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ADHERENCE TO THE HELPING BABIES BREATHE STRATEGY AT DELIVERY ROOM OF AN INSTITUTION LEVEL II OF CALI (COLOMBIA), YEAR 2017: CROSS SECTIONAL STUDY

Adherencia a la estrategia minuto de oro en sala de partos de una institución de segundo nivel en Cali (Colombia), junio-agosto de 2017: estudio de corte transversal

***Sandra Patricia Moreno-Reyes, MSc*[*1]*; Paola Andrea Calvo-Bolaños, Esp*[2]*; Freiser Eceomo Cruz-Mosquera, MSc*[3]*; Ángela Mayerly Cubides-Munévar, MSc*[4]*; Víctor Hugo Estupiñán-Pérez, MSc*[5]

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ABSTRACT

Objective: To determine adherence, overall and by components, to the Helping Babies Breathe strategy by physicians caring for neonates in an intermediate complexity institution.

Materials and Methods: Cross-sectional study that included live neonates born by spontaneous vaginal delivery and who received care from pediatricians, gynecologists or interns in the delivery room of a university hospital in the city of Cali, Colombia, in 2017. Fetuses with major congenital malformations, twins, and neonates with less than 34 weeks of gestational age were excluded. Sampling was systematic and the sample size was of 150 neonates. Baseline neonatal and maternal characteristics were assessed, as well as adherence to the Helping Babies Breathe strategy by physicians and its components. A descriptive analysis was performed.

Results: Adherence to the Helping Babies Breathe was 65.6% (95% CI 53.8-78.4) for pediatricians, 33.33% (95% CI: 4.3-77.7) for obstetricians and gynecologists, and 75.3% (95% CI: 64.8-85.1) for interns. The lowest frequency was found for cap placement on the neonate's head (64.90%; 95% CI: 56.7- 72.4) and placement of the baby in contact with the mother's skin, (65%; 95% CI: 55.9-74.4); the highest frequency was found for covering the baby with warm blankets (98.6%: 95% CI: 95.3-99.8), and positive pressure ventilation in cases of

* Correspondence: Sandra Patricia Moreno-Reyes, calle 48 # 99-20, barrio Valle del Lili, Santiago de Cali (Colombia). sandra.moreno04@usc.edu.co

1 Respiratory Therapist; Master in Health Management. Faculty, Universidad Santiago de Cali, Comprehensive Health Research Group. Cali (Colombia). sandra.moreno04@usc.edu.co

2 Respiratory Therapist; specialist in Pediatric Respiratory Therapy and Health Management, Control and Audit. Faculty, Universidad Santiago de Cali. Cali (Colombia). paola.calvo00@usc.edu.co

3 Respiratory Therapist; Specialist in Pedagogy and Teaching; Master in Epidemiology. Faculty, Universidad Santiago de Cali, Comprehensive Health Research Group. Cali (Colombia). freiser.cr uz00@usc.edu.co

4 Intern physician, Universidad Santiago de Cali; Respiratory Therapy Professional; Occupational Health Management Specialist; Master in Epidemiology. Faculty, Universidad del Valle, Fundación Universitaria San Martín, Public Health Research Group. Cali (Colombia). angela.cubides00@usc.edu.co

5 Respiratory Therapist; Master in Education. Faculty, Universidad Santiago de Cali, Comprehensive Health Research Group. Cali (Colombia). vestupinan@usc.edu.co

absent response to initial stimulation (100%; 95% CI 30-100).
Conclusions: Results pertaining to the degree of adherence on the part of the practitioners suggest the need to implement continuous education and evaluation processes focused on the application of this proven strategy in institutions offering childbirth care.
Key words: newborn; asphyxia; neonatal mortality; basic cardiopulmonary resuscitation.

RESUMEN

Objetivo: determinar la adherencia global y por componentes a la estrategia minuto de oro en médicos que atienden recién nacidos en una entidad de mediano nivel de complejidad.
Materiales y métodos: estudio de corte transversal; se incluyeron recién nacidos vivos de partos vaginales espontáneos atendidos por médicos pediatras, ginecólogos o internos en sala de partos de un hospital universitario de la ciudad de Cali, Colombia, en el 2017. Se excluyeron fetos con mal- formaciones congénitas mayores, gemelares y con menos de 34 semanas de edad gestacional. Muestreo sistemático. Tamaño muestral: 150 recién nacidos. Se evaluaron las características basales de los recién nacidos y sus madres, y la adherencia a la estrategia minuto de oro y sus componentes. Se hizo análisis descriptivo.
Resultados: la adherencia al minuto de oro en médicos pediatras fue del 65,6 % (IC 95 %: 53,8-78,4), en ginecobstetras, de 33,33 % (IC 95 %: 4,3-77,7), y en médicos internos, de 75,3 % (IC 95 %: 64,8-85,1). La menor frecuencia se dio en la colocación del gorro al recién nacido, 64,90 % (IC 95 %: 56,7-72,4), y poner al bebé piel a piel sobre la madre, 65 % (IC 95 %: 55,9-74,4); la mayor frecuencia se presentó en cubrir al recién nacido con paños calientes, 98,6 % (IC 95 %: 95,3-99,8), y la ventilación con presión positiva en los casos en los que no había respuesta a la estimulación inicial, 100 % (IC 95 %: 30-100).
Conclusiones: los resultados obtenidos sobre el grado de adherencia de los profesionales sugieren la necesidad de realizar procesos continuos de educación y evaluación sobre la aplicación de esta estrategia de reconocida efectividad en las instituciones que ofrecen el servicio de atención de partos.
Palabras clave: recién nacido; asfixia; mortalidad neonatal; reanimación cardiopulmonar básica.

INTRODUCTION

Neonatal mortality is defined as death occurring within the first 28 days of life; the term encompasses early and late mortality, occurring within the first 7 days and between 7 and 28 days, respectively (1). In 2016, the World Health Organization (WHO) estimated that, 2.6 million infants died in the world within the first month of life; of them, 1 million died on the first day and 1 million died within the next six days (2). In 2015, in high income countries like Germany, Australia, Finland, Iceland, Singapore and the United States, or in low income countries like Cuba, neonatal mortality ranged between 0.9 and 3.5 for every 1000 live births. In contrast, in Latin American, frequency ranged between 8.5 and 13.5 in 1000 live births in Costa Rica and Colombia, respectively (3). According to the Epidemiological Bulletin (*Boletín epidemiológico)* of the Colombian National Institute of Health, the main causes of neonatal death in Colombia are prematurity (24%), other causes (22.5%) and neonatal asphyxia (22.2) (4).

Neonatal asphyxia is defined as oxygen deprivation or reduction in neonatal organ perfusion; in the majority of cases (90%) this condition originates in events taking place before or during childbirth. However, there is a non-negligible proportion of neonates who die from cardiopulmonary failure or neurological impairment during the postpartum period (5). Asphyxia may result in hypoxic-ischemic encephalopathy, high rates of neurological sequelae and multiple organ damage, leading to increased healthcare costs not only for the system but for the

family as well (6). At present, this condition is still a clinical challenge given the significant associated mortality rate (7).

Although neonates are physiologically equipped to adapt to their environment in response to stimuli, either chemical (changes in arterial oxygen pressure), neurological (respiratory center stimuli), sensory (touch, drying), thermal (going from a warm fluid to a dry and cooler environment) or mechanical (going through the birth canal) (8), it is also true that birth is one of the most decisive and sensitive moments for the viability of the neonate (9); and although 90% of the neonates do not need any help to take their first breath, close to 10% need some form of support (10). Consequently, healthcare professionals who participate during this critical event should have the knowledge and skills required to ensure that the neonate can adapt adequately to the extra-uterine environment, and to respond effectively in the event additional interventions are required to initiate breathing within the first minute after birth (11-13).

to the Helping Babies Breathe consists of a logical sequence of steps designed to respond to the needs of the neonate at the time of birth, helping it to adapt. These include providing warmth, drying it thoroughly, suctioning the airway if needed, checking for breathing or crying, and cutting the umbilical cord. In vigorous term babies, these steps may be carried out on top of the mother's abdomen, promoting skin contact to create warmth and initiate early bonding. However, in cases in which breathing is not established after performing the initial steps, positive pressure ventilation is provided immediately so as not to delay the onset of breathing and avoid the consequences of asphyxia. All this must be done within the first minute of life (14). This first minute strategy, also known as "Helping Babies Breathe," (HBB) was first implemented in 2010 with the aim of training midwives as well as physicians in rural settings and birthing units in these steps (15, 16). Goudar *et al*. (17) evaluated the effectives of this strategy in reducing fetal demise and mortality before neonatal discharge. Using a before-and-after design in which they included 4187 neonates before the training and 5411 after the training, they found that cases of fetuses that did not respond adequately to neonatal resuscitation, considered as recent fetal demises (fetuses that did not initiate cardiac activity and were not macerated) went down from 3 to 2.3% (OR = 0.6; 95% CI: 0.59-0.98), although mortality before discharge was 0.1% during the two time periods. On the other hand, Msemo *et al*. (18) report that, after implementing training in the HBB strategy in eight hospitals in Tanzania during a period of 6 to 9 months, they found a substantial reduction in the frequency of neonatal deaths in the first 24 hours (RR=0.53; 95% CI: 0.43- 0.65) and in the proportion of recent fetal demises (RR = 0.76; 95% CI; 0.64-0.90); and in terms of the resuscitation steps, the use of stimulation and suctioning increased from 47 to 88% and from 15 to 22%, respectively.

Given that the implementation of the Helping Babies Breathe strategy requires a trained multidisciplinary team, the Colombian Ministry of Health and Social Protection, with the support of the Colombian Society of Neonatology and the regional health secretariats, has implemented since 2012 a series of workshops designed to train healthcare professionals involved in childbirth (19).

Little is known regarding the result of the implementation of this strategy in terms of compliance, acceptability, feasibility, relevance, costs, coverage, sustainability, or safety and efficacy (20).

Hence the objective of this study of determining compliance with the Helping Babies Breathe strategy among professionals and medical interns providing care in the delivery room of a general, intermediate complexity institution.

MATERIALS AND METHODS

Design and population. Cross-sectional study that included live neonates born by spontaneous vaginal delivery and received by pediatricians, gynecologists

and interns in the delivery room of an intermediate complexity teaching hospital in the city of Cali. The institution is private and serves a population affiliated to the insurance regime subsidized by the state within the Colombian Social Security System. Cases in which ultrasound had revealed the presence of major congenital malformations, twin pregnancies and fetuses of less than 34 weeks of gestation were excluded. A checklist comprising 23 items was developed to verify the conditions related to infrastructure, human resources and delivery room technology. High compliance was considered to exist with 23-20 items, intermediate between 19 and 16, and low with less than 16 items. After applying the checklist, it was found that the area showed high compliance (22 of the 23 items) with the requirements evaluated; "ambient temperature" was the item which could not be verified and was rated as "unmet".

Sample size was estimated using as a reference the mean number of vaginal deliveries over the study period (June-August) of the previous year, excluding instrumented deliveries (n = 534 neonates), 5% random error, expected adherence proportion of 84%, and 95% reliability; the finite population factor was taken into account, and the final sample selected was 150 births.

Systematic random sampling was performed. The Epidat 3.1 software package was used for the calculation.

Procedure. Two respiratory therapy professional and one fieldwork coordinator previously trained by the research team were responsible for data collection. They rotated to ensure a constant presence in the delivery room of the institution during a three-month period. Births that had a pre-assigned place were included based on two considerations: starting point (selected randomly between 1 and K) and skip calculated using the formula K = N/n (534/150 = 4). If the event did not meet the criteria, they waited for event in the next position.

The research team designed a checklist to verify that all the steps comprising the Helping Babies Breathe strategy were performed. The checklist was submitted for evaluation by experts in order to determine validity of the content and whether it actually evaluated adherence to the Helping Babies Breathe during neonatal care. Additionally, the type of professional and degree of experience was established. A pilot test was then run with a sample of 10 neonates, which resulted in changes to two items of the questionnaire and improvements in the wording of the instructions. Finally, a checklist consisting of 12 items was obtained (Table 2). The checklist was completed after every birth. High compliance with the strategy (high adherence) was defined ≥ 10 correctly performed steps.

Healthcare professionals and interns attending to the neonate were asked for permission to obtain information about the birth.

Measured variables: The following variables were considered: a) neonate-related: gestational age; b) Helping Babies Breathe-related: placement of the cap, cutting the umbilical cord and positive pressure ventilation evaluated in those cases in which the neonate did not respond to initial stimulation; in those cases, the availability and readiness of biomedical devices for nose or mouth suction was also evaluated (only evaluated in cases of absent breathing or crying); c) healthcare professionals and student-related: medical specialty or medical student (interns); work experience and date of the last training in neonatal resuscitation in the context of continuing education. These variables were measured in a dichotomic way. To evaluate the quality of the information, double entry and review of the forms by the fieldwork coordinator were done; likewise, completeness and sufficiency were also evaluated on a random selection basis.

Statistical analysis. The Stata software package version 14 was used for analyzing the information. Quantitative variables were expressed as central

trends and their respective scatter measures (interquartile range [IQR] for the median and standard deviation for averages), and ordinal and nominal variables were described in terms of frequency and percentages.

Ethical considerations. The research study was approved by the ethics committee of Universidad Santiago de Cali in a session held on February 2, 2017, and by the ethics committee of the health institution under number CEIHS- JD0015-017. All of the participants completed informed consents in writing and their information was treated as confidential.

RESULTS

Overall, 151 neonates were finally included in the study (Figure 1); in the sampled population, there was a larger frequency of male neonates (56%), with an average birth weight of 3252 g (standard deviation [SD] ± 481); the average gestational age in the study population was 39 weeks (SD ± 1.27). Apgar scores were 8 at 1 minute and 9 at 5 minutes in 50% of the neonates, with 1% having an Apgar score between 1-3, 25% between 4-7, and 74% more than 8 (Table 1).

Mothers of the neonates recognized themselves as being of mestizo ethnicity in 87% of cases; 8 out of 10 were living in free union; 40% had completed secondary education and only close to 3% had technical training; 90% lived in the urban area, and 87% belonged to the subsidized health insurance regime (Table 2).

In terms of the staff that executed the Helping Babies Breathe strategy, the majority (53%) were interns, followed by pediatricians (43%) and gynecologists (4%), the latter two having an average experience in the area of 7 years (SD± 6).

When adherence to the Helping Babies Breathe was evaluated by physician level of training, adherence among gynecologists was found to

Figure 1.

Distribution of neonates included in the study on adherence to the Helping Babies Breathe strategy in a Level II institution in Cali (Colombia), June-August, 2017

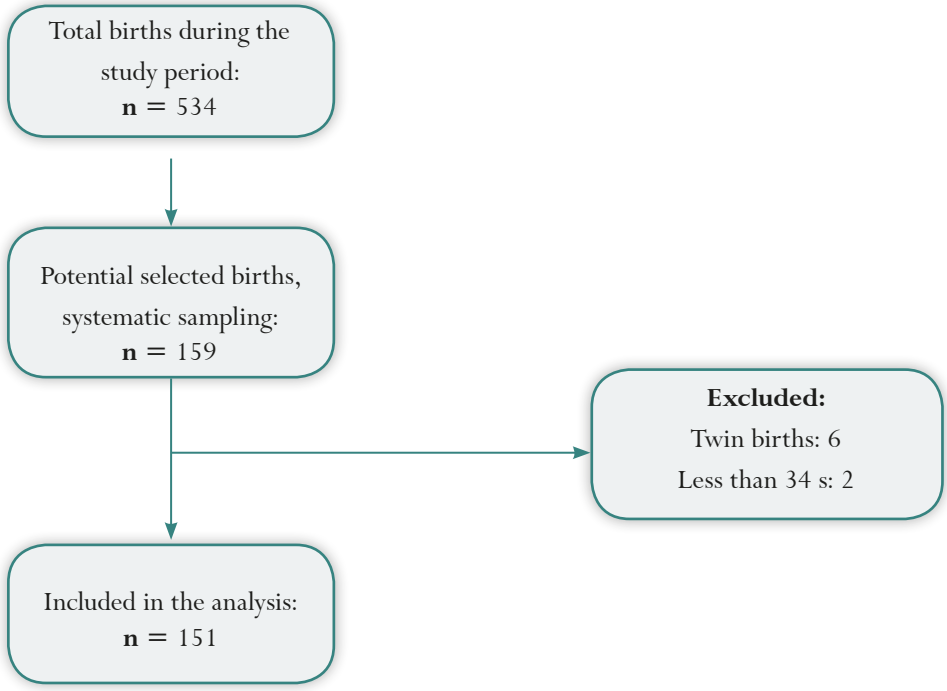

Table 1.
Sociodemographic characteristics of the neonates in which adherence to the Helping Babies Breathe was evaluated in a Level II institution in Cali (Colombia), June-August, 2017

Variable	n= 151	%	95% CI
Gender			
Female	67	44	36.1-52.6
Male	84	56	47.3- 63.8
Birth weight	Mean	SD	
	3253 g	481	3175-3330 g
Gestational age	39 SS	1.27	38.8-39.2
1 minute Apgar	Median	IQR	
	8	7-8	
5 minute Apgar	Median	IQR	
	9	9 -10	

be 33.3% (95% CI: 4.3-77.7), and 65.6 (95% CI: 53.8-78.4) and 75.3% (95% CI: 64.8-85.1) among pediatricians and interns, respectively. As relates to the Helping Babies Breathe steps, highest compliance was found for positive pressure ventilation when there was poor response to initial stimulation (100%; 95% CI: 30-100) and for the availability and readiness of medical devices (98%; 95% CI: 94.3-99.5). Steps for which low compliance was found were placing the cap on the neonate's head (64.9%; 95% CI: 56.7-72.4), followed by "skin-to-skin" contact between mother and baby (65%; 95% CI: 55.9-74.4) (Table 3).

Regarding time elapsed between the last training in neonatal resuscitation and the time of the study, 74% had received training more than 6 months before (64% more than one year before).

DISCUSSION

The initial few hours after birth are critical for neonatal survival (21). For this reason, knowing and correctly implementing strategies such as the "Helping Babies Breathe" is of the essence. The results found in this study show a 69% overall adherence Helping Babies Breathe strategy – 75.3% for interns, 65.6% for pediatricians and 33.3% for gynecologists– showing that adherence was inadequate. In terms of performing the steps comprised in the Helping Babies Breathe strategy, those with highest compliance were giving positive pressure ventilation when there was poor response, and having medical devices readily available; steps with the lowest compliance where placing the cap on the baby's head and placing mother and baby in skin-to-skin contact.

Our results were superior to those reported by Lindback *et al.* (22), who found, after observing the resuscitation process in 1827 neonates through a video camera in a tertiary hospital in Nepal, that the healthcare staff failed to comply with most of the steps included in the neonatal resuscitation guidelines. They are also superior to those of Gelbart *et al.* (23), who reported that more than 50% of the birth attendants in a referral hospital in Melbourne, Australia, failed to follow some of the guidelines for the initial approach and resuscitation of the neonate.

Regarding the steps comprised in the strategy, Pérez *et al.* (24), in the context of research conducted in two rural health centers in Nicaragua

Table 2.
Sociodemographic characteristics of the mothers of neonates in which adherence to the Helping Babies Breathe was evaluated in a Level II institution in Cali (Colombia), June-August, 2017

Variable	n= 151	%	95% CI
Ethnicity			
Indigenous	2	1.3	0.16 -4.7
African-Colombian	18	11.9	6.4 -17.4
Mestizo	131	86.8	81 -92.4
Mother's age			
< 20	62	41.1	32.8-49.2
20-34	81	53.6	45.3 -61.9
>34	8	5.3	1.3 -9.2
Marital status			
Married	6	4	0.5 -7.4
Single	24	15.9	9.7-22
Free Union	121	80.1	73.4-86.8
Education			
Basic primary	26	17.2	10.8 -23.5
Basic secondary	57	37.7	29.6-45.8
Middle academic	61	40.4	32.2-48.5
Technical professional	3	2	0.4-5.6
Technological	1	0.7	0.01 -3.6
None	3	2	0.4-5.6
Insurance regime			
Contributive	4	2.6	0.7 -6.6
Non insured	13	8.6	3.8 -13.4
Subsidized	134	88.7	83 -94
Place of residence			
Urban suburb	136	90.1	84.9-95.1
Urban center	10	6.6	2.3-10.9
Rural scattered	5	3.3	1 -7.5

Table 3.
Adherence, by step, to the Helping Babies Breathe strategy by healthcare staff attendants in the delivery room in a Level II institution in Cali (Colombia), June-August 2017

Steps in the strategy	No.	%	95% CI
Biomedical devices ready	148	98	(94.3-99.5)
Receiving the baby with clean. warm sponges and gloves	146	96.69	(92.4-98.9)
Placing the baby on the mother for skin-to-skin contact	73	65	(55.9-74.4)
Suctioning the airway	17 (19)*	89.4	(66.8 -98.6)
Drying the baby thoroughly from head to toe	147	97.35	(93.3-99.2)
Removing wet sponges	138	91.39	(85.7-95.3)
Assessing breathing or crying	147	97.35	(93.3-99.2)
Placing cap on baby's head	98	64.9	(56.7-72.4)
Cutting umbilical cord (1 min)	145	96	(91.5-98.5)
Verifying cord ligation	139	92	(86.5-95.8)
Verifying adequate neonate response in time and covering with a warm blanket to avoid heat loss	149	98.68	(95.3-99.8)
Initiating PPV** if no response to suction or stimulus	3(3)	100%	(30-100)

*19 newborns required airway clearance
** Positive pressure ventilation

which assessed compliance with certain neonatal care practices before and after the implementation of the "Helping Babies Breathe" initiative, found that, before the implementation, attendants failed to comply with the step of skin-to-skin contact, while after the implementation, adherence was greater than 56%. On the other hand, when assessing umbilical cord care, they found 85% compliance after the intervention, similar to the figure reported in this study.

This finding adds to the report by Shikuku *et al.* (25) in a total of 138 neonatal resuscitations carried out in the delivery room of the General Regional Hospital in Kakamega county in Kenia where they found adequate provision of bag and mask ventilation in 100% of cases of failed response to initial stimulation and airway maintenance. A warm environment was maintained in 71% of cases. It was found that warm babies were associated with survival in the first hour of life (OR = 3.3; 95% CI: 1.2-8.8).

As relates to the strengths of this study, it is important to highlight that a pilot test was performed before the observation exercise with the aim of verifying the relevance of the checklists implemented. Moreover, the use of random sampling minimizes the possibility of selection bias.

As far as weaknesses are concerned, it is important to mention that the number of obstetricians and gynecologists included was low, deliveries were

not discriminated by attendance hours, and there was no follow-up of the neonates after the first minute. Additionally, considering that nurses and residents did not act as the main leaders in the care of the neonates included in the study, compliance by these healthcare professionals was not measured.

CONCLUSIONS

Results pertaining to the degree of adherence by healthcare staff point to the need of setting up continuing education and evaluation processes for the application of this proven strategy in institutions providing childbirth care services.

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