

ORIGINAL RESEARCH

Shaken baby syndrome: The implementation and evaluation of an education program for parents

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Abstract

Nurses and health care professionals caring for infants in the hospital setting are responsible for educating parents regarding the care of their newborn. In addition to routine care, education about potential risks must also be addressed. One of the most devastating injuries that can occur during the first one to two years of life is Shaken Baby Syndrome (SBS), a form of abusive head trauma. A study was undertaken to assess parental knowledge about SBS, precipitating factors and prevention. Development of a formal education program about SBS was initiated on the Mother Baby unit at the Medical College of Georgia Hospital (now Georgia Regents Medical Center), and was presented to all mothers with healthy full term infants, prior to their newborn's discharge from the hospital. Mothers were given a pretest to assess knowledge of SBS followed by one-to-one teaching within 24-48 hours post-delivery. Fathers were included if present, but mothers were the target audience. Two teaching methods were utilized. Mothers were assigned on an alternating basis to either an oral presentation group, or a group that also received a video presentation. The video is produced by the National Center on Shaken Baby Syndrome and is specifically targeted for the post-partum population. Although 100% of the mothers had previous knowledge of SBS, only 37% were knowledgeable about prevention measures. Follow up data was gathered through a posttest via telephone contact. Mothers were asked identical questions as on the pretest. Knowledge of behaviors to prevent SBS had increased significantly. Although data analysis did not determine if one presentation method was more effective for information recall, all mothers contacted could correctly identify prevention behaviors. Education about SBS should begin during the post-partum period, but the information should be reinforced at each well baby visit to enhance retention, and discuss infant behaviors that can precipitate abuse by any and all caregivers.

Key words

Shaken baby syndrome, Abusive head trauma, Education

1 Introduction

Shaken Baby Syndrome (SBS) was first identified in the 1970s by Caffey ^[1] as the whiplash injury. The National Center on SBS defines it as a collection of signs and symptoms resulting from the violent shaking of an infant or small child. The American Academy of Pediatrics ^[2] now recommends identifying the syndrome as Abusive Head Trauma (AHT). The initial presentation after non-accidental AHT may not be immediately recognized as there are few external injuries. The infant may present with a history of lethargy or arousal difficulties in conjunction with poor feeding, irritability, or increasing unresponsiveness. The classic triad of signs, in addition to the previous symptoms, includes retinal

hemorrhages, subdural or subarachnoid hemorrhages and associated fractures^[3]. Victims are usually less than 2 years of age, with the majority less than 6 months. Numerous case reports have been presented in the literature^[4-6], but little research has been done regarding specific criteria that confirm the precipitating factors and subsequent diagnosis^[7].

Child abuse and other forms of non-accidental trauma cause devastating, costly injuries to children of all ages^[8]. Infants are especially susceptible and injuries may be unreported due to the age of the victim. Commitment by medical personnel, especially nurses and doctors, to increase education may reduce the occurrence of these injuries. Overall costs to state and federal agencies for this problem can also be reduced, as many of these children require lifelong medical and custodial support. Education is recommended to reduce the incidence of child abuse, such as SBS/AHT, and through this education, improve health outcomes.

Child abuse was not considered a medical issue until the 1960s^[9]. Prior to that time it was a concern reserved for social workers and child protective services. In the United States each year an estimated 1,200 - 1,400 children who are brought in for treatment are identified as having been shaken or have been the victim of non-accidental trauma which has resulted in an abusive head injury. From 25%-30% of those injured children will die as a result of the injuries. Since all injuries are not reported, many more babies may suffer from SBS/AHT and the effects. Accurate numbers are not known as there is rarely any evidence of external trauma.

The initial injury develops from the mechanism which occurs as the infant's brain is rotated in the skull. This is a result of the acceleration and deceleration forces. As the shaking movement stops, the brain continues to rotate, veins are stretched and ruptured, resulting in a subdural hemorrhage on the brain's surface. Studies have been done to replicate the movement and to determine how the damage occurs. Wolfson and colleagues^[11] utilized volunteers to shake manikins to determine if neck stiffness affected head motion and resulted in injury. Although the replication of shaking was achieved in the study, injuries similar to concussions required intense direct impact.

A subdural hematoma is the most common type of intracranial injury that occurs with SBS/AHT, and the hemorrhages and clots are the leading cause of death for the babies who have been subjected to the trauma. Subarachnoid hemorrhages also occur frequently. This bleeding is believed to occur as a result of the perpetrator compressing the thorax while grasping and shaking the baby. The decreased venous return to the head increases intracranial pressure and results in cerebral edema. Subdural bleeding is venous in origin with slower effects, and symptoms resulting from the injury may not manifest for 24 to 48 hours. The subarachnoid hemorrhage develops from an arterial bleed and can be fatal within hours of the insult^[12].

Retinal hemorrhages seen in SBS/AHT victims are not common in other types of head injury^[10]. The hemorrhages are more profuse than those seen in accidental head injuries, such as falls, and are usually bilateral^[13]. The retinal hemorrhages may be the first indication upon examination which can help determine that the infant's condition is a result of non-accidental head trauma, rather than infection or other medical condition.

Long term sequelae resulting from these injuries include brain damage from the initial injury as well as long term slowing of brain growth^[14]. This chronic condition often leads to seizure disorders, blindness, and severe developmental delay^[15]. The impact of caring for a chronically ill, severely disabled child can cause psychological stress to the family members, as well as the lifelong effects on the child^[16].

An infant suffering from SBS/AHT may first present with vague symptoms and the signs can resemble a variety of conditions. The history related may include poor feeding or vomiting, irritability or lethargy, increased sleepiness, difficulty being aroused, hypothermia, and decreased vocalization^[12]. Initially it may be suspected that the infant is in shock or has contracted an infection such as meningitis. While the health care provider may concentrate on the presenting symptoms, SBS/AHT may not be the initial diagnosis. A retrospective chart audit study of 173 children who suffered abusive head trauma^[17] found that over a 5 year period 54 children were misdiagnosed. Five of the misdiagnosed children died. The most common diagnoses on exam were viral gastroenteritis and accidental head injury. Non-accidental head

trauma should be a consideration among the differential diagnoses of infants and children who present with vague symptoms.

More severe presenting symptoms include seizures, a bulging or full fontanel, apnea and bradycardia. Examinations of these children should include palpation of fontanel, head circumference measurement, and thorough body exams looking for bruising or other signs of trauma. All infants or children should receive a fundoscopic exam, and if retinal hemorrhages are evident, SBS/AHT may be considered. Further studies include skull radiographs and computerized tomography or magnetic resonance imaging if a head injury is suspected. Radiologic exams of the extremities are also warranted. These exams often reveal old and new fractures in 25% of shaken babies^[12].

Initial onset of symptoms may occur immediately or up to 48 hours after the occurrence of the injury. A study of perpetrators who admitted to non-accidental trauma found that the symptoms that resulted from the inflicted traumatic brain injury (ITBI) were manifested within a short period. Most perpetrators described the infant immediately becoming limp, vomiting or having seizures. Upon admission, seizures and lethargy were the most common presenting symptoms. The study's investigators recognized that perpetrators may give unreliable accounts of the injury or infant's behavior. Of those who did admit to causing injury, however, the symptoms were described as immediate.

1.1 Infants at risk for SBS

Infant temperament can be a precursor to SBS. Infants who were colicky, cried frequently, or were hard to console were high risk to become victims of abuse. In addition, infants from multiple pregnancies, or those who required more care and attention, may cause caregiver strain. Infants with a history of prematurity or low birth weight, those who had an extended NICU stay, and those who were medically fragile or had special needs, are characteristics that have put these infants at risk for SBS/AHT^[13].

In a study of perpetrator admissions^[19] the authors found the father was the most common perpetrator, followed by the mother's boyfriend. Mothers also admitted to shaking their baby. The common living situation usually included both parents, or the mother and her boyfriend, but the perpetrators were alone with the infant 91% of the time when the injury occurred. Other factors that contribute to risk to become a perpetrator, besides male gender, include those who are illiterate, mentally challenged, have a low educational level (<12 years of formal schooling), and demonstrate behavior that is impulsive or childish. They also suffer from anxiety, depression, drug addiction, are apathetic, feel inadequate, have a need for nurturing themselves, are single parents, and have a history of domestic violence^[13]. However, no parent is truly immune. Education programs cannot target one specific group. All parents need to know the information about SBS/AHT, and share it with all caregivers of their infant.

Hundreds of articles have been written over the past 30 years describing the symptoms of SBS/AHT^[20], the sequelae that develop, and the theories on precipitating factors that put both perpetrators and victims at risk^[21]. Almost all articles are case reports, descriptions of specific injuries, or animal studies. There are few studies that fit the criteria of true research. Donohoe^[20] undertook a systematic review on the topic and did not find a single experimental study about SBS/AHT. The lack of evidenced based medicine needs to be resolved by developing studies that confirm the incidence of shaking with the injuries of retinal hemorrhages, subdural hematomas, subarachnoid hemorrhages, and skeletal injuries. Theodore and colleagues^[22] surveyed mothers in the Carolinas. The mothers were asked about their methods of discipline and the behaviors of the children's fathers. Many of the reported parental behaviors were potentially abusive. Based on the responses it was estimated that for each case identified as SBS, 150 were unreported or undetected. This study confirmed that official statistics of physical abuse may be highly underestimated.

Literature review of SBS/AHT and other forms of child abuse recommend education as a method to reduce the incidence. In order to examine this assumption an extensive study was done in New York state^[23] over a five year period. A hospital-based parent education program was delivered by nursing staff at 16 hospitals that provided maternity services in eight counties in western New York. Because parents are receptive to teaching of new information during the postpartum period,

the program was administered during the hospitalization, and included both parents whenever feasible. The instruction included written information, a short 11 minute video on dangers of infant shaking, and suggestions on ways to handle persistent infant crying, which has been found to be a key precipitating factor. Educational posters that advised against shaking a baby were also displayed on the maternity units. All information was available in both English and Spanish. Nurses were encouraged to seek out and include fathers whenever possible. The actual length of the presentation was 15 minutes including the video. The presentation was purposely kept short to encourage staff participation. After the information was disseminated, the parents were asked to sign a Commitment Statement (CS) stating that they had received the information and understood the material. Voluntary follow-up of 10% of the families was done by telephone interview. The purpose of the program was to determine if there would be a reduction in the incidence of abusive head injury among children less than three years of age. Because there was no control group, results were compared to the incidence of SBS during the previous six years before the program existed. Comparison was also made with the nearby state of Pennsylvania, which did not have an education program about SBS in place. The incidence of abusive head injury in western New York decreased 47% during the five year study period. During this same period, other forms of child abuse remained at previous levels. The incidence of abusive head trauma in Pennsylvania remained at stationary levels. The results strongly support the premise that an educational program can have a positive effect upon human behavior.

According to the Injury Prevention Services (IPS) of the Georgia Department of Human Services, SBS/AHT is a current problem in the state. In 2004, the IPS identified 99 cases of SBS/AHT that occurred between the years 1998-2002. Sixteen of the cases were fatal. Documentation was obtained from medical records, police reports and Child Fatality records. The documentation of these injuries confirms the frequency of the occurrence, and the need for education to reduce the incidence of SBS/AHT. The Children's Medical Center at the Medical College of Georgia (MCG) has had several infants admitted to the pediatric units after a shaking episode. Because of these statistics, education about SBS/AHT should begin as a preventive program for parents and caregivers.

1.2 Conceptual framework used to guide study

Orem's Self-Care Model^[24] focuses on the theory that each individual has the ability to either perform self-care or provide care to others. When caring for individuals nurses should have the goal to help people develop behaviors that will allow them to achieve the skills required to care for themselves or others in their care. Parents who may be assuming the role for the first time, or expanding the family with the addition of a new member, will have demands placed on them to provide care in a nurturing and safe manner. Through education programs, parents would be provided information about SBS/AHT. An education program can give parents additional information and tips regarding infant behaviors such as crying, and help them develop skills which result in positive parenting behaviors. The self-care deficit of parenting skills will be reduced through the education program.

2 Method

The educational program for this study was modeled after the one described by Dr. Mark Dias^[23] in western New York state. The target population for this study was mothers of newborns delivered at a large obstetrics department in the southeastern United States. Educational materials from The National Center on SBS were utilized to include an eight minute video and a one page handout.

The obstetrics department of this tertiary care center in the southeastern United States serves women in a 14 county area in eastern Georgia with emphasis on high risk perinatal patients. The perinatal area has an average birth rate of 100 deliveries per month. The study involved 24 mothers who had delivered term well babies and were hospitalized on the postpartum or Mother Baby unit. Mothers who agreed to participate gave written consent prior to the education program.

Nurses on duty were resources to determine which mothers were available for teaching. Because the hospital serves a high risk population, other women were hospitalized on the unit and were not included in the study. Mothers whose infants

were in the Neonatal Intensive Care Unit (NICU) were not approached, nor mothers who had experienced a fetal demise. Mothers under the age of 18 were not included due to possible concerns about legal age to give informed consent. Any mothers that the staff felt would not be agreeable to the program were not included. These mothers may have been experiencing difficulties with breastfeeding, infant care, or the staff felt that the education program on that particular day may have increased patient distress. Twenty-four mothers participated in the study.

The demographics of the study population (see Table 1) were nearly evenly divided between Caucasian and African American, with one Hispanic also participating. Ages ranged from 18-38, and infants were 1-2 days of age. Mothers were not approached on the day of delivery. Marital status was evenly distributed with 12 single women, and 12 married women. Education levels ranged from completion of 9th grade through medical school graduate.

Table 1. Subjects' demographics

Subjects' demographics for study participants, n = 24			
	Age	Mean ± SD	Percentage
Mother's age in years, range	18-38	26.62 ± 6.34	
Infant's age in days, range	1-2	1.24 ± 0.44	
Race			
Caucasian	11		45.83
African American	12		50.00
Hispanic	1		4.17
Marital status			
Married	12		50.00
Single	12		50.00
Education			
Some high school	3		12.5
High school diploma or GED	6		25.00
Some college	7		29.7
Associate degree	1		4.17
Undergraduate college degree	3		12.5
BSN	2		8.33
Graduate degree (Master's/Doctorate)	2		8.33

The mothers were assigned to one of two groups on an alternating basis. Although mothers were the target audience, fathers who were available were encouraged to participate and listen to the information as it was presented. Initially all mothers completed a five question pretest to assess their general knowledge about SBS/AHT, types of injuries that can occur, and behaviors that may prevent it. All mothers had previous knowledge of SBS/AHT, and were aware that it could result in serious injuries. However, only nine of the 24 women could identify specific preventive behaviors. At the completion of the pretest each mother was given information about SBS/AHT, to include types of injuries, precipitating factors, and behaviors that can be utilized to help prevent the injury from occurring. In addition, half of the mothers also were shown a brief video about SBS/AHT after receiving verbal and written materials.

Follow up telephone calls were conducted two to three weeks after the mother's discharge to determine recall. Mothers were asked if they could remember the information about SBS/AHT that was presented to them prior to discharge of their infant, and specifically if they recalled information about prevention of SBS/AHT. A five question posttest, identical to the pretest, was used to help determine recall of the information presented, and was completed at the time of the follow up telephone call. Mothers could describe the behaviors that can be employed when a caregiver is becoming frustrated with an infant. The mothers verbalized actions that can be taken by the caregiver if an infant is crying: comforting the infant, feeding the infant, and checking for symptoms of illness. Mothers were also taught suggestions of problem solving

techniques for frustration with a crying baby such as calling for assistance, placing the infant in a safe place such as a crib, and the caregiver removing themselves from the immediate situation for a brief five to ten minute period.

3 Results

Contact via telephone was successful with 21 of the 24 mothers (see Table 2). Some of those who were unavailable at the initial contact returned the phone call and answered the questions. Results were analyzed to determine recall of information, and if those who had received the video presentation had greater recall of the subject matter, especially with identification of SBS prevention behaviors.

Table 2. Pre and post test results

Pre and Post test results for 21/24				
Pre and post response data of participants to the survey (n = 24)				
Question	Pre-test		Post-test	
	Yes (%)	No (%)	Yes (%)	No (%)
#1 Knowledge of SBS?	21 (87.5)	3 (12.5)	21 (88)	0
#2 Causes injury?	22 (91.67)	2 (8.33)	21 (88)	0
#3 Types of injuries?	18 (75)	6 (25)	21 (88)	0
#4 Injuries permanent?	19 (79.17)	5 (20.83)	21 (88)	0
#5 How is SBS prevented?	9 (37.50)	15 (62.5)	21 (88)	0

All of the mothers contacted recalled information about SBS/AHT, types of injuries, and specific behaviors that could be utilized to prevent the injury. With 21/24 answering (see Table 3), the percent of retention was 88%. However, when the population was revised to only include those mothers who were contacted or chose to return the phone call, the results confirmed 100% retention of information (see Table 4).

Table 3. Subjects' demographics for respondents

Subjects; demographics for 21 respondents completing study			
	Age	Mean ± SD	Percentage
Mother's age in years, range	18-38	26.6 ± 6.13	
Infant's age in days, range	1-2	1.24 ± 0.44	
Race			
Caucasian	9		42.86
African American	11		52.38
Hispanic	1		4.76
Marital status			
Married	11		47.62
Single	10		52.38
Education			
Some high school	2		9.52
High school diploma or GED	5		23.81
Some college	7		33.33
Associate degree	1		4.76
Undergraduate college degree	3		14.29
BSN	2		9.52
MD	2		4.76

Table 4. Pre and Post test results for respondents

Pre and Post test results for 21/21				
Pre and post response data of participants to the survey (n = 24 initially, 21 respondents completing follow-up)				
Question	Pre-test		Post-test	
	Yes (%)	No (%)	Yes (%)	No (%)
#1 Knowledge of SBS?	19 (90.48)	2 (9.52)	21 (100)	0
#2 Causes injury?	19 (90.45)	2 (9.52)	21 (100)	0
#3 Types of injuries?	18 (76.19)	3 (23.81)	21 (100)	0
#4 Injuries permanent?	17(80.95)	4 (19.05)	21 (100)	0
#5 How is SBS prevented?	8 (38.1)	13 (61.9)	21 (100)	0

4 Discussion and conclusion

The objective of this study was to initiate an education program about SBS/AHT and to inform parents about the injuries that can occur if an infant is shaken. Presenting the information as verbal and written information, or with the additional enhancement of a video presentation, was utilized to determine if there was a more effective teaching method. Nearly all of the mothers approached did agree to participate in the study. Follow up telephone interviews requested the maternal parents to give verbal recall of the information which had been presented. Comparison of the two different presentations did not validate the most effective method. However, while mothers watched the video they often expressed dismay at seeing the injuries schematically presented on the video. This may reinforce the benefit of the video presentation as it allowed the information presented to be enhanced through a clear visualization of the mechanism of shaking an infant, and the resulting injuries.

SBS/AHT is a devastating cause of non-accidental traumatic brain injury in infants and children less than 36 months of age. It is a preventable injury and the incidence can be reduced through comprehensive education programs for parents and caregivers of infants and young children.

Every infant who is discharged from a newborn nursery should be sent home with parents who are equipped to care for them. By initiating educational programs, parents can receive positive guidelines to help them cope with children who have special needs, need extra attention, or simply cry for long periods. Parents are also encouraged to share this information with anyone who would help them care for their baby. Infants who sustain injuries after being shaken are hospitalized for longer periods than those with accidental head trauma^[25]. The increased costs during hospitalization may continue after discharge as the children require more frequent follow up, and extensive care may continue for years.

With the positive response to this basic program, it can easily be expanded to all parents who have infants in the Well Baby Nursery or NICU at MCG. A long term goal would be to include all other hospitals in the region where care is provided to newborn and high risk infants and their families. Goulet^[26] and colleagues developed a SBS Prevention program at two Canadian hospitals. Nurses received a training session and were responsible for presenting the materials to parents. Instruction included information about infant crying, SBS, and coping strategies. Both parents and nurses found the information useful and beneficial. Another study^[27], evaluated the effectiveness of educational materials. This group also utilized materials from the National Center on SBS. Education was presented during the prenatal period, on the postpartum unit, and during well baby care, and compared results to a control who did not receive the education. Mothers found the information beneficial, and shared prevention behaviors with other care givers. Continuing education programs such as this may reduce the incidence of SBS/AHT among infants who were born or hospitalized at the hospital at the Medical College of Georgia and other hospitals within the region. Long term benefit may only be measured through analysis to determine if there is a significant decrease in incidence of SBS when an education program has been established. Strong families will enhance the development of healthy children, and everyone will benefit.

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