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Primary Health Care as a guide for assistance to infants at risk of neurodevelopmental disorders

Atenção Básica como ordenadora do cuidado ao bebê de risco para alterações do neurodesenvolvimento

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Keywords

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ABSTRACT

Purpose: Characterize infants at risk of neurodevelopmental disorders according to sociodemographic and health profiles and describe their monitoring in Basic Health Units (UBS) under different management models. **Methods:** Data were collected from medical records of infants at risk of neurodevelopmental disorders in the west region of the city of Sao Paulo from August 2013 to February 2014 (phase 1 – characterization; phase 2 – monitoring). **Results:** Of the 225 individuals assessed in the first phase of the study, 51.1% were female and 7.11% were twins. Adolescent (45.2%), brown (50.56%), single (46.09%), complete primary education (47.60%) mothers were predominant. The mean number of prenatal visits was 7.12. Most mothers had vaginal delivery (62.22%) at mean gestational age of 37.05 weeks. Mean Apgar scores at the 1st and 5th minutes were 7.13 and 8.80, respectively. Mean weight at birth was 2597.21g., with 50.22% of newborns weighting ≤2500g. In its second phase, the study describes and compares the follow-up of 55 infants according to the UBS management model: 28 in UBS/"Estratégia Saúde da Família" (UBS/ESF) and 27 in traditional UBS (UBS/T). UBS/ESF presented higher mean of consultations (p=0.006). Longer interval between consultations was observed at UBS/T. No records of development milestones were found in 56% of the sample. Growth measures were better registered at UBS/ESF. In both management models, the number of consultations was smaller and the interval between them was shorter than those recommended by the Brazilian Ministry of Health. **Conclusion:** According to the recommended guidelines of the "Rede Cegonha" public policy, gaps in the monitoring of infants at risk of neurodevelopmental disorders are still observed.

Descritores

Saúde Materno-Infantil
Recém-Nascido
Serviços de Saúde Materno-Infantil
Desenvolvimento Infantil
Fatores de Risco

RESUMO

Objetivo: Caracterizar bebês de risco quanto ao perfil sociodemográfico e de saúde e descrever o acompanhamento de parte destes nas Unidades Básicas de Saúde (UBS), segundo diferentes modelos de gestão. **Método:** Levantamento de dados de prontuários dos bebês de risco nascidos na região Oeste da cidade de São Paulo entre agosto de 2013 e fevereiro de 2014 em duas etapas (1 – caracterização; 2 – acompanhamento do desenvolvimento). **Resultados:** Dos 225 indivíduos incluídos na primeira etapa, 51,1% eram do gênero feminino e 7,11% eram gemelares. Predominaram mães adolescentes (45,2%), pardas (50,56%), com ensino fundamental completo (47,60%) e solteiras (46,09%). A média de consultas pré-natais foi de 7,12. A maioria teve parto vaginal (62,21%) com idade gestacional média de 37,05 semanas. A média do Apgar foi de 7,13 no 1º minuto e 8,80 no 5º minuto. O peso médio ao nascimento foi de 2597,21 g, com 50,22% apresentando peso ≤2500g. Na segunda etapa, descreveu-se e comparou-se o acompanhamento do desenvolvimento de 55 bebês, segundo o modelo de gestão das UBS (28 em UBS/Estratégia Saúde da Família [ESF] e 27 em UBS tradicional). As UBS/ESF apresentaram maior média de consultas (p=0,006). Houve maior intervalo entre consultas nas UBS tradicionais. Da amostra, 56% não apresentaram registros referentes aos marcos de desenvolvimento. As medidas de crescimento foram registradas em maior número nas UBS/ESF. Para ambos, o número de consultas e o intervalo entre estas foram menores que o preconizado pelo Ministério da Saúde. **Conclusão:** Ainda existem lacunas no acompanhamento ao bebê de risco, segundo as diretrizes preconizadas na Rede Cegonha.

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INTRODUCTION

Analysis of child birth and mortality conditions is necessary to guide actions of the health services, improve their quality, and guarantee early diagnosis of possible impairments that interfere in the processes of child growth and development. Actions to promote, prevent, and assist with the health of pregnant women and newborns (NB) are of fundamental importance, considering that they directly influence the health status of these individuals during childhood and into adulthood[1,2].

Different studies have shown that Primary Health Care (PHC) can assist with reducing child mortality, especially postnatal mortality, corroborating the health care model in Brazil, focused on PHC[3,4]. From this perspective, Ordinance no. 1.459/2011[5] of the Brazilian Ministry of Health (BMH) established the "Rede Cegonha", an assistance network aimed at the organization and implementation of health care actions for infants (aged 0-24 months) in order to ensure their healthy growth and development[6]. The actions of this network include guidelines on family planning, prenatal care, childbirth, puerperium, and monitoring of the growth and development of children up to two years of age[6]. It is a recent public policy that should be extensively studied and evaluated to identify quality indicators and promote the re-adaptation of health processes and models.

At-risk newborns can be characterized as those exposed to situations involving greater risk of unfavorable evolution and who demand priority attention in health[6]. Thus, the identification and characterization of this population can direct actions in health and development of public policies for child health prevention and promotion. Although there are studies demonstrating risk factors for NBs[7-10], little is reported on the development of these infants throughout childhood.

With the implementation of the Family Health Strategy (ESF), PHC was strengthened in Brazil, anchored in the principles of integrality and hierarchy of assistance, territorialization, and registration of the population and multiprofessional teams; however, it is still necessary to evaluate the services that integrate the ESF[11]. In addition, ESF coverage is not comprehensive, with a large number of health services operating under the traditional management model, which consequently can reflect in the care provided to at-risk NBs, showing the need to investigate whether there are differences between the health actions for this population according to the management models of the services in which they are assisted.

In this context, the objectives of the present study were as follows:

1. Characterize infants at risk of neurodevelopmental disorders, born in the west region of the city of Sao Paulo from August 2013 to February 2014, according to sociodemographic and health profiles.
2. Describe and compare the monitoring of these NBs in Basic Health Units (UBS) under different management models: UBS/"Estratégia Saúde da Família" (UBS/ESF) and traditional UBS (UBS/T).

METHODS

This survey is an integral part of a broader research entitled "Primary Health Care as a guide for the 'Cegonha' and 'Cuidados à Pessoa com Deficiência' assistance networks" (proc. PPSUS – Fapesp 2014/500012-8), which was approved by the Research Ethics Committee of the Faculdade de Medicina of Universidade de São Paulo - USP and Secretaria Municipal de Saúde de São Paulo (no. 728402). All parents and/or legal guardians of the participants signed an Informed Consent Form (ICF) prior to study commencement. The project was conducted in partnership with the Programa de Educação pelo Trabalho PET/Redes of the USP and was, therefore, developed with the population residing in the west region of the city of Sao Paulo, linked to the *Supervisão Técnica de Saúde do Butantã (STS-BT)*. This is a retrospective, observational study.

A search was conducted for all newborns at risk of developmental disorders in the west region of the city of Sao Paulo, Brazil, between August 2013 and February 2014, and all those found were included in the study. These data were collected from the *Supervisão Técnica de Saúde do Butantã* (STS-BT) by means of declarations of live births (DLB).

Classification criteria of at-risk infants included those defined according to the Decree no. 43.407 of July 1, 2003[12], considering that the individuals belonged to the STS-BT, which presented a specific demand relative to the territorial diagnosis of characterization of at-risk infants. Consequently, it is worth emphasizing that some differences were observed regarding the risks described in the booklet of the Brazilian Ministry of Health (BMH)[6], but that all the risks investigated are relevant and both sources of classification are important for the monitoring of at-risk newborns. Moreover, it should be highlighted that a choice was made for a health demand study, considering that this is an alternative to obtain important information on the health of a given population under circumstances in which it is not possible to conduct population-based surveys[11], corroborating the situation of this study.

Thus the infants included in this study were as follows:

1. Born at the maternity wards of Mario Degni Hospital or Hospital Universitário, which are the reference maternity hospitals for the population in the region selected for the present study, between August 1, 2013 and February 2, 2014.
2. Considered at risk according to at least one of the following criteria of the STS-BT (São Paulo, 2003), namely, weight ≤2500g; and/or adolescent mother aged ≤16 years; and/or Apgar score ≤5 in the 1st minute of life.
3. Registered in the health services cover by the STS-BT.

Individuals who presented one or more of the following events were excluded from the study:

1. Absence in the first consultation after birth at the Basic Health Unit (UBS);
2. Medical record not available;
3. Death.

In the first phase of the study, information on the mothers and newborns (NB) was collected after identification of at-risk infants, namely, gender, prenatal/pregnancy (and intercurrences), childbirth (and intercurrences), birth at weight, Apgar score, gestational age, twinning, mother's age, educational level, marital status, color of skin/race, UBS in which they were assisted, etc. Intercurrences during pregnancy and delivery were regarded as follows: any type of clinical and/or obstetrical event that could interfere in the general health of mothers and infants and negatively influence the development of the latter. These data were collected through the SIGA system of the City hall of São Paulo and from the medical records of these NBs at the health service of reference.

In the second phase of the study, the newborns at risk of developmental disorders were monitored from 0 to 12 months of age at the reference UBS, linked to the *Supervisão Técnica de Saúde do Butantã*, and compared according to the management model of these health services: traditional (UBS/T) or "Estratégia Saúde da Família" (UBS/ESF). According to the sample calculation performed, the minimum number of individuals necessary to compose a significant sample for this second phase of the study would be 49, assuming a sampling error rate of 10% with confidence level of 95%. This calculation was performed using the following Formula (1):

$$n = \frac{N.Z^2.p.(1-p)}{Z^2.p.(1-p)+e^2.(N-1)} \quad (1)$$

where: *n* is the sample value calculated; *N* is the population; *Z* is the normalized standard variable associated with the level of confidence; *p* is the true probability of the event; *e* is the sampling error.

It is worth noting that the BMH[13] recommends that all newborns, at risk or not, should be monitored from 0 to 24 months of age. This follow-up refers to consultations conducted at the UBS (which should be at least seven from 0 to 12 months and two from 12 to 24 months of age), either with a physician or a nurse, in order to verify general health aspects of the infants, including, in particular, registration of development milestones, as well as measures of weight, height, and cephalic circumference. In the present study, it was not possible to monitor the selected newborns from 0 to 24 months of age due to the duration of the project to which this study was linked. Thus, the period from 0 to 12 months of age was defined, which also enables follow-up of the main development milestones of infants and registration of measures of weight, height, and cephalic circumference, as advocated by the BMH[13],as well as identification of possible disorders.

Six Basic Health Units (UBS), which presented the largest number of at-risk NBs in the region defined for the study development, were selected: three under the traditional (UBS/T) and three under the "Estratégia Saúde da Família" (UBS/ESF) management models, and 10 individuals were chosen in each of these health units.

An active search for medical records of NBs at risk of developmental disorders was conducted to collect the following information: number of consultations and interval between consultations (with comparison performed according to the recommendations of the BMH)[13], professional category of the person in charge of consultation (physician or nurse), registration of main development milestones (cervical control, sitting, and walking), and measures of weight, height, and cephalic circumference. It should be noted that data collection did not necessarily correspond to the real monitoring time of the study participants. Thus, with regard to the follow-up visits, when the infant's first consultation occurred after completion of 12 months of age and the information was in the medical records at the time of collection, these data were considered for the study sample. In addition, for individuals who were present in a larger number of consultations than that preconized by the BMH for the period from 0 to 12 months of age, the total number of consultations was considered for general characterization of the sample; however, data referring to the consultations recommended by the BMH were analyzed in detail, according to the objectives of the present study.

Collected data were analyzed by means of descriptive and inferential statistics using the Chi-square test, Fisher's exact test, and One-way ANOVA. A significance level of 5% ($p<0.05$) was adopted for all statistical analyses.

RESULTS

Phase 1: characterization of at-risk newborns

Initially, 306 infants at risk of developmental disorders were identified. Of these, 225 newborns composed the final sample of the study, because cases in which infants were not located in the territory (38), deaths (9), infants whose addresses were not in the west region (30), and infants who did not meet the STS-BT risk criteria (4) were excluded from the study.

Of the total number of infants (225), 115 (51.1%) were female and 110 (48.9%) were male. Within this sample, 16 newborns (7.11%) were twins; therefore, the total number of mothers was 217. The mean age of mothers at the time of delivery was 22.85 years (SD: 8.08; minimum=13 and maximum=43 years). The age distribution of mothers in the sample was as follows: ≤14 years (5.1%); 15-19 years (40.1%); 20-34 years (42.9%); ≥35 years (11.9%). The mean number of prenatal visits was 7.12 (SD: 2.93, minimum=0 and maximum=16), and 41.48% of the mothers were present in less than seven consultations.

Regarding the marital status of the mothers, 46.09% were single, 42.4% had stable union, only 11.05% were married, and 0.46% of the data were not found. As for color of skin/race of the mothers, most of them were brown (50.56%), followed by white (41.26%), black (7.81%), and indigenous (0.37%). With respect to educational level, the majority of mothers presented only elementary school (47.60%); 44.28% of them had high school; 1.84%, incomplete elementary school; 1.84%, complete college education; 1.48%, incomplete high school; 1.48%, incomplete college education; and 1.48% did not inform their schooling.

With regard to delivery of the at-risk infants, most mothers had vaginal delivery (62.21%) and the remaining underwent

cesarean section (37.79%). Mean gestational age was 37.05 weeks (SD: 2.88; minimum=24 and maximum=41); 42.88% of the infants were born at gestational age <37 weeks, and 17% of these were born at gestational age <34 weeks.

Mean Apgar scores were 7.13 (SD: 2.57; minimum=0 and maximum=10) and 8.80 (SD: 1.57; minimum=1 and maximum=10) at the 1st and 5th minutes of life, respectively. Mean weight at birth was 2,597.21g (SD: 688.83; minimum=610g and maximum=4,755g), and 50.22% of the newborns presented weight ≤2500g.

Regarding the services to which the infants were linked, 46.2% were at traditional UBS, 32% at mixed UBS, 12% at UBS with family health strategy, 8.9% at UBS concomitantly with secondary health service, and only 0.9% exclusively at secondary health service.

Phase 2: description of the monitoring of at-risk newborns at the Basic Health Units (UBS)

Of the 225 at-risk infants included in the study, 60 (~25%), distributed in six Basic Health Units, were selected to have their monitoring described. Five of them were excluded because their medical records did not present the necessary information. Therefore, 55 individuals composed the final sample of the follow-up description.

Of the 55 infants of the sample, 28 were assisted at UBS/"Estratégia Saúde da Família" (UBS/ESF) and 27 at traditional UBS (UBS/T). Risk distribution was similar in both management models (Table 1). Weight at birth presented the highest prevalence followed by maternal age (adolescent mother). All analyzed medical records contained information on Apgar score and weight and height at birth.

Number of consultations and mean time elapsed between birth and 1st consultation

UBS/ESF presented larger number of consultations compared with that of UBS/T, with statistically significant difference. No statistically significant difference was observed in relation to mean time elapsed between birth and 1st consultation in the comparison between the two UBS models (Table 2).

Interval between consultations

The number of consultations did not follow a regular pattern at either UBS management models, ranging from one to 17. Concerning the interval between consultations, UBS/T presented longer interval for all the consultations assessed (with statistically significant difference in the consultations 5 to 9). It was also possible to observe that the interval between consultations was longer in the first ones for both management models, and those consultations 7 to 9 occurred at intervals shorter than those preconized by the Brazilian Ministry of Health (BMH) (Table 3).

Development milestones

Information on the three basic development milestones was found in only 1.82% of the 55 medical records analyzed. It was also observed that 56.36% of the records did not register any of

Table 1. Distribution of study participants according to the risk criteria (number and percentage) and management model of Basic Health Unit (UBS)

Risks	UBS/ESF	UBS/T	*p*-value	Total
Weight	11	12		23 (41.82%)
Maternal age	7	7		14 (25.45%)
Apgar score	7	6	0.959	13 (23.63%)
2 or more risks	3	2		5 (9.1%)
Total	**28 (50.9%)**	**27 (49.1%)**		**55 (100%)**

p<0.05, Chi-square test
Captions: UBS/ESF = Basic Health Unit under the Family Health Strategy model; UBS/T = traditional Basic Health Unit

Table 2. Mean, standard deviation, minimum, maximum, and *p*-value referring to the number of consultations and time elapsed between birth and the 1st consultation at the different UBS models

	Consultations	UBS/ESF	UBS/T	Total
Number of consultations	Mean	9	6.14	7.81
	Standard deviation	4.18	3.25	4.07
	Minimum	2	1	1
	Maximum	17	11	17
	p-value		0.006*	
Time elapsed between birth and 1st consultation (in days)	Mean	40	46.07	43
	Standard deviation	59.64	55.99	57.43
	Minimum	3	5	3
	Maximum	324	307	324
	p-value		0.698	

**p*<0.05, Chi-square test; One-way ANOVA
Captions: UBS/ESF = Basic Health Unit under the Family Health Strategy model; UBS/T = traditional Basic Health Unit

the development milestones (Table 4). In addition, no statistically significant difference was observed between the management models of the services investigated with regard to this aspect.

Growth measures

Regarding the registration frequency of growth measures, no statistically significant difference was found between the two management models at the health units investigated. However, it was possible to observe that, in general, weight at birth was the most frequently registered measure in the medical records of selected at-risk babies, especially of those enrolled in UBS/T. Height at birth was also registered more frequently at UBS/T. Cephalic circumference measure presented lower registration frequency in both UBS management models (Table 5).

Specialty of the professional who conducted consultations with at-risk newborns

It was observed that, at UBS/T, 100% of the consultations were conducted by pediatricians. At UBS/ESF, consultations with a pediatrician were observed for approximately 53.55% of

Table 3. Mean, standard deviation, minimum, maximum, and *p*-value referring to the interval between consultations and that preconized by the Brazilian Ministry of Health at the different UBS models

Consultation	Prec. (in days)	UBS/T Mean (SD)	UBS/ESF Mean (SD)	*p*-value	UBS/T Min.	UBS/ESF Min.	UBS/T Max.	UBS/ESF Max.	UBS/T Diff. from Prec. (in days)	UBS/ESF Diff. from Prec. (in days)
1	7	96.35 (92.98)	89.04 (120.16)	0.800	12	4	398	586	-89.35	-82.04
2	37	117.00 (80.32)	88.08 (48.44)	0.108	23	17	427	208	-80.00	-51.08
3	67	154.45 (81.76)	117.24 (56.69)	0.052	31	21	442	275	-87.45	-50.24
4	127	194.42 (82.17)	156.65 (76.25)	0.080	38	24	457	324	-67.42	-29.65
5	187	263.29 (113.88)	190.04 (78.67)	0.007*	45	46	524	331	-76.29	-3.04
6	277	293.46 (119.83)	214.43 (73.28)	0.004*	51	86	549	319	-16.46	62.57
7	367	347.10 (139.21)	231.11 (76.31)	<0.001*	69	103	583	340	19.90	135.89

*$p<0.05$; One-way ANOVA
Captions: Prec. = interval between consultations (in days) preconized by the Brazilian Ministry of Health; UBS/ESF = Basic Health Unit under the Family Health Strategy model; UBS/T = traditional Basic Health Unit; Diff. = Difference; Min. = Minimum; Max. = Maximum; SD = Standard deviation

Table 4. Distribution of the registration of development milestones according to UBS model

Development milestones	UBS/ESF	UBS/T	*p*-value	Total
Cervical control	6	0	0.076	6 (10.9%)
Sitting	2	1		3 (5.45%)
Walking	1	3		4 (7.28%)
All	1	0		1 (1.82%)
Two milestones	3	7		10 (18.19%)
No record	15	16		31 (56.36%)
Total	**28 (50.90%)**	**27 (49.09%)**		**55 (100%)**

$p<0.05$, Fisher's exact test
Captions: UBS/ESF = Basic Health Unit under the Family Health Strategy model; UBS/T = traditional Basic Health Unit

Table 5. Percentage between the number of consultations and registrations referring to the growth measures according to UBS model; *p*-value

Measure	UBS/ESF % (DP)	UBS/T % (DP)	*p*-value	Both % (SD)
Weight	80.05 (17.69)	97 (7.69)		88.37 (40)
Height	74.13 (23.92)	92.84 (15.69)	0.463	83.31 (22.21)
Cephalic circumference	64.62 (26.08)	61.57 (34.14)		63.12 (30.05)

$p<0.05$, Chi-square test
Captions: UBS/ESF = Basic Health Unit under the Family Health Strategy model; UBS/T = traditional Basic Health Unit

the infants, with 42.85% conducted by family physicians and/or nurses (42.85%). Some medical records (3.6%) did not identify the professional who conducted the follow-up.

DISCUSSION

Factors such as socioeconomic conditions, access to health care, intercurrences in childbirth, etc., can positively or negatively influence the birth and proper development of infants[9,14,15]. Thus, it is necessary to analyze birth conditions to guide future actions in health services, aiming at primary health care and promotion, as well as at early identification of different health and development risks for this population.

Characterization of at-risk newborns

Homogeneous distribution regarding gender was observed in the present study, corroborating the results of a previous survey[2].

With respect to twinning, the number of births of twins identified in this study was very close to that reported in the research conducted by Ramos and Cuman[8]. This aspect is relevant to investigate the profile of live births, because the presence of more than one fetus increases the chance of preterm birth, low birth weight, hypertension, rupture of membranes, and fetal death[8].

As for maternal age at the time of delivery, there was higher concentration of adolescents aged 13 to 19 years. The World Health Organization (WHO) and the Brazilian Ministry of Health (BMH) consider pregnancy in adolescence as of high risk because of the possible complications and problems inherent in childbirth within this age group[16,17]. However, if prenatal care is conducted properly, this risk can be reduced[15]. In this survey, the risk of teenage pregnancy was confirmed and the number of adolescent mothers was larger than that observed in previous studies[6,17,18]. This increased prevalence of adolescent mothers is likely to be associated with the study population, which is composed only of mothers of at-risk newborns, whereas mothers of infants in general were included in the other studies.

In addition, 41.48% of the mothers of at-risk infants attended fewer prenatal consultations than the number recommended by the BMH[13,19]. Martinelli et al.[14] reported 69% of adjustments regarding the number of consultations conducted and the beginning of prenatal follow-up, a prevalence higher than that found in the present study. Viellas et al.[18] also observed failures in prenatal care, including inadequate number of visits, which affects the quality and effectiveness of this monitoring.

Intercurrences relative to gestation may be augmented when associated with unfavorable socioeconomic and geographical conditions, as well as with fragility of family structure and difficulty in accessing assistance services[8]. Social determinants verified in the present sample indicated that the majority of mothers of at-risk newborns was single, brown and/or black, and had only elementary school; these findings corroborate those reported in previous studies[8,20], suggesting that socially deprived groups have poorer access to prenatal care service[14].

Vaginal delivery was more frequently observed regarding the childbirth of at-risk infants included in the present study. It is known that vaginal delivery is safer for both the mother and the baby, and higher morbidity and mortality of both mothers and newborns are observed in cesarean sections. In addition, assistance expenses required for cesarean section are higher compared with those for vaginal delivery. However, it should be considered that, in high-risk pregnancies, cesarean section is a relevant procedure for reduction of perinatal risks, increasing neonatal survival rate[20], which may be one of the factors that justify the occurrence of this type of delivery in just over a third of present sample.

Main determinants of mortality risk during the neonatal period are low birth weight and gestational age <37 weeks[7-10]. In this study, half of the identified infants weighed <2500 g and 42.88% were born with gestational age <37 weeks, confirming the presence of both risks, which may contribute not only to neonatal mortality, but also to occurrence of sequelae throughout development, such as impaired lung function[21], motor[22] and language[23] skills, etc.

It is important to consider that the increased number of preterm births is associated with factors such as pre-gestational maternal diseases, preeclampsia, genital urinary infections, low educational level of the pregnant woman, unemployment, smoking and drug use during gestation, absence of prenatal care, previous preterm birth, among others[7,14]. These risk factors should be addressed in health promotion and primary care activities at the Brazilian Unified Health System (SUS), because prenatal care can control risk factors that cause complications during pregnancy, enabling timely treatment and favorable perinatal and maternal outcomes[14].

Apgar scores reflect the vitality conditions of newborns and, together with other variables, comprise indicators to predict risk of death[20]. In the present study, most of the at-risk infants presented adequate Apgar scores at the 1st and 5th minutes of life, corroborating the findings by Silva et al.[20]. Lower Apgar scores may be associated with neonatal death[10] and neurodevelopmental sequelae[2,24].

With respect to follow-up at health services, it was verified that most of the newborns at risk of developmental disorders are monitored at the UBS, and that less than 10% are monitored by secondary health services. Postnatal assistance in PHC has been stimulated by public policies of wide coverage and proven efficacy, aimed at reducing infant morbidity and mortality. Actions in PHC have prioritized the assistance to all newborns in the areas covered by the professionals of the UBS, favoring promotion of health care as well as surveillance of risk situations that determine illness or death in infancy[25]. Articulation between PHC and hospital/specialized care in the assistance to at-risk infants is recommended by the BMH. Thus, active search for infants should be conducted, when necessary, to guarantee basic health care follow-up, ensuring an integral and singular vision about the children and their families[26].

Monitoring of at-risk newborns at the selected Basic Health Units (UBS) according to management model

Information collected from the medical records of at-risk newborns was used in the second phase of the present study. One of the difficulties encountered was the illegibility of the information contained in the medical records, which led to the exclusion of five individuals. It is worth noting that, according to Ordinance 1412[27], there is a need to restructure the Basic Health Care Information System (SIAB) into a unified system that integrates all information systems for PHC in order to ensure not only individualized registration through the National Health Card (CNS), but also the use of an electronic medical record of citizens, for access throughout the SUS network. Among other possibilities, this may enhance the quality of written notes, improving the readability of information described in the medical records.

Similarity was observed in the distribution of the risks presented at birth for the infants monitored in the two UBS management models assessed, with low weight at birth as the most prevalent risk, followed by maternal age (adolescent mother), and low Apgar score. Low weight at birth is the most important single risk factor for infant mortality, with prevalence of approximately 8% in Brazil and 9.2% in the Country's southeast region, with higher incidence in the extremes of maternal age[6,20]. In the case of the population studied, it should be emphasized that the higher prevalence of this risk is associated with the sample, composed exclusively of at-risk newborns, as well as with the high concentration of adolescent mothers, which as previously mentioned, is a contributing factor to increased risk of low-birth-weight newborns[6].

The BMH[6] emphasizes the importance of verifying the Child Health Handbook[19] to identify risks and vulnerabilities at birth. This registration should also be included in the medical records. In this study, registration of the Apgar score and weight and height at birth of at-risk infants was found in all medical records monitored in both UBS management models.

In this study, it was possible to notice the importance of having a registration - either in the medical record or in the National Health Card (CNS) - of infants at risk of developmental disorders in order to increase the possibilities of improving the effectiveness of care. Furthermore, accurate records may favor the monitoring of at-risk newborns and the active search for these individuals after their absence from routine consultations is identified. It is also worth mentioning that, at hospital discharge, mothers of at-risk infants should schedule a consultation at PHC, program the home visits, and schedule the follow-up at an outpatient clinic of secondary health care[6]. Currently, for the population of the present study, there are not enough professionals in the basic health units to actively search for absence of infants from routine consultations. Thus, the Specialized Rehabilitation Center (CER) of the region to which the health units belonged conducted a standard cross-reference of the patient to the UBS, so that monitoring was performed in the two health services.

Statistically significant difference was observed between the UBS management models with regard to the number of consultations. Infants monitored at UBS/ESF attended a larger number of consultations than at UBS/T. This finding indicates increased health assistance and greater capacity for longitudinal follow-up of at-risk newborns. In addition, these results may be related to those identified in the study by Martinelli[14], in which adequacy of the prenatal care process, according to the parameters of the Prenatal and Birth Humanization Program, was better developed in services rendered at basic health units under the "Estratégia Saúde da Família" model (UBS/ESF) compared with those provided at basic health units under traditional management (UBS/T). Another possible justification for these findings would be that active search is also performed by community health agents during the monitoring of infants at the UBS/ESF[11].

A newborn's first consultation is extremely important, and should occur within the first week of life because this moment constitutes a space for discussion of forms of stimulation that directly assists the family with difficulties inherent in the life of the baby, e.g., exclusive breastfeeding and immunization, and also establishes/strengthens the family support network[6]. This study shows that the first consultation of at-risk newborns occurred late (around the 40th day of life, on average) at both UBS management models, which is not in agreement with the time preconized by the BMH. Extreme cases were also identified, when the first follow-up consultation occurred almost at one year of life. With regard to health services, this fact may be related to lack of professionals in the health units and difficulty of professionals in scheduling consultations due to agenda overcrowding. Another aspect to be considered is the lack of demand from the families of at-risk infants, which can occur for different reasons, from judgment of the real necessity to attend all consultations advocated by the BMH, to questions associated with socioeconomic vulnerability and unfavorable geographical and family structure conditions[8,14,20].

Regarding intervals between consultations, the BMH[6] recommends reduced time intervals according to the severity and/or risk situation, characteristics, and health conditions of the newborn, who would, therefore, require more systematic follow-up. The data of this study show irregular intervals and intervals longer than those preconized by the BMH at both UBS management models. This may have occurred because of the busy schedule of professionals, absence or reduction of professionals in the health units, or lack of demand on the part of the families[11].

Comparison between the two UBS management models showed statistically significant difference for interval between consultations (from the 5th to the 7th consultation), with longer interval observed at UBS/T. These shorter intervals between consultations of infants treated at UBS/ESF may have occurred because active search, conducted by community health agents, is foreseen within this management model aiming both to assist at-risk infants in general, as well as when they are absent from consultations[11]. Moreover, when teams from the Family Health Support Unit (NASF) are present at UBS/ESF, several home visits to monitor at-risk newborns can be conducted.

Child development monitoring and identification and assessment of risk factors and family-related aspects are organic conditions subject to care. Therefore, the need for systematic monitoring of child growth and risk factors are conditions that require surveillance, because they present increased probability for development of perinatal and infantile diseases in these at-risk infants. It is also worth emphasizing that at-risk newborns should be monitored at least until they complete two years of age for better evaluation of cognitive and language functions[2,6].

Development milestones are extremely important to evaluate the growth of an infant, as recommended in the Child Health Handbook[19]. Monitoring of children's development in PHC aims at the promotion, protection, and early detection of impairments that may interfere with their lives. This can be achieved mainly through educational actions and integral follow-up of the children's health[28]. In this context, the BMH recommends[13] that the main development milestones be verified in routine consultations and be noted in the Child Health Handbook together with the growth measures[19].

In the present study, although data on the infants' birth conditions were registered in the medical records of individuals cared at both UBS management models, information concerning the main development milestones was not registered in many of the medical records assessed. A possible explanation for this finding refers to the professionals' concern to register in the medical records only the data required by the management of the services, for generation of exclusively accounting information[11]. This hinders estimation of the actual coverage of health programs for the population, in this case, regarding the monitoring of infants at risk of developmental disorders.

Comparison of the analyzed management models showed that registration of development milestone data did not differ significantly between them. Registration of all development milestones was only verified in one medical record, and ten records contained two development milestones. However, most medical records did not contain any milestone. This finding indicates that the basic guidelines preconized by the BMH are not being followed, and arouses thought on the awareness of health professionals about the importance of development milestones for the global and effective follow-up of children's health.

Evaluation of the technical-scientific quality of health services provided to newborns has shown inadequate situations of assistance. Factors such as the quantitative and qualitative profile of human resources and the great difficulty found in the processes of selection, establishment, and continuing education of professionals should be highlighted. The quality control of health care practice in this setting is insufficient. This scenario needs to be reviewed in order to ensure adequate assistance in agreement with the best scientific evidence available[29].

As for growth measures, studies indicate that routine monitoring is widely accepted by health professionals, and is an important component of child consultation worldwide until the age of two[2,6]. The specific scientific literature also reports that height for age is the best indicator of child growth, and that it represents the most important anthropometric deficit in Brazil[30]. Likewise, weight is considered an important general indicator of the health level of a population, and is determined by several correlated factors, such as social, economic and environmental conditions[20]. With respect to cephalic circumference, it is an indicator of cerebral growth and assists with identification of neurological and cognitive impairments[2]. Therefore, measurement and periodic registration of weight, height, and cephalic circumference are essential for the evaluation of child growth by health professionals, and enable identification of morbidity and mortality risks, assisting with protection and promotion of health[2].

In this survey, weight was the most registered measure in the medical records, followed by height and cephalic circumference. No statistically significant difference was observed for the growth measures. However, a higher frequency of registration of weight and height measures was observed at UBS/T. It should be emphasized that these measures are not systematically registered at both UBS management models, which can compromise the monitoring of healthy child growth, hindering prevention actions and early diagnosis. Furthermore, it is worth highlighting that the BMH recommends[13] that measurements of weight, height, and cephalic circumference be performed in all consultations with at-risk infants up to 2 years of age.

With regard to cephalic circumference, slightly over half of the medical records contained this registration at both UBS management models. It is important to note that monitoring this measure is fundamental, mainly in the first year of life, because it indirectly indicates the growth of encephalic mass, and may be associated with neuropathologies. Therefore, health services should be aware of this measure, especially in relation to at-risk newborns. It should be emphasized that several factors may predispose altered brain growth in at-risk infants, such as prematurity and low birth weight[2].

Regarding the medical specialty of the professionals who conducted consultations with the newborns at risk of developmental disorders, 100% and approximately 50% of them were pediatricians at UBS/T and UBS/ESF, respectively, with consultations also being conducted by family physicians and/or nurses at the latter. These findings are associated with the different UBS management models. It is worth mentioning that UBS/ESF pediatricians are also practitioners at NASF, and the fact that they have more consultations than family physicians can be explained by the high resistance presented by family members of at-risk infants, who insist on being cared by a specialist in child development. This is a paradigm that still needs to be broken.

CONCLUSION

Results of the study showed some important characteristics prevalent among the newborns assessed, such as: predominance of adolescent, single, brown and/or black, complete primary education mothers; small number of prenatal consultations for most mothers; weight at birth ≤2500g, gestational age <37 weeks; higher concentration of vaginal delivery.

Some of the aforementioned aspects deserve attention, because they may direct future health actions, seeking prevention of risks that may contribute to the birth of at-risk infants. Many of these issues can be avoided through population orientation and training of health professionals, especially in Primary Health Care (PHC), because this level of assistance organizes of health care networks in Brazil.

Regarding the monitoring of infants at risk of neurodevelopmental disorders, according to the management model of the services studied, significant differences were observed with respect to number of consultations performed - larger at the UBS/ESF model and longer interval between consultations at the UBS/T model. As for registration of development milestones and growth measures, no significant differences were found between the management models, emphasizing that both models present inconsistencies in the monitoring of at-risk newborns.

Both management models presented smaller number of consultations than that preconized by the Brazilian Ministry of Health for the effective monitoring of newborns in PHC. Therefore, it would be extremely relevant to conducted further studies with larger samples contemplating the two management models investigated, bringing the management of professionals and families closer together. These actions can strengthen health councils and empower the population regarding the discussion about at-risk newborns and the implications of these risks and others that are not considered, but which are known to negatively influence the development of infants. In this context, it is necessary to reflect on the possibility of also including these risks, so that solutions can be found to improve the effectiveness of assistance provided to at-risk newborns at PHC.

The present study emphasizes that there are still gaps in the monitoring of infants at risk of neurodevelopmental disorders regarding application of the recommended guidelines within the "Rede Cegonha" health network.

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Author contributions

DRMA was responsible for the design of the study methodology, analysis and discussion of data, and writing of the manuscript; SRM contributed to analysis and discussion of data, bibliographic review, and writing of the manuscript; ERB and ACS were in charge of collection and analysis of data, bibliographic review, and writing of the manuscript; DCD contributed to collection and analysis of data and writing of the manuscript; AGS was responsible for the design of the study methodology, analysis and discussion of data, and writing of the manuscript.

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Erratum

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Where it reads:
"Alessandra Gianella Samelli"

It should read:
"Alessandra Giannella Samelli"