

Assistance and assessment of the health situation of high-risk newborn children in a Sanitary District of Belo Horizonte: challenges beyond the child survival

Avaliação da assistência e da situação de saúde de crianças recém-nascidas de alto risco de um Distrito Sanitário de Belo Horizonte: desafios para além da sobrevivência infantil

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ABSTRACT

Introduction: Newborns who survive with extreme weight and gestational age, with asphyxia and/or congenital malformations, have increased the risk of morbidity and mortality and demand more health attention. **Objective:** to evaluate the assistance and health situation of high-risk children in the first three years of life and the implementation of the High-risk Newborn Protocol from the Health Municipal Secretary of Belo Horizonte. **Methods:** this was a noncompetitive cohort study of high-risk children (birth weight \leq 2000 grams and/or Apgar $<$ 7 in the fifth minute of life), born in 2006, in a sanitary district of Belo Horizonte-MG, identified in the System of Information on Live Births. The data were collected through an assessment of the children and a structured interview with their parents. We evaluated the actions advocated by the Protocol and considered as: not implemented ($<$ 40%), partially implemented (40 to 79%), and implemented (\geq 80%). **Results:** 165 children were identified; 42 died, 41 of them in the first year of life (infant mortality rate of 248 deaths per 1,000 live births); and 58 were excluded for other reasons. Among the 65 evaluated children, approximately 31, 16.9, 35, and 63.2% were followed-up by the primary health care as advocated; were in a specialized monitoring; were not screened for hearing and prematurity anemia; and were not screened for bone metabolic disease, respectively. The time for breastfeeding and supplementation of vitamins and iron, as well as the use of special vaccines, was also inadequate. **Conclusion:** the monitoring of high-risk children was unsatisfactory because the recommended health actions were partially implemented. The improvement in the attention to these children is necessary to promote their health and quality of life throughout the period set by the program. **Key words:** Infant, Low Birth Weight; Infant, Premature; Asphyxia Neonatorum; Continuity of Patient Care; Health Evaluation.

RESUMO

Introdução: recém-nascidos que sobrevivem com peso e idade gestacional extremos, com asfixia e/ou malformações congênitas apresentam risco aumentado de morbimortalidade, demandando mais atenção da saúde. **Objetivo:** avaliar a assistência e a situação de saúde de crianças de alto risco nos três primeiros anos de vida e a implantação do Protocolo do Recém-Nascido de Alto Risco da Secretaria Municipal de Saúde de Belo Horizonte. **Métodos:** estudo de coorte não concorrente das crianças de alto risco (peso ao nascer \leq 2000 gramas e/ou Apgar $<$ 7 no quinto minuto de vida), nascidas em 2006, em um distrito sanitário de Belo Horizonte-MG, identificadas no Sistema de Informações sobre Nascidos Vivos. Os dados foram coletados por meio de avaliação das crianças e entrevista estruturada com os pais. Foram avaliadas as ações preconizadas pelo Protocolo e consideradas como: não implantadas ($<$ 40%), parcialmente implantadas (40 a 79%) e implantadas (\geq 80%). **Resul-**

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tados: foram identificadas 165 crianças; 42 faleceram, 41 delas no primeiro ano de vida (taxa de mortalidade infantil de 248 óbitos por 1.000 nascidos vivos); e 58 foram excluídas por outros motivos. Entre as 65 crianças avaliadas, aproximadamente 31, 16,9, 35 e 63,2% não tiveram acompanhamento pela atenção primária, conforme preconizado; estavam em acompanhamento especializado; não realizaram a triagem auditiva e de anemia da prematuridade; e não realizaram pesquisa da doença metabólica óssea, respectivamente. O tempo de amamentação e de suplementação vitamínica e férrica, bem como o uso de vacinas especiais, foi igualmente inadequado. Conclusão: o acompanhamento das crianças de alto risco foi insatisfatório, uma vez que as ações de saúde preconizadas foram parcialmente implantadas. É necessário o aprimoramento da atenção a essas crianças para promover sua saúde e qualidade de vida durante todo o período estabelecido pelo programa.

Palavras-chave: Recém-Nascido de Baixo Peso; Prematuro; Asfixia Neonatal; Continuidade da Assistência ao Paciente; Avaliação em Saúde.

INTRODUCTION

The evolution of pre-, peri- and post-natal care has contributed to reduce infant mortality and survival in the increasing number of children born under adverse conditions.¹ Several national^{2,3} and international^{4,5} studies have registered an increasing prevalence of prematurity and low birth weight (BW), both in economically disadvantaged and developed regions. There are some plausible justifications for this fact such as the increase in rates of multiple births due to the expressive use of assisted reproductive techniques, increased number of gestations in women at extreme ages, women with body mass index out of normalcy, medicalization during gestation, delivery with gestational age (GA) estimated in error, pregnancy interruption by induction or elective cesarean section,^{1,5} and mothers with low education.¹

Premature and low birth weight newborns who survive and those born with asphyxia and/or congenital malformations have increased risk of morbidity and mortality, growth alterations, cerebral palsy, attention deficit and hyperactivity disorder, and disturbances in behavior, vision, hearing, motor coordination, and learning.⁶ These disorders vary according to the health condition of the child at birth and unfavorable sociodemographic factors in the family⁶ bringing serious repercussions for life and resulting in medical, educational, psychological, and social high costs.⁶ Other factors, often associated with each other, also contribute aggravating the health situation

of these children such as: family lack of structure, low-income, education, and maternal age,⁷ maternal life habits (licit and illicit drug use and improper environmental conditions); parents anxiety, insecurity, and unpreparedness to care for the child after hospital discharge.¹ Therefore, the care of children at risk represents multiple and long-term challenges not only for the family but for society.

Considering that many of the common alterations in children with high-risk conditions at birth can be prevented or modified with the appropriate intervention at the right time, pediatric organizations in Brazil^{1,8,9} and worldwide¹⁰ recommend to follow up these children in a systematic, comprehensive, and individualized way seeking a bond with the family through guidance for care and early detection of alterations. In general, the proposed monitoring of high-risk newborns (HRNB) advocate basic and specialized health services by a multidisciplinary team with actions of nutritional evaluation, neuro-psychomotor growth and development, immunization, visual and hearing screening, and monitoring of anemia, metabolic diseases, chronic lung diseases, and neurological disorders.^{1,8,10,11}

Despite the importance of monitoring HRNBs during early childhood, few studies evaluate the health assistance provided after their discharge from the maternity ward. However, it is essential to know the reality of such assistance in order to verify their suitability and promote timely interventions about risk factors and aggravations. This article aims to identify a cohort of HRNB children and evaluate their health and assistance situation during the first three years of life according to the "Protocol for Monitoring the High-Risk Newborn"¹¹ from the Municipal Health Secretary of Belo Horizonte (SMSA-BH).

CASUISTRY AND METHODS

This was a non-concurrent population-based cohort study, exploratory and descriptive, with health situation analysis and normative evaluation of the variables in the process related to health monitoring of high-risk children. A cohort of children born in 2006 and residing in the East health district (DISAL) in Belo Horizonte were identified in the Sinasc, selected by presenting the highest infant mortality rate of the municipality in 2006 (15.0 deaths for every 1,000 live births compared to 12.9 for every 1,000 live births in the municipality). DISAL also presented the greatest propor-

tion of NB with Apgar score < 7 in the fifth minute of life (1.9% compared with 1.2% for the municipality). In the study period, DISAL had 14 basic health units (UBS), 49 family health teams (ESF), and 14 pediatricians.

The HRNBs were considered according to the criteria from SMSA-BH for the specific identification and monitoring¹ of those with birth weight less or equal to 2,000 grams and/or Apgar score <7 in the fifth minute of life (proxy of fetal distress or asphyxiation).¹²

A total of 165 children were identified with the inclusion criteria in the Information System about Live Births database (SINASC) and provided by SMSA-BH, born between January 1 and December 31 of 2006. Death was recorded in 42 children (25%) identified in the Information System about Mortality (SIM) between 2006 and 2008, resulting in 123 surviving children.

Children given up for adoption (n=3) and those with incorrect records on birth weight and/or Apgar in the fifth minute in the Sinasc and according to discharge data and the child's health booklet (n=16) were excluded from the study, resulting in 104 eligible children. There was also the loss of 33 children who were not located, four whose parents refused to participate in the study, and two who did not attend the scheduled consultations. A total of 58 children were excluded from the study, 47.2% of the original total. Thus, out of the 65 children who participated in the study (included), 16 were evaluated in UBSs by pediatricians, three in specialized outpatient clinic, and 46 by the researcher in their homes.

DATA COLLECTION

Workshops were conducted with managers and pediatricians from the involved health units for training and operationalization of the study; these professionals were trained to use the research instruments, evaluate neuro-psychomotor development, and identify major expected alterations.

The professionals conducted the examination for child health assessment using their booklets from the Ministry of Health, applied the structured pre-tested questionnaire, and evaluate each child. The former history of each child was reconstituted through the structured interview with their parents and through consultation in the following documents: prenatal card, maternity discharge record, child health booklet, test results, and other health documents provided by the family.

STATISTICAL ANALYSIS

A descriptive analysis of the general characteristics of the cohort's children who died was performed including the main cause of death, socio-demographic causes considering those effectively evaluated (gender, age, race/skin color, residence in risk area measured by the of Health Vulnerability Index,¹³ and type of maternity where they were born), conditions of risk at birth (birth weight, gestational age, weight classification related to gestational age, Apgar score in the first and fifth minutes of life, neonatal resuscitation, congenital malformation or chromosomal anomaly, hospitalization in neonatal intensive care unit, length of stay since birth, and prescription of medicines to use after maternity discharge), and health situation in the neonatal period and at the time of evaluation.

The following actions recommended by the protocol for general monitoring of all children were evaluated: neonatal screening (phenylketonuria, congenital hypothyroidism, sickle cell anemia, and cystic fibrosis); hearing screening; red reflex eye test; number of consultations in health primary care (HPC) in the first and second year of life (appropriate monitoring was considered as: at least six consultations with a pediatrician and four consultations with general practitioners and/or nurse in the first year, and two consultations with a pediatrician in the second year of life in the public health service; 10 consultations with a pediatrician in the first year and two in the second year of life in the private health service not linked with SUS – or additional health); referral to medical specialists and/or rehabilitation and specialist outpatient clinic monitoring. The evaluation of updates in the immunization record card was also conducted; breastfeeding time (recommended up to 24 months), exclusive breastfeeding (recommended up to six months), and attendance to early childhood education institutions were also evaluated.

Other variables were analyzed for children with specific risk conditions at birth as recommended in the protocol³ and some items in the propaedeutic (fundoscopy examination, transfontanellar ultrasonography, echocardiography, long bone x-rays, dosage of serum calcium, phosphorus, and alkaline phosphatase, and premature anemia screening) and therapy (vitamins supplementation for at least 12 months, iron supplementation – minimum of 18 months and special vaccines – fourth dose of hepatitis B vaccine, influenza vaccine, and heptavalent pneumococcal vaccine) of HRNBs.

To analyze the degree of implementation of the HRNB Protocol, the attribution of specific weights for each stage reached by the implementation of the recommended health action was standardized.¹⁴ Therefore, when health actions were performed in less than 40% of eligible children, a score of zero was assigned and the action was labeled as not implemented; for the execution between 40% and 79%, one point was given and the action was considered partly implemented; and for the execution of 80% or more, two points were assigned, and the action was considered implemented. Twenty-one actions were evaluated, constituting a total of 42 points. The percentage difference between the highest and obtained score was used to classify the degree of protocol implementation.

To analyze the possibility of selection bias in relation to children lost in the study, the Chi-square tests of Pearson and Fisher's exact test were used considering 5% level of significance in the evaluation of the Sinasc 2006 variables regarding socio-demographic characteristics (gender, age, race/skin color, and residence in risk area), conditions at birth (PN, IG, Apgar score in the first and fifth minutes, and congenital malformation), maternal characteristics (age, education, marital status, and number of children born alive or dead), prenatal assistance (number of prenatal consultations), and childbirth (maternity and childbirth type). The Statistical Package for the Social Science (SPSS) version 13.0 program was used.

ETHICAL ASPECTS

The study was approved by the Ethics Committees in Research with Human Beings from the Federal University of Minas Gerais under reference ETIC number 419/08, and from the Municipal Health Secretary of Belo Horizonte under reference number 062.2008; the rights of research subjects attested in the Informed Consent signed by the parents were preserved.

RESULTS

Out of 165 newborns from the DISAL 2006 cohort, 107 remained in the study after 58 were excluded. Death before and after one year of age occurred in 41 children and one child, respectively, corresponding to an infant mortality rate (IMR) of 248 deaths in every 1,000 live births. Out of these 41 children, 21 were males; 25 died

in the early neonatal period; nine in the late neonatal period; and seven in the post-neonatal period. Births occurred at less than 28 gestation weeks in 23 children; between 28 and 36 in 13 children; and over 36 weeks in five children. The birth weight was less than 1,000 g in 26 children; between 1,000 and 2,000 g in 8 children; and 2,000 g or more in seven children. The Apgar score in the fifth minute was less than seven in 39 children. The causes of death were associated with prematurity, infection, and other causes in 12, 10, and 19 newborns, respectively. The newborn that died after the first year of life (377 days) had other bronchial diseases non-classified in other parts as the cause of death.

In the evaluated surviving population (n=65), 50.8% were females, 50.8% were black, 41.5% lived in areas of medium health risk, and 69.2% were born in maternity hospitals from SUS-BH. The minimum age at evaluation was 26 months and the maximum was 44 months, with average and standard deviation of 35±4 months and median of 36 months. Prematurity was noted in 55 newborns (85%) with birth weight less than 2 kg (n=56); 61.5% being classified as suitable for the gestational age (SGA). Most children were born with GA between 32 and 36 weeks (58.5%), i.e., they were moderate to late preterm and weighed between 1,500 and 1,999 g (50.8%). The Apgar score was below seven in the first minute of life in about 30% in the studied children; 44.6% were revived at birth (n=29) and orotracheal intubation was the most used procedure (n=17; 58.6%). The Apgar score was less than seven in the fifth minute of life in 15.4% of the children. Approximately 15% (n=10) of the children had congenital malformation, a percentage higher than that registered in Sinasc (n=4; 6.2%) highlighting heart defects as the most common anomaly (n=4). Most of the children were hospitalized in the NICU (n=49; 75.4%) and the average time of stay in the maternity ward was 28.2±25.4 days (minimum zero; maximum 111; median 20). For a quarter of the children, medication, other than multivitamins and iron sulphate given to every child, was indicated after discharge; 95.4% were referred to some health service (29.2% UBS; 27.7% UBS and HRNB outpatient clinic; 13.8% UBS/outpatient clinic and other specialized service; 24.6% private consultation office; and 4.6% no service indicated).

The most frequent diagnoses in neonatal period were: jaundice (75.4%), hyaline membrane disease (50.8%), infections/sepsis/septic shock (44.6%), and anemia (29.2%). It was observed that 4.6% showed hearing loss (n=3); 3.1% visual impairment (n=2); 49.2% some respiratory disease (n=32), being asthma

/ wheezing / bronchitis the main mentioned diagnosis (96.9%); 7.7% heart alteration (n=5); and 13.9% neurological alteration (n=9). It is highlighted that 3.1% had a diagnosis of cerebral palsy (n=2). It has been found that almost half of the evaluated children was hospitalized at least once in the first two years of life (n=3), being 67.7% (n=21) in the first year of life (Table 1).

Table 1 - Diagnostics in the neonatal period, at the time of evaluation and history of hospitalization in evaluated high risk children. Belo Horizonte, cohort of live births in 2006, East Sanitary District

Variables	Total evaluated children	
	n	%
Diagnosis in the neonatal period		
Jaundice	49	75.4
MH/SDR	33	50.8
Infections/sepsis/septic shock	29	44.6
Anemia	19	29.2
Apnea	12	18.5
Intraventricular hemorrhage	10	15.4
Gastroesophageal reflux	8	12.3
SFA/SAM/ hypoxic-ischemic encephalopathy	7	10.8
Premature retinopathy	7	10.8
Patent arterial duct	6	9.2
Convulsus	5	7.7
Bronchopulmonary dysplasia	5	7.7
TTRN	5	7.7
Necrotizing Enterocolitis	2	3.1
Metabolic bone disease	1	1.5
Other diagnoses	23	35.4
Diagnosis at the time of evaluation		
Hearing impairment	3	4.6
Visual impairment	2	3.1
Respiratory disease	32	49.2
Classification		
Bronchial asthma/bronchoconstriction/bronchitis	31	96.9
bronchiectasis	1	3.1
Allergic rhinitis	1	3.1
sinusitis	1	3.1
Heart alteration		
Classification		
breath	2	40.0
hypertrophic cardiomyopathy	1	20.0
communication inter atrial "ostium secundum" type	1	20.0
TGA surgical correction	1	20.0

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Table 1 - Diagnostics in the neonatal period, at the time of evaluation and history of hospitalization in evaluated high risk children. Belo Horizonte, cohort of live births in 2006, East Sanitary District

Variables	Total evaluated children	
	n	%
Neurological alteration	9	13.8
Classification		
DNPM delay	2	22.2
cerebral palsy	2	22.2
Epilepsy + HIC	1	11.1
HPIV grade II	1	11.1
PBO	1	11.1
Down syndrome and West syndrome	1	11.1
hand tremor	1	11.1
Hospitalization in the 1st and/or 2nd year of life		
Yes	31	47.7
No	32	49.2
ignored/without records	2	3.1
Total evaluated HRNBs	65	100.0

Source: SIM/SINASC (2006); structured interviews; documents and exams made available.

The APS follow-up was inadequate in the first two years of life (n=20, 30.8%) as well as performance of hearing and visual screenings (red reflex test), with a large proportion of absent records (n=27; 41.5%) about this test (Table 2). There were referrals to specialized services in Neurology (26.2%), Physical Therapy (20%), Otolaryngology (20%), Speech Therapy (16.9%), Ophthalmology (13.8%), and Pulmonology (12.3%) among others.

Important protocol actions that are specific for prematurity such as propedeutics for metabolic bone disease, anemia screening, and vitamins supplementation for at least 12 months, and iron for at least 18 months, and special vaccines for the significant majority of children were not conducted (Table 3). The analysis revealed that the HRNB Protocol was partially implemented, reaching 20 points out of the 42 possible points, representing 47.6% adequacy.

The losses in the study were statistically significant for children with appropriate weight at birth (33.3%; p=0.009), low Apgar score in the fifth minute of life (15.4%; p=0.001), and those whose mothers did not have a previous still born child (36.5%; p=0.05).

Table 2 - Health actions evaluated regarding follow-up on APS evaluated high-risk children. Belo Horizonte, cohort of live births in 2006, East Sanitary District

Health actions evaluated	Evaluated children		Scores assigned to criteria		Classification Degree of implementation
	n	%	maximum	obtained	
Neonatal screening					
Yes	65	100.0	2	2	Implemented
No	0	0.0			
Hearing screening					
Yes	39	60.0	2	1	Partially implemented
No	23	35.4			
ignored/without records	3	4.6			
Red Reflex test					
Yes	26	40.0	2	1	Partially implemented
No	12	18.5			
ignored/without records	27	41.5			
Monitoring on the Primary Health Care					
adequate	43	66.2	2	1	Partially implemented
inadequate	20	30.8			
ignored/without records	2	3.1			
Referrals to specialist					
Yes	36	55.4	2	1	Partially implemented
No	28	43.1			
ignored/without records	1	1.5			
Specialized ambulatory monitoring					
Yes	15	23.1	2	0	Not implemented
No	50	76.9			
Updated basic vaccination card					
Yes	62	95.4	2	2	Implemented
No	2	3.1			
ignored/without records	1	1.5			
Breastfeeding time (months)			n=62; min 0; max 36		
Did not breastfed	12	18.5	2	0	Not implemented
< 1	4	6.2			
1 to 6	18	27.7			
6 to 12	9	13.8			
≥ 12	19	29.2			
ignored/without records	3	4.6			
Exclusive breastfeeding time (months)			n=62; min 0; max 8		
did not breastfed exclusively	34	52.3	2	0	Not implemented
< 1	3	4.6			
1 to 4	8	12.3			
4 to 6	14	21.5			
≤ 6	3	4.6			
ignored/without records	3	4.6			

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Table 2 - Health actions evaluated regarding follow-up on APS evaluated high-risk children. Belo Horizonte, cohort of live births in 2006, East Sanitary District

Health actions evaluated	Evaluated children		Scores assigned to criteria		Classification Degree of implementation
	n	%	maximum	obtained	
Attends early childhood education institution					
Yes	35	53.8			
No	29	44.6	2	1	Partially implemented
ignored/without records	1	1.5			
Partial total	10		20	9	

Source: SIM/SINASC (2006); structured interviews; documents and exams made available.

DISCUSSION

This study allowed the identification of a cohort of HRNB children born in 2006 in the east district and the verification of their state of health. The study also evaluated the implementation of the HRNB Monitoring Protocol. Among the 165 identified live births, 41 died before completing one year of life indicating TMI of 248.0:1,000 live births, 16 times the TMI of the east District of 15:1000. It is possible that the non-adhesion to the HRNB Protocol is partly responsible for the deaths that occurred in the postnatal period in addition to one death resulting from a preventable cause after one year of life. It is necessary that these aspects be discussed with the population to ensure the planned assistance and reverse this undesirable outcome.

The evaluated surviving children showed a high percentage of hospitalization, higher than in that reported in other studies.^{1,15-18} The rate of re-hospitalization of high-risk children was higher than in this study in only one of the analyzed studies, reaching 50% in the analyzed period of 2006 to 2007.¹⁹ This indicates that these criteria can be used by health services and in other researches because they identify children with high vulnerability and high risk of adverse outcomes to whom it is necessary to provide differentiated health assistance in order to protect and promote their survival and quality of life.

The national systems for information about births and deaths were important instruments for the evaluation of health services and their management support providing useful information for the structuring of health policies.^{20,21} This investigation warns to the need of incorporating this data analysis in routine services to guide the identification of individuals with increased risk of morbidity and mortality whose as-

sistance should be prioritized. Such systems could be explored in addition to research on infant mortality in which a reduction can only be achieved through the understanding and evaluation of the health situation and pre-, peri-, and post-natal assistance to the mother and HRNB.

The HRNB monitoring protocols recommend an active search after maternity discharge as a fundamental strategy for health surveillance, establishment of bonds with the family, and assurance of care continuity.^{1,8,10,11} However, this study found difficulties in the active search for children because of its non-prioritization within the APS list of activities, also observed by other authors²¹: the lack of localization of the address recorded in the Sinasc, change of address, absence of people at home at the time of active search as reported by Machado,¹⁵ and even absence to scheduled evaluations in at least three attempts. All this resulted in great loss of children for evaluation (37.5%), however, less than the loss reported by other authors (55.7%).¹⁵ This fact suggests challenges to HRNB surveillance in metropolitan areas in the country.

Despite that 95% of the families had been oriented at hospital discharge to seek health services as UBS, specialized outpatient clinic, and private offices among others for continuity in HRNB assistance, in general no formal referrals for these services were identified. Vieira and Melo²² described similar results, noting that the lack of reference and counter reference among services where HRNB are assisted results in a fragmented care requiring that families take the responsibility of inserting themselves in oriented services because there is no active search routine in the UBS. Thus, effective official programs are necessary to advocate an integral maternal and child care, managed by the APS,^{1,8,11} in order to guarantee care continuity.

Table 3 - Health actions evaluated regarding vitamins and iron supplementation and vaccinations for evaluated high-risk children. Belo Horizonte, cohort of live births in 2006, East Sanitary District

Health actions evaluated	Evaluated children		Scores assigned to criteria		Classification Degree of implementation
	n	%	maximum	obtained	
Time of vitamins supplementation * (months)					
< 6	5	8.9	2	1	Partially implemented
6 to 11	9	16.1			
≥ 12	37	66.1			
ignored/without records	5	8.9			
Subtotal	56	100.0			
Time of iron supplementation † (months)					
< 6	6	10.9	2	1	Partially implemented
6 to 11	7	12.7			
12 to 17	14	25.5			
≥ 18	23	41.8			
ignored/without records	5	9.1			
Subtotal	55	100.0			
Special vaccines					
Hepatitis B ‡					
Yes	16	28.6	2	0	Not implemented
No	38	67.9			
ignored/without records	2	3.6			
Subtotal	56	100.0			
Influenza §					
Yes	11	52.4	2	1	Partially implemented
No	9	42.9			
ignored/without records	1	4.8			
Subtotal	21	100.0			
Heptavalent pneumococcal #					
Yes	13	39.4	2	0	Not implemented
No	18	54.5			
ignored/without records	2	6.1			
Subtotal	33	100.0			
Partial total	5		10	3	
Total health actions evaluated in the Protocol	21		42	20	Partial implementation

Note: * NB with BW < 2500 g and/or estimated GA < 37 weeks; † NB with BW < 2500 g and/or estimated GA < 37 weeks; ‡ NB with BW < 2000 g and/or estimated GA < 33 weeks; Immunosuppressed NB/serious/asthma/ congenital cardiopathy/chronic neurological disease; # NB with estimated GA < 35 weeks receiving respiratory assistance. Source: SIM/SINASC (2006); structured interviews; documents and exams made available.

Penalva⁹ states that many families have the habit to seek health care only in urgent and emergency cases, which means that their children are not brought to the referenced services; these families do not understand the importance of longitudinal follow-up of children at risk for their health promotion and early detection of alterations. The continuity of the care of HRNBs also depends on the differentiated assistance from the family considering their insecurity and un-

preparedness to deal with the situation of a child in need of special care. It is essential to establish a bond with the family and a trusting and credible relationship to ensure better quality of life for the child.

Another important factor that probably influenced the lack of adequate monitoring in these children was the ignorance about the HRNB1 Protocol by many pediatricians in the involved UBS. Buccini et al.²¹ evaluated the perception of physicians from the APS in the periph-

ery of São Paulo and verified that they feel insecure to handle longitudinal monitoring of children of low birth weight, often using unofficial instruments and parameters. In addition, due to the complexity of the actions that they have to develop, these doctors claim prioritizing emergency and punctual issues in their working process at the expense of basic care principles of humanization, integrity, and longitudinal aspects of care.²¹

Considering that the Schedule of Commitments to the Integral Health of Children and Reduction of Infant Mortality from the Ministry of Health (MH)⁸ recommends that high-risk children must be monitored by multidisciplinary teams, both in the basic and specialized health care, a low percentage of referrals to specialists and number of children followed-up in specialized outpatient clinics was observed.

Table 4 - Other health actions evaluated in high-risk children. Belo Horizonte, cohort of live births in 2006, East Sanitary District

Evaluated health actions	Evaluated children		Scores assigned to criteria		Classification Degree of implementation
	n	%	maximum	obtained	
Fundoscopy*					
yes	29	87.9	2	2	Implemented
no	3	9.1			
ignored/without records	1	3.0			
Subtotal	33	100.0			
USTF †					
yes	32	84.2	2	2	Implemented
no	3	7.9			
NB outside the elected criteria and who were examined	3	7.9			
Subtotal	38	100.0			
Echocardiogram ‡					
yes	16	84.2	2	2	Implemented
no	2	10.5			
ignored/without records	1	5.3			
Subtotal	19	100.0			
Long bone x-ray §					
yes	6	31.6	2	0	Not implemented
no	12	63.2			
ignored/without records	1	5.3			
Subtotal	19	100.0			
Serum dosing of calcium, phosphorus, and alkaline phosphatase #					
yes	13	68.4	2	1	Partially implemented
no	5	26.3			
ignored/without records	1	5.3			
Subtotal	19	100.0			
Screening for premature anemia¶					
yes	33	60.0	2	1	Partially implemented
no	19	34.5			
ignored/without records	3	5.5			
Subtotal	55	100.0			
Partial total	6		12	8	

Note: *NB with estimated GA < 32 weeks and/or BW < 1500 g and/or use MV and/or CPAP > 15 days; † NB with estimated GA < 34 weeks or BW < 1500 g or neurological alteration or use of MV; ‡ NB with BW < 1000 g/symptomatic/ NB with diabetic mother/fetal echo altered during pregnancy/congenital rubella; § NB with estimated GA < 34 weeks and BW < 1500 g; # NB with estimated GA < 34 weeks and BW < 1500 g; ¶ NB with estimated GA < 37 weeks. Source: SIM/SINASC (2006); structured interviews; documents and exams made available.

One third of those who were assisted in specialized outpatient clinics were discharged before the time recommended by the MH, which is six years,¹¹ indicating the need to strengthening the specialized HRNB monitoring actions.

Among the general health actions recommended in the HRNB¹ Protocol, only neonatal screening and basic calendar of vaccination were actually implemented, possibly, because they are the most consolidated practices in the health care of children. It is possible that the difference found regarding the implementation of special vaccines results from the fact that the Manual of Reference Centers for Special Immuno-biologicals (CRIE), which regulates the use of these vaccines, was published in the year of the birth of the studied children. The low percentage (60%) of hearing screening may be justified because until 2009 this service was only available to high-risk hospitalized children.

Although simple, quick and inexpensive, it was found that health professionals do not routinely perform the red reflex test yet. This is probably due to the ignorance about its importance in the early detection of background eye abnormalities and opacities in the visual axis, and about the execution technique corroborating the findings of Lúcio, Cardoso, and Almeida²³ in a public maternity in Ceará in 2004.

The low percentage of breastfeeding in the sixth month of life indicates the persistence of unsatisfactory results in breastfeeding. Xavier et al.,²⁴ found similar results 20 years ago, as 18.5% and 13.5% of children were not breastfed and 43.1% and 38.5% were breastfed until six months of age. This shows that public policy encouraging breastfeeding have not yet achieved the expected effectiveness for children born with low weight which usually receive other types of food early in life. Alves et al.²⁵ showed that it is possible to improve the duration of breastfeeding in newborns with low birth weight in UBSs areas of Belo Horizonte peripheries through awareness of professionals in the unit and the community advice by students and teachers from a university about the importance of breastfeeding.

In relation to early childhood education, the proportion of children under three years old at school (53.8%) is much higher than that in Brazil (18.4%) found in the National Research by Domiciles Samples in 2009.²⁶ This result is possibly from the implementation in Belo Horizonte of the First School Program in 2004, which created municipal units for early childhood education.²⁷ The results from school census in

Belo Horizonte, from 2006 to 2010, revealed an important increment of children in kindergartens, from 16,840 in 2006 to 23,912 in 2010 showing higher growth percentage in municipal kindergartens (77.0%) than in private kindergartens (39.7%).²⁸

Among the specific actions recommended in the HRNB¹ Protocol for premature newborns, only funduscopy, transfontanelar ultrasound, and echocardiography were implemented; other screenings showed a low percentage of execution.

Thus, this study identified the distance between the care recommended for HRNB and the one effectively performed. The analysis of the implementation of the "Monitoring Protocol of the High-Risk Newborn" from SMSA-BH revealed challenges for health care adequacy provided to children at risk, active search and monitoring by the health services, and the provision of qualified, continued, and in time care. Despite scientific evidences signaling the importance of general and systematized evaluation of HRNBs and the existence of proposed protocols for that, there are still important gaps in public policies to be eliminated explaining the increased prevalence of premature and low birth weight newborns and ensuring adequate health assistance that fosters their full development. It is necessary to give visibility to HRNBs and their specific needs complying with the existent protocols for their monitoring. Furthermore, it is necessary to train professionals who will provide health care to these children and systematically evaluate the care offered to improve the care provided especially in regards to propaedeutics and therapy to specific referrals at the right time.

CONCLUSION

This study adds to other studies about the implementation of HRNB monitoring protocols^{1,8-11} and comprehensive evaluation of assistance from the perinatal period, in the maternity, and developed throughout early childhood, widening the focus of analysis beyond the APS assistance procedures as observed in other studies.^{15,16} The evaluation methodology used contributed to highlighting the weakest points in the HRNB longitudinal monitoring, enabling the identification of health actions worthy of efforts to improve their execution. Therefore, the evaluation of the health care provided to HRNB is necessary and fundamental to the planning of actions that will guide

better practices, resulting in changes in the health status of this population. The literature²⁰ cites that studies that evaluate public health programs are increasingly common because they constitute supporting instruments for necessary decisions in the dynamics of services and implementation of health policies.

Children who were born with low Apgar score and appropriate weight were under-represented in this study. However, incorrect record may have occurred in the Sinasc as identified during the active search.

It was concluded that the health surveillance of high-risk children might provide subsidies for the best performance of services to promote, prevent, and rehabilitate these children and contribute to reducing morbidity and mortality. Considering that the integral health in children depends on the success of their physical, cognitive, and emotional development, childhood alterations resonate throughout life influencing not only the individual but his family and community in which they are inserted. Ignoring or minimizing the focus on the health care of high risk children means to expand future spending with this citizen and neglect the possibility of life with quality.

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