and judicial system (Barr, 2012). In addition, an important property of AHT is the existence of a specific behavior (shaking) and a specific risk factor (infant crying) associated with its occurrence, which allows prevention messages to be more objective and focused. Finally, another important trait relates to the existing empirical evidence on the effectiveness of prevention programs in reducing the incidence of AHT (Barr, 2012). Dias et al. (2005) and Altman et al. (2011) observed a reduction of 47% and 75%, respectively, in cases of AHT after the implementation of a brief intervention with parents in the maternity wards of the region.

Although these studies provide evidence of the effectiveness of this type of intervention toward preventing AHT, it is important to examine whether other prevention programs reach the same results, what their differences and similarities are, and which evaluation methods have been used. In this sense, the objective of the present study is to summarize the main AHT prevention strategies described in literature, aiming to identify evidence of their efficiency, as well as strengths and limitations.

Method

A literature review was held searching the databases Web of Science, MEDLINE, SciELO, EBSCO, Academic Search Complete, CINAHL, Education Source, ERIC, Medic Latina, Psyc Articles, Psychology and Behavioral Sciences Collection, Psyc INFO, SOC Index, The Serials Directory, Fonte Acadêmica, Communication Abstracts, Criminal Justice Abstracts, Humanities Abstracts, SCOPUS, Cochrane Library, and BIREME from January 2005 to October 2015, using the key words *Shaken Baby Syndrome* or *abusive head trauma* or *nonaccidental head trauma* or *abusive head injury* or *nonaccidental head injury*, all of which were followed by *prevention*. A total of 1,215 articles were found and 352 articles were excluded as they were either published before 2005 (45) or were duplicates (307). Subsequently, the abstract and method

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of each article was read, from which 829 were eliminated since they were not empirical studies (81); did not describe AHT prevention programs (724); or the abstract or full article was unavailable (24). Therefore, 34 complete articles were selected for this study. These articles were read carefully, seeking to identify the proposed intervention, its strengths, limitations, and empirical evidence of its effectiveness.

Results

Barr (2014) points to two possible ways to prevent AHT: (1) change infant's crying pattern, reducing its quantity or (2) reduce parents or caregivers response toward crying that results in abuse or shaking. Russell, Alpert, and Trudeau (2009) also highlight that preventive actions of AHT should also include a component directed to the caregiver's emotional regulation skills. In this regard, the initiatives found in the present review were analyzed according to their main objectives and categorized into (1) initiatives aiming at reducing infant crying, (2) initiatives aiming at the caregiver's emotional regulation, and (3) initiatives aiming at raising awareness about AHT.

From the articles read, 20 initiatives were found for the prevention of AHT and were included in the study (Altman et al., 2011; Barr, Rajabali, Aragon, Colbourne, & Brant, 2015; Barr, Barr, et al., 2009; Barr, Rivara, et al., 2009; Bechtel et al., 2011; Blom, Van Sleuwen, De Vries, Engelberts, & L'Hoir, 2009; Cook et al., 2012; Deyo, Skybo, & Carroll, 2008; Dias et al., 2005; Foley et al., 2013; Fujiwara, 2015; Fujiwara et al., 2012; Goulet et al., 2009; Hennink-Kaminski & Dougall, 2009; Hiscock et al., 2014; Keefe et al., 2006; Keenan & Leventhal, 2010; Landgren, Kvorning, & Hallström, 2010; McRury & Zolotor, 2010; Meškauskas et al., 2009; Monsalve-Quintero & Alvarado-Romero, 2010; Morrill, McElaney, Peixotto, VanVleet, & Sege, 2015; Okamoto, Ishigami, Tokimoto, Matsuoka, & Tango, 2013; Reese, Heiden, Kim, & Yang, 2014; Rodriguez, Marrero, Ortiz, Rios, & Rivera, 2011; Runyan et al., 2009; Shanahan et al., 2014; Simonnet et al., 2014; Smith, 2010; Stewart et al., 2011; Taşar et al., 2015; Tolliday et al., 2010; van Sleuwen et al., 2006; Williams-Orlando, 2012).

Initiatives to Reduce Infant Crying

Five initiatives with the main objective of reducing infant crying in the first months of life were identified, represented in seven studies (Blom et al., 2009; Cook et al., 2012; Hiscock et al., 2014; Keefe et al., 2006; Landgren et al., 2010; McRury & Zolotor, 2010; van Sleuwen et al., 2006). Of these studies, two were conducted in the United States (Keefe et al., 2006; McRury & Zolotor, 2010), two in the Netherlands (Blom et al., 2009; van Sleuwen et al., 2006), two in Australia (Cook et al., 2012; Hiscock et al., 2014), and one in Sweden (Landgren et al., 2010). Fathers or mothers of infants were the target population of all initiatives, and the chief materials used were videos (Cook et al., 2012; Hiscock et al., 2014; Keefe et al., 2006; McRury & Zolotor, 2010) and handouts (Cook et al., 2012; Hiscock et al., 2014; Keefe et al., 2006).

The program *REST Routine for Infant Irritability* was developed in Charleston, South Carolina, and Denver, Colorado, with the primary goal of regulating and reducing the infant's level of arousal by environmental and behavioral restructuring (Keefe et al., 2006). In this program, parents of newborns are encouraged to promote synchrony in the parent–infant dyad following four principles: regulation, entrainment, structure, and touch. Orientation is provided by the nurses throughout four home visits in which specialists guide the infant's routine through individualized daily schedules, offering educational material for the family, such as the video *Fussy Babies and Frantic Families* and a parent workbook. The program evaluation included 121 infants between the ages of 2 and 6 weeks, considered by their parents to present excessive crying. The infant's parents were randomly distributed among the experimental group, receiving the *Rest Routine* intervention, and the control group, receiving standard well child-care intervention.

After the intervention, infants in the experimental group were crying 1.7 hr less per day if compared to individuals in the control group. This reduction in daily crying for the experimental group reflected on the parents' perception of solving problems related to their infants' crying, as well as the actual resolution of the problem, defined by the weekly crying average being equal to or less than an hour a day. In this regard, by the end of the intervention, 61.8% of infants in the experimental group and 28.8% of infants in the control group reduced the crying average to less than 1 hr per day, while 83% of parents in the experimental group and 68% from the control group reported that their child's crying problems had been solved (Keefe et al., 2006).

The effectiveness of swaddling in reducing the amount of infant crying was investigated in the studies performed by van Sleuwen et al. (2006) and Blom et al. (2009). The initiative consisted of orienting the parents through visits to a nursing clinic and through telephone contact for the implementation of a child care routine characterized by the following cycle of activities: (a) sleep of swaddled infant, (b) breastfeeding or infants' feeding, (c) positive interaction and playing with the infant, and (d) placing the tired but still awake infant in the crib or playpen. Parents were randomly divided into two groups, with the only difference between the guidance given to either groups being to swaddle the infant (experimental group) or not (control group). After 13 weeks of exposure, infants between 1 and 7 weeks of age had the greatest reduction in crying when swaddled, while infants aged between 8 and 13 weeks had the greatest reduction in crying when not swaddled (van Sleuwen et al., 2006).

Landgren, Kvorning, and Hallström (2010) explored the effects of acupuncture on reducing infant crying by randomly dividing 81 babies with colic into two groups. Babies in the experimental group underwent six sessions of acupuncture for 3 weeks. The infants in the control group were subjected to the same manipulation as the experimental group, but without the use of acupuncture. After the intervention, both groups showed

a significant reduction in the number of hours of crying; however, this reduction was greater in the experimental group (Landgren et al., 2010).

The Happiest Baby initiative involves teaching a method to calm infants based on the assumption that actions mimicking conditions in the womb will trigger a calming reflex. This method consists of progressively following each of these strategies until the infant calms down: (a) swaddling the infant, (b) positioning the infant on their side or stomach, (c) shushing (producing a loud and constant sound near the infant's ear), (d) rocking the infant gently, without shaking it, and (e) offering something that the infant can suck on, like a pacifier (McRury & Zolotor, 2010). To evaluate the effectiveness of this intervention, 35 parents of infants were randomly assigned to two conditions. The experimental group received a video that taught *The Happiest Baby* method by mail, while the control group received a video with guidelines for standard child care. After a period of 12 weeks of monitoring, no differences were noted for amount of infant crying and parental stress in either of the two groups.

Finally, Cook et al. (2012) and Hiscock et al. (2014) investigated the effectiveness of the *Baby Business* intervention in the improvement of infant crying and sleeping problems and in the symptoms of postnatal depression in mothers. The *Baby Business* program involved mailing educational material, consisting of a DVD and booklet to the participating families, monitoring activities through telephone consultation, and a group session to discuss any questions about the intervention. The booklet contains information on the normal sleeping cycles and crying patterns of infants, strategies to promote falling asleep independently, and ways to improve parental well-being. The DVD also includes footage of discussions recorded with parents about tired signs their infant displayed, and methods used to settle their infant, along with a demonstration of these techniques. Mothers of 781 infants were randomly assigned to two groups: The experimental group was exposed to the *Baby Business* program and the control group was exposed to usual care as offered by health services. After the intervention, mothers in the experimental group showed a greater reduction in depressive symptoms, significantly less wakening throughout the night to respond to the infant and significantly less worrying with the infant's sleep, as compared to mothers in the control group. Nevertheless, changes in infant crying or sleeping in neither group were not observed after intervention (Hiscock et al., 2014).

None of these studies explored the reduction in the incidence of AHT due to the implementation of its actions. A summary of the intervention strategies, study design, and variables investigated in each study, along with the empirical evidence of each initiative targeting reducing infant crying are found in Table 1. Of the five initiatives discussed, three showed evidence of reduction in infant crying frequency (Keefe et al., 2006; Landgreen et al., 2010; van Sleuwen et al., 2006), but one study only observed such effect in infants between 1 and 7 weeks of age (van Sleuwen et al., 2006).

Strategies that present evidence of reduction in infant crying often involve home visits or individualized interventions, indicating a restriction of these high-cost initiatives as a public policy strategy to prevent this form of abuse.

Initiatives for Caregiver's Emotional Regulation

Three studies described initiatives aimed at caregiver's emotional regulation targeting parents of newborns and potential caregivers: one study held in the United Kingdom (Smith, 2010), one in the United States (Williams-Orlando, 2012), and one in Japan (Okamoto et al., 2013).

Smith (2010) investigated the use of organizational protocols in nurses' decision-making on behalf of complaints of parents and other caregivers about infant crying on a health support telephone line, *NHS Direct*. In this service, the nurse who answers the call inputs complaints brought by parents into the system and the system in turn offers guidance, through the use of algorithms, on the best procedure to be adopted by parents. To assess how nurses use this organizational protocol, 11 call recordings were analyzed in which the main complaint was related to excessive infant crying. The use of the algorithm for infant crying by the nurses is influenced by the experience and level of confidence of these professionals regarding the algorithm. In addition to this, some resistance on behalf of the nurses was noted in questioning the parents if they reached the point where they could shake the baby in order for it to stop crying.

Another initiative focused on the emotional regulation of parents and caregivers was created by Williams-Orlando (2012) to teach parents and caregivers strategies to reduce their daily stress. Among the strategies proposed, the author highlights dietary changes with the introduction of foods that help prevent stress; lifestyle changes, such as practicing physical exercise and seeking social interactions; consumption of natural supplements for stress reduction; and relaxation and meditation training known as *Mindfulness-based Stress Reduction*. The program was implemented preliminarily through the course of 6 weekly meetings, lasting an hour and a half each. The study included 14 participants between the ages of 19 and 61, 10 of which had children. By the end of the program, all participants reported improvement in the ability to cope with stressful situations, reduction in pain and anxiety, and increased relaxation abilities.

Finally, Okamoto, Ishigami, Tokimoto, Matsuoka, and Tango (2013) investigated the effectiveness of the *Early Parenting Program*, which consists of a 3-hr lesson on the changes in infant crying patterns throughout child development information, approaches to deal with infant crying, and regional resources for parental support. The course content was covered with the aid of a 10-page booklet that demonstrated strategies with the use of illustrations to calm the baby. To evaluate program effectiveness, differences in emotional difficulties reported by mothers who participated in the program and mothers who did not were investigated. Participation in the program was shown to help minimize the subjective loss of confidence as a mother.

Table 1. Study Description and Evidence of Reduction in Infant Crying for Each Initiative.

Initiative	Intervention	Study	Study Design	Dependent Variables	Evidence
REST Routine For Infant Irritability	Home visits by nurses to guide parents about baby care routine	Keefe et al. (2006)	Experimental—randomized clinical trial	Frequency of excessive crying; intensity and frequency of arousal in the infant; perception and actual resolution of problems relating to crying	Reduction in infant crying frequency and actual resolution of problems relating to crying
Swaddling the infant	Orientation about baby care routine through parental visits to the clinic and telephone contact	van Sleuwen et al. (2006)	Experimental—randomized clinical trial	Frequency of excessive crying, infant crying and agitation, parents' perception of crying	Reduction in crying frequency strictly for infants between 1 and 7 weeks
		BlomVan Sleuwen, De Vries, Engelberts, and L'Hoir (2009)	Case study	—	—
Acupuncture	Parental clinical visits for infant acupuncture sessions	Landgren, Kvorning, and Hallström (2010)	Experimental—randomized clinical trial	Frequency of excessive crying, infant crying, and agitation	Reduction in frequency of infant crying
The Happiest Baby	Mailing of *The Happiest Baby* video to calm the baby	McRury and Zolotor (2010)	Experimental—randomized clinical trial	Postnatal depression; frequency of infant crying; mother's amount of sleep and stress level	No evidence
Baby Business	Mailing of video on infant sleeping and crying and strategies that promote the infant to fall asleep independently and improve parental well-being	Hiscock et al. (2014)	Experimental—randomized clinical trial	Gravity of infants' sleeping, crying or feeding problems; frequency and duration of parents' responses to infants throughout the night; depressive symptoms in parents; parents' quality of sleep; perception of efficiency in parents as caregivers; number of visits to professionals due to problems regarding infant sleeping, crying, or well-being	Reduction of depressive symptoms in caregivers; decrease in the time taken to respond to the infant throughout the night
		Cook et al. (2012)	Research project	—	—

None of the evaluated initiatives looked into the reduction in AHT incidence after program implementation. Table 2 presents a summary of the intervention strategies, study design, and variables investigated in each study, along with the empirical evidence of each initiative aimed at the emotional regulation of caregivers.

Two of these initiatives may be considered low cost and easy to implement, as they involve group interventions with few encounters (Okamoto et al., 2013; Williams-Orlando, 2012). Furthermore, all three initiatives presented high acceptance by participants. However, only the *Early Parenting Program* supplied robust evidence of a shift in the caregiver emotional regulation (Okamoto et al., 2013), indicating a shortage in empirical evidence that supports initiatives toward emotional regulation in caregivers.

Initiatives to Raise Awareness About Pediatric AHT

The most common initiatives found in literature are those aimed at raising parents and caregivers awareness on AHT, summing up to 25 studies describing 12 initiatives. These initiatives were chiefly developed in the United States (Altman et al., 2011; Barr et al., 2015; Barr, Rivara, et al., 2009; Bechtel et al., 2011; Deyo et al., 2008; Dias et al., 2005; Henninkaminski & Dougall, 2009; Keenan & Leventhal, 2010; Meškauskas et al., 2009; Morrill et al., 2015; Reese et al., 2014; Runyan et al., 2009; Shanahan et al., 2014) but also present in Canada (Barr, Barr, et al., 2009; Goulet et al., 2009; Stewart et al., 2011), Australia (Foley et al., 2013; Stephens, Kaltner, & Liley, 2014.; Tolliday et al., 2010), Japan (Fujiwara, 2015; Fujiwara et al., 2012), Turkey (Foley et al., 2013; Taşar et al., 2015), France (Simonnet et al., 2014), Colombia (Monsalve-Quintero & Alvarado-Romero, 2010), Puerto Rico (Rodriguez et al., 2011), Greece, Brazil, and Hungary (Foley et al., 2013).

The program *Prevent Shaken Baby Syndrome*! elaborated in Western New York, consisted of parental education directed at parents of newborns who were at the maternity ward for their child's birth. It involved screening the video *Portrait of a Promise*, distributing a pamphlet on AHT, and discussing the risks of shaking a baby with a maternity nurse, in addition to signing a term of commitment agreeing not to shake their infant (Dias et al., 2005). To evaluate the effectiveness of this intervention in preventing AHT, the incidence of AHT in the program's implementation region was calculated before and after its start, as well as in a nearby region, outside the program's area of influence. A significant reduction of 47% in the number of AHT cases in the program area was observed after its implementation, with no variation in AHT incidence in the neighboring region. Moreover, a relative risk of AHT occurrence 2.3 times higher for parents who did not take part in the program was detected. This program was replicated in upstate New York, also yielding a significant reduction of 75% in the number of AHT cases after program implementation (Altman et al., 2011), indicating the effectiveness of this initiative in the prevention of this form of abuse.

Table 2. Study Description and Evidence of Emotional Regulation in Caregivers.

Initiative	Intervention	Study	Study Design	Dependent Variables	Evidence
NHS Direct	Health support telephone line	Smith (2010)	Field research	Record of telephone calls; discourse of nurses	No evidence
Wholistic- and Mindfulness-based Stress Reduction	Lectures that teach strategies to reduce daily stress levels	Williams-Orlando (2012)	Ex post facto	Ability to deal with stress and relax; perception of pain and anxiety	Perception of improvement in ability to relax, to deal with stress, pain, and anxiety
Early Parenting Program	Lesson on infant crying and development, strategies to deal with infant crying and community resources for parental support	Okamoto, Ishigami, Tokimoto, Matsuoka, and Tango (2013)	Experimental—nonhomogeneous control and experimental groups	Maternal emotional difficulties	Alleviate subjects' loss of self-confidence as mothers

Based on the promising results of studies by Dias et al. (2005) and Altman et al. (2011), several other initiatives seeking to raise awareness of AHT were developed, with emphasis on the program *The Period of PURPLE Crying* (Barr, Barr, et al., 2009; Barr et al., 2015; Barr, Rivara, et al., 2009; Fujiwara, 2015; Fujiwara et al., 2012; Hennink-Kaminski & Dougall, 2009; Reese et al., 2014; Runyan et al., 2009; Shanahan, Nocera, Zolotor, Sellers, & Runyan, 2011; Stephens et al., 2014; Stewart et al., 2011). The development of this initiative was the starting point for the creation of a set of preventive materials entitled, *The Period of PURPLE Crying* (PURPLE; Runyan et al., 2009).

In sequence, a 12-min DVD was prepared, along with a booklet that addresses the normality of crying, suggests strategies to comfort the infant, reinforces the idea that such strategies will not always work, describes the reasons why inconsolable crying is frustrating, and suggests three steps to deal with the infant crying: (1) increase responses of holding and walking with the baby in the caretaker's arms, comforting and talking to it; (2) if the crying becomes very frustrating, place the infant in a safe place, leave for a few minutes to calm down, and return to see how the baby is; and (3) never shake or hurt the baby. The material also describes AHT, emphasizing the importance of informing other caregivers about infants' crying patterns, the dangers of shaking the baby, and the three action steps described above (Barr, Rivara, et al., 2009).

The effectiveness of this material in changing knowledge and behavior of parents of newborns concerning infant crying and AHT was investigated in three studies. The participants exposed to PURPLE materials showed a significant increase in knowledge regarding both infant crying patterns (Barr, Barr, et al., 2009; Barr, Rivara, et al., 2009; Fujiwara et al., 2012) and risks of shaking a baby (Barr, Rivara, et al., 2009). Participants reported having shared significantly more information with other caregivers about the importance of walking away from the infant when frustrated with the crying (Barr, Barr, et al., 2009; Barr, Rivara, et al., 2009; Fujiwara et al., 2012), and the risks of shaking a baby (Barr, Barr, et al., 2009; Barr, Rivara, et al., 2009; Fujiwara et al., 2012), besides stating that they walked away from the baby significantly more often when frustrated with inconsolable crying (Barr, Barr, et al., 2009; Fujiwara et al., 2012). These studies were developed in the United States, Canada, and Japan, suggesting a robustness of the results and potential for international application.

The material offered by *The Period of PURPLE Crying* was also transformed and adapted into a media campaign to raise awareness on the infant's crying pattern and AHT among friends and family of new parents, on account of being potential caregivers, and offering emotional support to parents (Hennink-Kaminski & Dougall, 2009). The idea behind creating this campaign was to allow the implementation of the program *The Period of PURPLE Crying* in three stages, namely: (1) education of new parents in hospitals and birthing centers; (2) reinforcement in community settings, such as during prenatal visits or in the follow-up of newborns in health units; and (3) media campaign for the public, reaching out especially to potential caregivers (Runyan et al., 2009).

Finally, the effectiveness of *The Period of PURPLE Crying* program was studied in four different countries: United States (Reese et al., 2014; Shanahan et al., 2014), Canada (Barr et al., 2015; Stewart et al., 2011), Australia (Stephens et al., 2014), and Japan (Fujiwara, 2015). In Canada and in one of the studies conducted in the United States, the three stages of the program were evaluated, observing an increase in nurses' knowledge of the infant's crying pattern and nurses' knowledge of AHT (Stewart et al., 2011), with a reduction in the number of visits by new parents to the pediatric emergency department with complaints regarding infant crying within the program's coverage area (Barr et al., 2015). Moreover, the implementation of the program was considered successful since it has been broadly applied according to its core messages (Shanahan et al., 2014).

The assessment carried out in Japan encompassed only parental education during mothers' prenatal visits, with reinforcement of messages in home visits after the birth of the baby. An increase in knowledge of infant crying and the risks of shaking was seen, as well as a greater acceptance of the strategy of walking away from the infant when frustrated with excessive crying (Fujiwara, 2015). The study by Reese, Heiden, Kim, and Yang (2014) in the United States investigated solely the implementation of parental education in maternity wards, noticing an increase in mothers' knowledge of infant crying pattern, risks of shaking, and secures strategies to deal with crying. Finally, Stephens, Kaltner, and Liley (2014) investigated the viability of implementing the program in a rural area in North Queensland, Australia, observing high acceptance among nurses who considered the program appropriate and useful for the region.

The program *Shaking Your Baby is Just Not the Deal* (Foley et al., 2013; Taşar et al., 2015; Tolliday et al., 2010) was developed by *The Children's Hospital at Westmead*, Australia, and is an initiative taking place in different countries. The program involves screening the video *Shaking Your Baby Is Just Not the Deal*, delivering pamphlets on AHT and placing posters in strategic locations of maternity wards (Tolliday et al., 2010). The first evaluation of the program was conducted in Australia, observing an increase in the knowledge of parents of newborns participating in the program on the average number of an infant's crying, and risks of shaking a baby (Tolliday et al., 2010). According to the authors, the program provided more frequent use of strategies to deal with the infant's crying directed to the environment or to the caregiver (Tolliday et al., 2010). In a replication study of this program in two maternity wards in Turkey, an increase in the awareness of mothers of infants about the risks of shaking was also observed (Taşar et al., 2015). In Brazil, the program's material was evaluated separately between groups: one was exposed to the experimental video, another to the pamphlet, and one to a control video not addressing AHT (Foley et al., 2013). The pamphlet group demonstrated a significant increase in the understanding of

Table 3. Description of the Empirical Evidence, Strengths, and Limitations of Initiatives for Raising Awareness of Abusive Head Trauma (AHT).

Initiative	Intervention	Study	Study Design	Dependent Variables	Evidence
Prevent Shaken Baby Syndrome!	Parental education at maternity wards about AHT	Dias et al. (2005)	Ex post facto	Number of cases of AHT	Reduction in number of cases of AHT
		Altman et al. (2011)	Ex post facto	Number of cases of AHT	Reduction in number of cases of AHT
The Period of PURPLE Crying	Parental education on the pattern of infant crying	Barr, Barr, et al. (2009)	Experimental—randomized clinical trial	Knowledge of infant crying and risks of shaking; responses to: crying and inconsolable crying; sharing knowledge of crying and risks of shaking; to walking away from the baby when frustrated with the crying; contact, carrying the baby and walking away when agitated, and level of frustration toward infant crying	Increase in knowledge of infant crying; greater sharing of information on infant crying, risks of shaking the infant, and response of walking away when frustrated; higher frequency of walking away from the baby when facing inconsolable crying
		Barr, Rivara, et al. (2009)			Increase in knowledge of infant crying and risks of shaking; greater sharing of information on shaking the baby and walking away when frustrated
The Period of PURPLE Crying	Parental education on the pattern of infant crying	Fujiwara et al. (2012)	Experimental—randomized clinical trial	Knowledge of infant crying and risks of shaking; responses to: crying and inconsolable crying; sharing knowledge of crying and risks of shaking; to walking away from the baby when frustrated with the crying; carrying the baby and walking away when agitated, and level of frustration toward the infant's crying	Increase in knowledge about infant crying; greater sharing of information about the response to walk away when frustrated; higher frequency of responses of walking away when frustrated
		Shanahan, Nocera, Zolotor, Sellers, and Runyan (2011)	Survey	Presence and characteristics of AHT prevention programs in hospitals of North Carolina	Most hospitals presented prevention programs with varied approaches
		Fujiwara (2015)	Experimental—experimental and control groups	Knowledge of infant crying and risks of shaking; responses to: crying and inconsolable crying; sharing knowledge of crying and risks of shaking; to walking away from the baby when frustrated with the crying; contact, carrying the baby and walking away when agitated	Increase in knowledge of the infant's crying and risks of shaking a baby; higher frequency of responses of walking away when frustrated

(continued)

Table 3. (continued)

Initiative	Intervention	Study	Study Design	Dependent Variables	Evidence
The Period of PURPLE Crying	Media campaign on the pattern of infant crying	Hennink-Kaminski and Dougall (2009)	Survey	Advice quality and format of media campaign	Attractive media campaign
		Reese, Heiden, Kim, and Yang (2014)	Ex post facto	Attitude toward intervention; knowledge of infant crying and risks of shaking a baby; responses to deal with inconsolable crying; intentions of sharing information with other caretakers	Intervention evaluated as useful; Adequate knowledge about infant crying, risks of shaking and responses to calming and dealing with infant crying
	Media campaign and parental education on infant crying	Runyan et al. (2009)	Case study	–	–
		Stewart et al. (2011)	Experimental—pre- and posttest	Knowledge of nurses about the pattern of crying and AHT	Increase in knowledge of nurses about crying and AHT
			Survey	Satisfaction of parents with the program	Program evaluated by parents as useful
		Barr et al. (2015)	Experimental—pre- and posttest	Number of visits to the Pediatric Emergency Department with complaints related to infant crying	Reduction in number of visits related to infant crying
Shaking Your Baby is Just Not the Deal	Parental education at maternity wards about AHT	Tolliday et al. (2010)	Ex post facto	Knowledge of infant crying and AHT	Adequate knowledge about infant crying and AHT
		Foley et al. (2013)	Experimental—randomized clinical trial	Knowledge of infant crying and AHT	Increase in knowledge about infant crying and AHT
		Taşar et al. (2015)	Experimental—randomized clinical trial	Knowledge of infant crying and risks of shaking the baby	Increase in knowledge about risks of shaking a baby
Love Me . . . Never Shake Me	Parental education at maternity wards about AHT	Deyo, Skybo, and Carroll (2008)	Experimental—pre- and posttest	Knowledge of infant crying and AHT	Increase in knowledge about infant crying
The Perinatal Shaken Baby Syndrome Prevention Program	Parental education at maternity wards about AHT	Goulet et al. (2009)	Experimental—pre- and posttest	Satisfaction of parents and nurses with the program	No evidence
Central Massachusetts Shaken Baby Syndrome Prevention Campaign	Parental education at maternity wards about AHT	Meskauskas, Beaton, and Meservey (2009)	Ex post factor	Satisfaction of parents and nurses with the program	No evidence
Utah's Shaken Baby Prevention Program	Parental education at maternity wards about AHT	Keenan and Leventhal (2010)	Case study	Occurrence of AHT	No evidence

(continued)

Table 3. (continued)

Initiative	Intervention	Study	Study Design	Dependent Variables	Evidence
Colombia Prevention Program	Parental education at maternity wards about AHT	Monsalve-Quintero and Alvarado-Romero (2010)	Experimental—pre- and posttest	Knowledge and behaviors related to AHT	Increase in knowledge of infant crying and consequence of AHT
Take Five Safety Plan for Crying	Parental education at maternity wards about AHT	Bechtel et al. (2011)	Experimental—experimental and control group	Beliefs about infant crying; behaviors related to AHT	Increase in behavior of walking away from the infant when frustrated
The Hand Project: More Hugs, No Shakings	Parental education at maternity wards about AHT	Rodriguez, Marrero, Ortiz, Rios, and Rivera (2011)	Experimental—pre- and posttest	Knowledge about AHT	Increase in knowledge about AHT.
Saint Maurice Maternity Hospital	Parental education at maternity wards about AHT	Simonnet et al. (2014)	Experimental—pre- and posttest	Knowledge about AHT	Increase in knowledge about AHT and consequences of shaking the baby
All Babies Cry	Parental education at maternity wards about AHT	Morrill, McElaney, Peixotto, VanVleet, and Sege (2015)	Experimental—pre- and posttest with control and experimental groups without randomization	Strategies to calm the baby, dealing with parental stress; knowledge about parenting and child development; parental resilience; quantity of social connections; perception of self-confidence to deal with infant crying and to deal with stress	Increase in knowledge about parenting and child development; increase in parental resilience

risks associated to shaking a baby, and of strategies to adopt when a baby is inconsolably crying, while the experimental video group showed an increase in knowledge of the average number of daily hours of infant crying upon viewing the video. Despite having already started the implementation of the program in Greece and Hungary, no evaluations have yet been carried out on their effectiveness for the prevention of AHT (Foley et al., 2013).

In addition to these programs, other 9 initiatives were developed: five in the Unites States (Bechtel et al., 2011; Deyo et al., 2008; Keenan & Leventhal, 2010; Meškauskas et al., 2009; Morrill et al., 2015), one in Canada (Goulet et al., 2009), one in Colombia (Monsalve-Quintero & Alvarado-Romero, 2010), one in Puerto Rico (Rodriguez et al., 2011), and one in France (Simonnet et al., 2014). All these initiatives encompass parental education in maternity wards on AHT and child development information, mainly the normal pattern of infant crying (Bechtel et al., 2011; Deyo et al., 2008; Goulet et al., 2009; Keenan and Leventhal, 2010; Meškauskas et al., 2009; Morrill et al., 2015; Rodriguez et al., 2011; Simonnet et al., 2014) or in health units (Monsalve-Quintero & Alvarado-Romero, 2010). The intervention strategies, study design, and variables investigated in each study, along with the empirical evidence of each initiative aimed at raising awareness about AHT are found in Table 3.

Among the 24 studies that investigate the effectiveness of initiatives aimed at raising AHT awareness, 12 revealed evidence of increase in knowledge of participants, 6 showed evidence of change in caregivers' behaviors regarding infant crying, and 2 featured evidence reduction in the number of AHT cases after implementation. In addition, all initiatives were well assessed by the participants and may be regarded as low cost and easy to implement.

Discussion

A total of 35 empirical articles were identified describing 20 initiatives of AHT prevention, 5 aiming to reduce infant crying, 3 promoting emotional regulation or the caregiver, and 12 in regards to raising awareness of this form of abuse. Table 4 summarizes the critical findings of the present review.

The initiatives aimed at raising awareness of AHT indicate that the best strategy for its prevention is through the education of parents and caregivers on the pattern of infant crying and the risks of shaking a baby. In the scope of this review, the studies present assuring results in raising awareness and show a lower cost and ease of implementation when compared to the other initiatives that target reducing the infant's crying or the emotional regulation of the caregiver, both requiring longer interventions and specialized training of health professionals.

Despite these promising results, the aforementioned strategies need further evaluation as the studies contain some limitations. As stated previously, only one initiative investigated the impact of reducing the incidence of AHT in the program's implementation (Altman et al., 2011; Dias et al., 2005). One of the possible reasons for the absence of this type of assessment resides in the difficulty of systematically monitoring the occurrence of AHT (Butchart, 2008).

Table 4. Summary Table of Critical Findings.

1. Among initiatives aimed at reducing infant crying, only two obtained a significant reduction in doing so, one showed reduction only for infants with up to 7 weeks of age and the remaining two displayed no reduction.
2. Initiatives directed at the emotional regulation of caregivers also showed modest results, with little significance in preventing AHT.
3. Initiatives aimed at raising awareness about AHT presented evidence of increased knowledge on infant crying and the consequences of shaking the baby, as well as changes in behavior in relation to the baby's crying and presenting a reduction in the number of cases of AHT.

Note. AHT = abusive head trauma.

Table 5. Summary Table of Implications for Practice, Policy, and Research.

1. Parental education about infant's crying and risks of shaking a baby seem to be a promising strategy for abusive head trauma prevention.
2. Initiatives aimed at reducing the infant's crying or regulating caregiver's emotions show higher costs and are more difficult to implement, as they require longer interventions and specialized training of professionals.
3. The program *The Period of PURPLE Crying* stands out for its empirical evidence for abusive head trauma prevention.

In this sense, many studies seem to rely in secondary measures to evaluate the effectiveness of prevention programs, such as scales on the knowledge and beliefs of parents and caregivers related to infant crying and AHT (Barr, Barr, et al., 2009; Barr, Rivara, et al., 2009; Bechtel et al., 2011; Deyo et al., 2008; Fujiwara, 2015; Fujiwara et al., 2012; Monsalve-Quintero & Alvarado-Romero, 2010; Morrill et al., 2015; Reese et al., 2014; Rodriguez et al., 2011; Simonnet et al., 2014; Taşar et al., 2015; Tolliday et al., 2010). Despite the limitations associated with the use of instruments, such as, for example, the occurrence of social desirability bias, its adoption may be a viable and immediate solution to the difficulty in investigating the incidence of AHT. It should be highlighted that, unlike what was observed in some studies (Barr, Barr, et al., 2009; Barr, Rivara, et al., 2009; Deyo et al., 2008; Fujiwara, 2015; Fujiwara et al., 2012; Monsalve-Quintero & Alvarado-Romero, 2010; Reese et al., 2014; Rodriguez et al., 2011; Simonnet et al., 2014; Taşar et al., 2015; Tolliday et al., 2010), the use of instruments, such as questionnaires and scales in research must involve psychometric validation to ensure valid and reliable results. In addition, systematic investigations on the relationship between parent and caregiver knowledge and beliefs on AHT, and the occurrence of this form of maltreatment are much needed. Understanding how this relationship occurs will contribute to the improvement of both methods of program evaluations as well as strategies used by them for the prevention of AHT.

Conclusion

The literature on pediatric AHT has expanded in recent years, with promising results in the development of strategies for prevention of this serious form of abuse. In Table 5, there is a summary of the main implications of this review for practice, policy, and research.

On a more practical level, this review suggests that AHT is preventable through simple and low-costs strategies, such as parental education as soon as possible after delivery. This evidence should motivate professional and researchers to pursue the development and evaluation of such intervention initiatives.

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