American Journal of Pediatrics
2020; 6(2): 129-132
http://www.sciencepublishinggroup.com/j/ajp
doi: 10.11648/j.ajp.20200602.22
ISSN: 2472-0887 (Print); ISSN: 2472-0909 (Online)

Review Article

Discussing the "First Cry" as an Initial Assessment for Neonates

Georges Pius Kamsu Moyo*, Joel Romaric Momo Tetsiguia

Faculty of Medicine and Biomedical Sciences, University of Yaoundé I, Yaoundé, Cameroon

Email address:
kamsuzicfried@yahoo.fr (G. P. K. Moyo)

*Corresponding author

To cite this article:
Georges Pius Kamsu Moyo, Joel Romaric Momo Tetsiguia. Discussing the "First Cry" as an Initial Assessment for Neonates. *American Journal of Pediatrics*. Vol. 6, No. 2, 2020, pp. 129-132. doi: 10.11648/j.ajp.20200602.22

Received: February 7, 2020; **Accepted**: February 19, 2020; **Published**: March 17, 2020

Abstract: Background: Crying is common in newly born infants. For many years, it has been considered as a sign of vitality and wellbeing in neonates. However, recent studies have shown that the most important event in neonates' adaptation to extra-uterine life is "breathing". Nevertheless, there seems to be multiple organ systems involvement in the act of crying which can be compared with conventional assessments for newly born infants. This review aims at describing the act of crying in newborns, in order to discuss its physiological or pathological significance, so as to elucidate or deny its importance in the initial assessment of a newborn. Method: A review of the literature which was based on the collection and the screening of various scientific articles treating the topic was made, with relevant information reported and their pertinence discussed accordingly. Results: It appears that there is multiple organ systems involvement during crying which can be superposed to conventional assessments such as the Apgar score. Conclusion: The first cry may be considered as an assurance of effective and spontaneous breathing, and is generally associated with multiple organ system involvement, similar to those evaluated by conventional assessments such as the Apgar score. Therefore, the "first cry" alone when present, may be effective in the initial assessment of a neonate, as far as adaptation to extra uterine life is concerned.

Keywords: First Cry, Apgar Score, Adaptation

1. Introduction

Most newborns cry after birth, though it is possible to have a healthy newborn without crying [1]. Right back from centuries ago, the first cry of the newly born has always been a significant event during delivery, being assimilated to "the birth of a baby full of life" [1, 2]. With time, it became a natural expectation that the newborn infant should cry, but this is not always the case in daily clinical practice as crying is not indispensable for the neonate's adaptation to extra-uterine life [1, 2]. The high activity rate of a neonate which occurs during vigorous crying with high amplitude movements is generally reassuring, while an abnormal or a weak cry may set anxiety both for the medical staff, the mother and family [3]. Some decades ago, non-crying was automatically correlated with reduced activity and hence altered health state in neonates [3]. The most irritable neonates thus appeared to be the most active ones, and so systematic gestures to provoke the first cry of babies after delivery was practiced in order to fulfill expectations [1]. However, such practices have gradually been abandoned except in remote areas where there is limited resource settings, especially for neonatal resuscitation [2]. It has been suggested that crying from a healthy newborn is typically powerful, clearer and more rhythmic while that from newborns with health problems are not [1]. Though there is evidence that training improves perception abilities of listeners, there is marked variation in the ability to distinguish cries and their causes due to individual bias [4-7]. This led to the introduction of spectrometric techniques to study cry sounds of normal and ill neonates based on the fundamental frequencies (Fo), which may correspond to the most determining frequency of an emitted sound [7]. Over the years, there has been considerable and outstanding research in the field of diagnoses pertaining to the act of crying in newborns [8-10].

2. Background

Crying in newborns may be induced by variations of environmental parameters between intrauterine and extra-uterine conditions [7-9]. But yet, very little is known about endogenous and exogenous factors influencing the onset of the first cry in a healthy infant immediately after birth. The first cry of a neonate may provide substantial information about its past, present and future condition [1].

Recent studies related to fetal auditory learning and memory revealed that the fetus is highly attracted to its mother's voice, including the melodic nature of her speech, unlike other external voices which are dampened by the mother's abdominal wall [11-13]. Therefore, the mother's voice seems to be the most important acoustic speech source from which the fetus can learn how to cry [14-16]. Even though obstetrical ultrasound studies of the fetus have shown facial mimics which are similar to infant crying, there is evidence that linguistic and prosodic language properties are processed by distinct neuronal arcs during the first day after birth [17, 18]. The learning process of crying in the fetus might thus include inputs from language specific influences that may affect the characteristics of crying outputs. In effect, according to some authors, prenatal exposure to maternal language might shape the newborn's crying melody and pitch [19, 20].

Some hypotheses have been emitted on a possible relationship between crying, activity, weight and health condition in neonates [3, 21]. However, it was later on realized that infants with questionable health status and low birth weights could produce sounds with quite high fundamental frequencies (Fo), even though activity could vary according to weight [3, 21]. Crying may signal body needs or distress, suggesting that a vigorous first cry may not only indicate wellbeing but rather reflect a request for rapid intervention to a potential life-threatening illness [2, 3]. Therefore, the quality of the first cry may represent a subtle indicator reflecting various ways of starting life by providing information about the baby's wellbeing, adaptation to extra-uterine life and future physical, mental or emotional developments [2, 3].

A number of earlier studies had equally questioned the relationship between the mode of delivery and the newborn's first cry [1, 22, 23]. The results seemed to conclude that there are significant differences between neonates delivered by vaginal route and those from caesarean section [1]. Various justifications advanced were mainly based on the type of caesarean section being elective with spinal anesthesia or emergency caesarean section with general anesthesia [3]. In effect, the intensity of neonatal sedation was higher with general anesthesia, which is often practiced in case of emergency caesarean sections [1]. Moreover, vaginal delivery is strenuous with extra stimulation of the neonate, while elective caesarean section delivery is less stressful with little or no corticoid-induced pulmonary liquid resorption which might cause transient tachypnea in neonates, preventing them from crying [1, 3].

Some authors estimate that crying is increased in the first born of a family compared to the subsequent ones [24, 25]. In a same neonate, the intensity of crying is thought to increase from birth to reach a maximum at four to six weeks, after which it declines [24, 26]. Newborns may possess a wide set of behaviors involving crying for regulating their internal biological state as well as for exchanges with the external environment [27]. Therefore, neonates may manipulate their vocal fundamental frequencies so as to communicate a variety of intentions and emotions reflecting neurophysiological processes [1-3].

3. The Physiology of Crying

Crying in neonates is a complex neurophysiological act which occurs in response to particular stimulations such as changes in the external environment, pre or perinatal stress, hunger, pains, anger, sleepiness [7, 28, 29]. The crying response is regulated by structural or functional changes in neurological structures such as the hypothalamus, the amydala, the caudal periaqueductal region and the cranial nerves mainly [7]. While peripheral phonatory effector organs involve the lungs, the respiratory airways, the vocal cords, the subglottic and supraglottic cavities essentially [7]. Pressurized air expulsed from the lungs through the respiratory airways causes rhythmic oscillations of the vocal cords, alternating condensation and rarefaction of air streams to produce sound waves [2, 7]. The sound waves are then amplified by the subglottic and supraglottic cavities of the larynx which act as resonance cavities [2, 7]. Therefore, phonation may be resumed as the result of periodic oscillations of the vocal cords and adequate amplification [7]. A high-pitch may be defined as a hyper phonation, while low-pitch corresponds to hypo phonation and dysphonia may be considered as an irregular phonation characterized by alternating hyper and hypo phonations [2, 7].

From a respiratory point of view, crying may equally be described as a series of four movement phases which may be assimilated to adults' vasalva manoeuver [29]. It starts with a short, rapid, strenuous inspiration known as the strain phase, followed by exhalation or expiration known as the sigh phase, after which a pause corresponding to the non-phonatory phase occurs [2, 7, 29]. Then follows an inspiratory gasp that precedes the next cry [2]. It therefore appears that the act of crying includes psycho-neurological, respiratory, musculoskeletal, energy producing metabolism including cardiovascular and genetic involvements [2, 7, 29]. Disorders in one or more of these determinants might be responsible for a defective crying process [2, 7, 28, 29].

4. Effects and Impact of the First Cry

Though a vigorous cry at birth might announce to all that the infant is alive and breathing well, it may be associated with a number of physiological and pathological changes in various organ systems which can be interpreted in one way or another [2, 3].

Under normal circumstances, neonates exhibit

neurophysiological control over crying, but the intensity of the stimulant may as well determine its pitch and duration [2, 30, 31]. The crying of newborn infants has a fundamental frequency which normally varies between 400–600 cycles per second [32]. In some ill neonates, this frequency may be increased, especially in those with diseases affecting the central nervous system [2]. In effect, in case of brain injury, it is believed that the fundamental frequency may carry information which are characteristic of brain dysfunction [8, 10, 33].

Extreme and rapid variations of the intrathoracic and esophageal pressures within normal range in most newborns are attained during crying [7]. An increase in pressure of about 60 cm H_2O recorded in the process may be necessary for the clearance of the respiratory airways from liquid or mucoid secretions [7]. In critically ill neonates with respiratory distress syndrome, polypnea and grunting has been found to decrease with increasing frequency of crying [7]. A decline in the blood oxygen partial pressure (PaO_2) of about 16.8 mmHg has been reported during crying, while no considerable variation in blood partial pressure of carbon dioxide (PCO_2), pH or base excess has been noted [7]. In case of acute hypoxia, chemoreceptors in the carotid and aorta are stimulated, thereby exciting their innervating neurons. The immediate response is a hypothalamus-mediated modification of breathing and vasodilation so as to improve oxygenation and blood supply to body organs. The fact that no significant variation in PCO_2, pH or base excess occur may indicate that the change in PaO_2 is harmless, and induces a physiological response which is otherwise beneficiary for the organism [7].

The first gasp together with cutting of the umbilical blood supply helps to decrease pressures in the pulmonary system and the right heart [2, 29]. This is responsible for the closure of shunts such as the foramen ovale and doctus arteriosus as pressures in the left heart rises [10]. Marked increases in the pulse rate close to 19 beats, and increases in the blood pressures of about 135% have as well been reported during the first phase of crying [7]. This punctual increases in cardiovascular parameters may result from the inversion of pressures in the circulatory system and may help maintain noble organ perfusion and body temperature [7].

The act of crying mobilizes skeletal muscles of the limbs and smooth muscles such as the diaphragm with useful amelioration of tonus and energy production [7, 28, 29]. However, the various modifications noted during crying in the newly born, may have punctual or instantaneous beneficiary effects, but may be deleterious on a long course [2, 7, 28, 29].

5. Conclusion

The primum movens in newborns' adaptation to extra-uterine life is "breathing", which may be accompanied by crying or not. Crying is a neurophysiological reflex immediately after birth and becomes more adapted and regulated with neurological maturation. Nevertheless, the first cry may be an assurance of effective and spontaneous breathing, and is generally associated with multiple organ system involvement, which can be superposed to conventional assessments such as the Apgar score. Therefore, the "first cry" alone though not compulsory, may be effective in the initial assessment of a neonate when present, as far as adaptation to extra uterine life is concerned.

Author Contributions

The 1st author participated in all steps of the study, the 2nd author reviewed the article.

Conflict of Interest

The authors declare that they have no competing interest.

Acknowledgements

All collaborators to the project.

References

[1] Makoi Z, Takacs G. Analysis of the first cry of the newborns in case of vaginal delivery and caesarean section. 8th IFAC Symposium on Biological and Medical systems. 2012; 45 (18): 478-483.

[2] Ludington-Hoe SM, Cong X, Hashemi F. Infant crying nature, physiologic consequences and select interventions. Neonatal Netw. 2002; 21 (2): 29-36.

[3] Korner AF, Kraemer HC, Haffner ME, Thoman EB. Characteristics of crying and non-crying activity of full-term neonates. Child Dev. 1974; 45 (4): 953-958.

[4] Gupta JM, Scopes JW. Observations on blood pressure in newborn infants. Arch. DIS. Child. 1965; 40 (214): 637-644.

[5] Lind J, Stern L, Wegelius C. In: Human Fetal and Neonatal Circulation. Thomas. Springfield, IL. 1964 p. 39.

[6] Moss AJ, Duffie ER, Emmanouilides G. Blood pressure and vasomotor reflexes in the newborn infant. Pediatrics. 1963; 32: 175-9.

[7] Dinwiddie R, Richter-wilmott R, Scwartz JG, Shaffer TH, Fox WW. Cardiopulmonary changes in the crying neonate. Pediatr Res. 1979; 13 (8): 900-3.

[8] Wasz-Höckert O, Michelsson K, Lind J. Twenty-five years of Scandinavian cry research. Infant crying. In: Boukydis C, Lester B, eds. Infant Crying. Theoretical and Research Perspectives. Springer Verlag. 1985: 83–104.

[9] Fuamenya NA, Robb MP, Wermke K. Noisy but effective: crying across the first 3 months of life. J Voice. 2015; 29: 281–286.

[10] Michelsson K. Cry analyses of symptomless low birth weight neonates and of asphyxiated newborn infants. Acta Paediatr Scand Suppl. 1971; 216: 1–45.

[11] May L, Byers-Heinlein K, Gervain J, Werker JF. Language and the newborn brain: does prenatal language experience shape the neonate neural response to speech? Front Psychol. 2011; 2: 222. doi: 10.3389/fpsyg.2011.00222.

[12] Jardri R, Houfflin-Debarge V, Delion P, Pruvo JP, Thomas P, Pins D. Assessing fetal response to maternal speech using a noninvasive functional brain imaging technique. Int J Dev Neurosci. 2012; 30: 159–161. doi: 10.1016/j.ijdevneu.2011.11.002.

[13] Webb AR, Heller HT, Benson CB, Lahav A. Mother's voice and heartbeat sounds elicit auditory plasticity in the human brain before full gestation. Proc Natl Acad Sci USA. 2015; 112: 3152–3157. doi: 10.1073/pnas.1414924112.

[14] Byers-Heinlein K, Burns TC, Werker JF. The roots of bilingualism in newborns. Psychol Sci. 2010; 21: 343–348. doi: 10.1177/0956797609360758.

[15] Moon C, Lagercrantz H, Kuhl PK. Language experienced in utero affects vowel perception after birth: a two-country study. Acta Paediatr. 2013; 102 (2): 156–60. doi: 10.1111/apa.12098.

[16] DeCasper AJ, Fifer WP. Of human bonding: newborns prefer their mothers' voices. Science. 1980; 208 (4448): 1174–6.

[17] Gingras J, Mitchell E, Grattan K. Fetal homologue of infant crying. Arch Dis Child Fetal Neonatal Ed. 2005; 90 (5): 415-418.

[18] Vannasing P, Florea O, González-Frankenberger B, Temblay J, Paquette N, Safi D et al. Distinct hemispheric specializations for native and non-native languages in one-day-old newborns identified by fNIRS. Neuropsychologia. 2016; 84: 63–69.

[19] Wasz-Höckert O, Lind J, Vuorenkoski V, et al. The Infant Cry. A Spectrographic and Auditory Analysis. London: Heinemann. 1968.

[20] Wermke K, Teiser J, Yovsi E, Kohlenberg PJ, Wermke P, Robb M et al. Fundamental frequency variation within neonatal crying: does ambient language matter? Speech Lang Hear. 2016; 19 (4): 211-217.

[21] Rautava L, Lempinen A, Ojala S, Parkkola R, Rikalainen H, Lapinleimu H, et al. Acoustic quality of cry in very-low-birthweight infants at the age of 1 ½ years. Early Hum Dev. 2007; 83: 5-12.

[22] Dimitriou G, Greenoug A, Dyke H, Rafferty GF. Maximal airway pressures during crying in healthy preterm and term neonates. Early Hum Dev. 2000; 57 (2): 149–156.

[23] Taylor A, Fisk NM, Glover V. Mode of delivery and subsequent stress response. Lancet. 2000; 355 (9198): 120.

[24] Brazelton TB. Crying in infancy. Pediatrics 1962; 29: 579-88.

[25] Aldrich CA, Sung C, Knop C. The crying of newly born babies. The individual phase. J Pediatr 1945; 27: 89-96.

[26] Bell SM, Ainsworth MOS. Infant crying and maternal responsiveness. Child Dev. 1972; 43: 1171-90.

[27] Wermke K, Robb MP. Fundamental frequency of neonatal crying: does body size matter? J voice. 2010; 24 (4): 388-94.

[28] Douthitt TC, Brackbill Y. Differences in sleep, waking, and overt activity as a function of prone or supine resting position in the human neonate. Psychophysiology. 1972; 9: 99-100.

[29] Griffiths E, Chapman N, Campbell D. An apparatus for detecting and monitoring movement. Am J Psychol. 1967; 80 (3): 438-441.

[30] Wermke K, Mende W, Manfredi C, Bruscaglioni P. Developmental aspects of infant's cry melody and formants. Med Eng Phys. 2002; 24: 501-514.

[31] Baeck H, de Souza M. Longitudinal study of the fundamental frequency of hunger cries along the first 6 months of healthy babies. J Voice. 2007; 21: 551-559.

[32] Lester BM, Anderson LT, Boukydis CFZ, Garcia-coll CT, Vohr B, Peuker M. Early detection of infants at risk for later handicap through acoustic cry analysis. Birth Defects Orig Artic Ser. 1989; 26 (6): 99–118.

[33] LaGasse LL, Neal AR, Lester BM. Assessment of infant cry: acoustic cry analysis and parental perception. Ment Retard Dev Disabil Res Rev. 2005; 11: 83–93. doi: 10.1002/mrdd.20050.