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Early Evaluation Of Neuro-Psychomotor Development Of Children, 34 Weeks During The First Three Years Of Life In The Outpatient Premature Ward Of The Holy Para Mercy House Foundation ((FSCMPa) In Northern Region, Brazil.

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ABSTRACT

The most dramatic events in the growth and development occur before birth, and receive influence of genetic factors, hormonal, environmental, placental, nutrition and maternal health, which can exert influence in varying degrees, providing benefits or harms the growth pattern and fetal development. Among the premature, a higher incidence of disorders related to immaturity of organs and systems, and more likely to change and / or deviations in their acquisitions and development. Thus, the objective of this research was to evaluate the neurological development of newborns premature infants less than 34 weeks during the first three years of life that attended the Clinic of Premature of the Holy Para Mercy House Foundation ((FSCMPa). Therefore, treated a observational study of a retrospective cohort type, performed at the Clinic of premature of the Holy Para Mercy House Foundation with 90 premature infants enrolled from June 2008 to June 2009 and are considered premature infants, all infants with gestational age less than 37 weeks. The areas analyzed by the Denver II Test, there was no significant correlation in the analysis only on personal social area ($p = 0.1496$). Test results among VLBW infants characteristics and the outcome of the Denver II test tended to be correlated with results changed in the first year of life, male, ($p = 0.0009$), gestational age 27-29 weeks, gestational age ($p = 0.0022$) and from 33 weeks ($p = 0.0398$), weighing less than 1500 g ($p = 0.0001$) and exclusive breastfeeding time ($p = 0.0001$). It was observed in this study with the Denver test, high proportion of children carries an increased risk of developmental delays, especially in children born with gestational age of 34 weeks, during which can be seen most organic immaturity. Among the evaluated, delays can be noted that the first year of life to change in the overall motor development prevailed, but from the second year delay in the area of language prevailed.

Keywords: Neuro-Psychomotor development, Prematurity, Denver II Test.

Introduction

The neonatal and postnatal periods are considered critical psychomotor development. Any outside interference in these periods may interfere with the development of the infant (FELÍCIO; PEREIRA, 2010). In this sense, the survival of premature infants reflect the quality of antenatal care, after conducting the labor and neonatal care structure of the various regions and countries of the world (ALMEIDA, *et al*., 2010). Assistance to prenatal allows diagnosis and treatment of numerous complications during pregnancy and the reduction or elimination of risk factors and behaviors that can be corrected (Kilsztajn, *et al*., 2003). Brazilian studies show increased risks for children born to mothers with little or no prenatal care (VICTÓRIA, 2001). Since the comparative analysis between the Brazilian regions in 2004 already showed that the Northern and Northeastern Brazilian regions have the lowest percentage of completion of seven or more prenatal consultations, demonstrating the need for changes in the health policies of administrators in these states (BRASIL, 2004).

Thus, appropriate assistance to newborns in the delivery room is essential to prevent asphyxia injuries, which can lead to neonatal death or the presence of neurological damage, impairing the child's quality of life and his family, and the high cost in medical care of this child (ALMEIDA; GUINSBURG, 2005). In this sense, advances in neonatal intensive care and mechanical ventilation, have contributed to improving the survival of vulnerable newborn, including in this group the extremely premature infants (FELÍCIO; PEREIRA, 2010). However, despite all this progress, improving survival rates of these children are not reflected evenly in reducing sequelae in the development, leaving the risk of these changes psychomotor in the short, medium and long term (Resegue, *et al.* , 2007).

The infant mortality rate reflects the living conditions and health of the population and this ratio has been used as indicator of the level of development and quality of life of nations (Bercini, 1994). Neonatal mortality includes deaths occurring from birth to 27 days of life related to congenital anomalies; and the post-neonatal component, including the deaths of the 28th day up to one day before one year, are the product of the action of hostile environmental conditions on

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children born in good condition (Bercini, 1994; RIBEIRO; SILVA, 2000; CARVALHO *et al*., 2007).

Mortality in the neonatal period is a growing concern for public health in Brazil since the 90s, when it became the main component of infant mortality, due to the more marked reduction in post-neonatal mortality (OAK AND GOMES, 2005; MARANHÃO *et al*., 1999). However, a large portion of the high infant mortality could be avoided if there was a better quality of perinatal care (Barros *et al*., 1987).

In Brazil, the infant mortality rate fell 61.7% between 1990 and 2010 from 52.04 deaths per thousand births to 19.88 / 1000 live births in 2010, however, this index remains high similar to the index of the 60's in developed countries, and about three to six times higher than that of countries such as Iceland 2.6 / 1000 live births, Sweden 2.7 / 1000 live births and Cyprus / 1000 live births. Brazil is also high compared to other developing countries, such as Chile 6.48 // 1000 live births and Cuba 5.25 / 1,000 live births (THE LANTET, 2010; UNICEF, 2007).

Still on child mortality there are regional differences in Brazil as seen in the period 2000-2008 the infant mortality rates remained highest in the North / Northeast and lowest in the South / Southeast. During this period, the infant mortality rate in the Northern region fell from 28.6 / 1000 live births to 23.1 / 1000 live births, and specifically in Pará, where they was a decrease of 29.0 / 1000 to 23.6 / 1000 live births while in the south, the reduction was 19.2 / 1000 to 14.2 / 1000 live births (BRASIL, 2009).

These high neonatal mortality rates in Brazil point to the need for better understanding of the role of assistance in the process of determining the health and neonatal morbidity and mortality. Affordable and good health services should be able to recognize the preventable deaths and implement measures to reduce them (ALMEIDA; BARROS, 2004).

Reviewed studies indicate an increase in preterm births in Brazil (Silveira *et al.*, 2008). According to SINASC data (Information System of live births) the prevalence of preterm births in Brazil was 6.7% in 2000, 6.3% in 2002, 6.5% in 2004 and 2010 was 7.1% live births per 100 births. According to a report released by the World Health Organization each year, about 15 million babies are born premature in the world. Brazil currently takes the 10th place in absolute numbers, with 279,300 premature births each year. When taking into consideration the rate of preterm births per 100 births, the country has 9.2% of premature (LORENA; BRITO, 2009). Thus, the proposition of this study was to evaluate the psychomotor development of preterm infants less than 34 weeks during the first three years of life who attended the Foundation Premature outpatient Santa Para Mercy House (FSCMPA).

Methodology

This is an observational study of retrospective cohort and descriptive, to evaluate a sample of preterm infants, born and outpatients treatment at the Premature of the Holy Para Mercy House Foundation (FSCMPA), from June 2008 to June 2009. Initially selected were all premature database of medical records of children at FSCMPA of premature outpatient totaling 243 records and then screened in accordance with the inclusion criteria carried out, then getting a sample of 90 children who were followed at the outpatient premature ward regularly. We included all premature infants born from June 2008 to June 2009 and who survived, enrolled in the clinic premature, gestational age up to 36 weeks and six days and monitoring was conducted on a regular basis for at least the first year of life. Not participated in the survey infants born with gestational age greater than 37 weeks from June 2008 to June 2009, which did not follow up on a regular basis, who left before the first full year, Preterm carriers of genetic syndromes with major congenital malformations, congenital infections and twin pregnancies. Possible maternal intervening variables were studied and related to postnatal clinical progress during the first three years of life. As for the evaluation of psychomotor development of preterm infants, the first three years of life was considered, using the Denver II screening test adapted to the Portuguese language, which was applied in children from birth to the age of three years analyzing: **personal / social, adaptive motor, language and gross motor skills**. Each item was classified as normal when the child shows no delays or has at most one item of incomplete evaluation, and suspected delay when the child responds incompletely to two or more items and / or one or more delays. Results presented according to the examination of recent evaluations on the first, second and third year of life. The survey was conducted by analyzing charts using research protocol. This study was approved by the Research Ethics Committee in humans, and is in line with current regulations in Resolution No. 196/96 of the National Health Council / Ministry of Health, and their complementary, governing research involving human subjects. For the analysis we used the non-parametric statistical tests, chi-square test and G-Test all were applied considering the significance level a = 0.05. In all these tests the level of rejection of the null hypothesis was set at 5% or $p \leq 0.05$.

In June 2008 and 2009 was registered 5,645 newly born births in FSCMPA, being selected to be part of the study 243 preterm infants, 86 patients were excluded because evade before the first full year of corrected age, 29 were carriers genetic syndromes, 19 because they had major congenital malformations, congenital infections by 13 and 6 twin pregnancies. The selected total of newborns and effectively participated in the study were 90 children newly born prematurely.

Of the infants examined, 41 (45.55%) were followed up at the outpatient clinic of premature over the first 3 full years of age, 33 (36.66%) dropped out in the second year of life and 16 (17.78%) in the third year of life. The areas analyzed by the Denver II Test, there was no significant correlation in the analysis only on personal social area ($p = 0.1496$). Table 3 shows the distribution of the preterm infants according NPMD (Table 1).

The results of analysis of characteristics of VLBW infants and the result of the Denver test are contained in Table 5. Tended to be correlated with results changed in the Denver test in the first year of life, male, ($p = 0.0006$), gestational age 27-29 weeks gestational age ($p = 0.0022$) and from 33 weeks ($p =$

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0.0206), weighing less than 1500 g (p <0.0001) exclusive breastfeeding time (<0.0001). In the second and third year of life, prevailed correlation with gestational age 27-29 weeks (p <0.0001) and (p = 0.0025) and weighing less than 1000g (p <0.0001) and (p = 0.0016) respectively (Table 2).

Discussion

Prematurity is an adverse factor for the development of the child, including postural control, fine motor skills, vision, language and cognition. For the optimization of a sensory-motor, stimulation becomes necessary for an accurate and complete child, which can reveal the presence or absence of reflexes and postural reactions within the motor development, indicating whether or not a delay in their development, providing a therapeutic monitoring and need for early intervention for preterm neonate when a motor delay is diagnosed (ALMEIDA; Paines; ALMEIDA, 2008). Valentini *et al,* (2002) showed that children with motor delays, when motor intervention opportunities are not given, they tend to show developmental delays accented which can persist throughout adulthood.

Table 1: Distribution of the preterm infants[3] according to their neurodevelopment

	1st Year		2nd Year		3rd Year		p
	N = 90		N = 57		N = 41		
NPMD[2]	**n**	**%**	**n**	**%**	**n**	**%**	
Normal	23	25·26	28	31·11	23	25·55	7·133[1]
Coarse Motor change	64	71·11	18	20·00	6	6·67	< 0·0001[1]
Fine Adaptive Motor change	33	36·67	13	14·44	5	5·56	< 0·0001[1]
Personal Social change	13	14·44	12	13·33	5	5·56	0·1496[1]
Language change	40	44·44	22	24·44	9	10·00	< 0·0001[1]

Source: Research Protocol 2011. [1]Chi-square test. [2]Neuropsychomotor development. [3]Premature Newborn.

The need to stimulate specific acquisitions as significant developmental milestones in the first year of life, such as smile, verbalization, with motor and hide and discovers game, this related to the concept of object permanence, are relevant to the gross motor development, fine adaptive, social, language and cognitive child to be built with the child's personal resources and experiences arising from social interaction established with the primary caregivers in the trajectory of development (Linhares *et al*., 2003). In relation to the development classification, it was found in this study, of the sample of 90 preterm infants, 71.1% of children had delayed motor development between 0 and 12 months, this being the largest area percentage of risk in this age; the passage from the 12th to the 24th month, this ratio decreased to 20.0%, and the 24th month to the 36th reduced to 6.6%, a statistically significant variance. It is observed that there was an improvement in motor skills of children in the course of development, in accordance with the study of Lino *et al* (2008), in which preterm infants had lower gains in the valuations of four and six months, suggesting that their greater challenges to play the items related to the age of six months, after then accelerating gains to the eighth month.

According to Piper *et al*. (1992) there is a certain chronology and sequence in typical motor development, since the premature infant neurologically intact can get gross motor skills similar to children the end to eight months of corrected age, regardless of gestational age at birth. This aspect is of paramount importance, since children when in motor limiting conditions can deprive yourself of the means that may assist it in the development of other skills (Miller and Clark, 2002; Lamônica, 2004).

In this study, the gross motor area remained changed in the three years analyzed, as described above, with significant reductions, agreeing to study Urzêda *et al* (2009), in which most of the children had an improvement in engine area coarse over the years, reducing the cases of changes in it. And in this study, minimizing the motor change was accompanied by a reduction in changes in other areas of development.

In the age group 12-36 months was observed prevalence of delay in the area of language, with 22 (24.4%) and 9 (10.0%), respectively, with a positive statistical significance. Similar to the study by Moraes *et al*. (2010), demonstrating that most children studied late at NPMD, the language was the biggest change variable found, with 54.3% of children 12 to 36 months and Fraga *et al*. (2008) also found that in a population of preterm evaluated at 12 months in language perform below expectations, however, were discordant to the study of Magalhães *et al*. (1999) in which the gross motor area was considered the latest in the development of premature babies evaluated from 12 to 24 months of age using the test Denver II.

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Table 2: Maternal characteristics of preterm infants 6 according to the result of the Denver II test with 12, 24 and 36 months corrected age.

	1st year					2nd year					3rd year				
	normal	%	changed	%	P	normal	%	changed	%	p	normal	%	changed	%	p
Age (weeks)															
10 to 19	8	20.51	31	79.49	0·0004[1]	7	35·00	13	65	0·2636[1]	3	42.86	4	57.14	< 0,00012
20 to 34	15	33.33	30	66.67	0·0369[1]	16	51.61	15	48.39	0·2636[1]	9	52.94	8	47.06	1·000[1]
From 35	2	33.33	4	66.67	**0·0003[2]**	3	50·00	3	50·00	0·2636[1]	1	50·00	1	50·00	1·000[1]
Prenatal															
Missing/incomplete	21	28.77	52	71.23	0·0004[1]	22	47.83	24	52.17	0·8828[1]	11	52.38	10	47.62	1·000[1]
Complete	4	23.53	13	76.47	0·0523[1]	4	36.36	7	63.63	0·5465[1]	2	40·00	3	60·00	**0.0025**
Complications															
ITU[3]	11	20.75	42	79.25	< 0·0001[1]	17	51.52	16	48.48	1·000[1]	5	31.25	11	68.75	0·21131
IPV	12	23.53	39	76.47	0·0003[1]	18	52.94	17	47.06	0·8638[1]	8	44.44	10	55.56	0·81371
DHEG[4]	7	21.88	25	78.13	0·0027[1]	9	36	16	64·00	0·8638[1]	5	38.46	8	61.54	0·57911
Roprema[5]	4	23.53	13	76.47	0·0523[1]	6	54.55	5	45.45	1·000[1]	7	70·00	3	30·00	**< 0·0001[2]**
Drugs															
Yes	0	0·00	7	100·00	0	1	20·00	4	80·00	**0·0016[2]**	0	0·00	0	0·00	0
No	24	28.92	59	71.08	0.00021	25	48.08	27	51.92	0·8897[1]	13	50·00	13	50·00	1·000[1]
Antenatal corticosteroid															
Yes	1	20·00	4	80·00	**0·0003[2]**	4	100·00	0	0·00	0	4	66.67	2	33.33	**0·0003[2]**
No	23	27.06	62	72.94	< 0·0001[1]	22	41.51	31	58.49	0·2718[1]	9	45	11	55	0·8231[1]
Parity															
First pregnancy	11	25.58	32	74.42	0·0023[1]	9	34.62	17	65.38	0·1698[1]	6	42.86	8	57.14	0·7893[1]
Multi-gestation	13	27.66	34	72.34	0·0035[1]	17	54.84	14	45.16	0·7194[1]	7	58.33	5	41.67	0·7728[1]
Childbirth															
Vagina	12	27.91	31	72.09	0·0061[1]	12	42.86	16	57.14	0·5708[1]	8	53.33	7	46.67	1·000[1]
Cesarean section	12	25.53	35	74.47	0·0013[1]	14	48.28	15	51.72	1·000[1]	13	50·00	13	50·00	1·000[1]

Source: Research Protocol 2011. [1]Chi-square test, [2]G. Test, [3]Urinary Tract Infection, [4]Hypertension Disease during pregnancy, [5]Premature rupture of membranes, [6]premature newborn.

As demonstrated in this study, Silva *et al*. (2011) confirms that the area of language prevails as the second most affected area and that further delay in achieving the normal range after a previous delay. The change in the area of language may be related to lack of child exploitation experience in the middle causing a mismatch in speed and understanding of language development, a condition that can lead to this imbalance is precisely the motor impairment attributable to the limited interaction with means (Amaral; TABAQUIM; LAMONICA, 2005; LAMONICA, 2004). This data is significant, since, in this study the change in gross motor area, prevailed as the second most frequent finding among children assessed 12-36 months old. As the assessment on the fine motor area yielded significant prevalence, especially in the period 0-12 months of 33 (36.6%) newborns, reducing to 13 (14.4%) in the period 12-24 months, with only 5 (5.5%) cases in the third year of life. These data can be related to evidence that certain aspects of development, such as fine motor skills, they are more influenced by extra-uterine stimulation, which would give a significant "advantage" for preterm infants (Magalhães *et al*., 1999).

However, the study Magellan *et al*. (2003) and Pereira and Tudella (2008) preterm infants with less than 35 weeks gestational age had major difficulties in fine motor area that appeared only from five to seven years of age, which was not observed in this study, since that the evaluation of the children was carried out only until the third year of life, but opens the range to the discussion on the importance of monitoring these children until at least school age, in an attempt to detect changes early on.

Of all the areas assessed, psychosocial proved to be the biggest area for all study participants, with prevalence in the first year of life change in 13 (14.4%) of the children studied, 12 (13.3%) and 5 (5.5%) cases in the second and third year, respectively,

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with positive significance. Concordant to Amaral; Tabaquim and Lamonixa (2005) study, in which 70% of premature infants presented the preserved cognitive, demonstrating higher cognitive impairments in the most complex and symbolic levels of motor skills, and gains in the simplest and most elementary, the conclusion was that this ability , related to interpersonal and family interaction activities, due to the appreciation of the midst of these skills, the stimulation and the child's response as a source including gratification.

It is extremely important to emphasize that the most significant risk percentage for all areas analyzed by the Denver Test II was found in the age group 0-12 months corrected age, with a positive level of significance, probably due to influences of the risk factors biological in the first months of life and child adjustment process in the home environment. The immediate intervention in this age group is necessary because the motor delay, the more significant in this age group, is an important sign of problems in the developing baby, causing prejudice to the operation of other areas of development (FORMIGA, 2009).

In this study, there was a higher incidence of moderate prematurity in 48 (53.3%) cases. Similar to the study by Castro (2004) which concludes that a sample of 59 preterm infants weighing less than 2,500 g, the occurrence of moderate prematurity became present in 60.8%. In general this group of infants has low mortality rate and can develop perinatal asphyxia, problems related to blood transfusion placental booking and hyperbilirubinemia (MARCONDES, 2004). Ambrose (2010) showed that in relation to gestational age, preterm exhibit alterations in quote and chemoarchitecture of the central nervous system, leading to impaired neurofunctional performance since the extra-uterine environment does not provide adequate incentives for neuronal development.

In this study, according to the relative values, low gestational age 27-29 weeks, showed a strong relationship with significant delay DNPM in the first three years of fixed life, which is consistent with demonstrating in the literature. Except the third year of life, which despite the statistical significance showed a lower relative value of children with delay. This is due to low sample of very preterm in the third year of life due to great maternal avoidance of outpatient follow-up of around 60%, with no significant sample of children born 27 to 29 weeks, these data are consistent with the literature that reports the difficulty to keep the band is one of the main problems in follow-up studies, loss rates being reported 20-40% especially in extremely low birth weight or very preterm infants (Dusick *et al*., 2003).

Silva et al (2011) showed that the average birth weight of our sample was 1236g, 372g varying more or less, which converges with the results presented in this study, therefore, 51 (56.6%) of very preterm included in the very low birth weight rating.

Both low gestational age and low birth weight are factors that lead to the development of higher chances of sequelae such as cerebral palsy, sensorineural deafness, visual impairment, deficit muscle tone, posture and reflexes (Huner; RAMIREZ, 2002; FELICE *et al* 2010;. GIARETTA; BECKER; Fuentefria, 2011). This study shows consistent data with the literature, since over the three years of full life, it was observed that, as the lower the birth weight of newborns higher the percentage changes in your DNPM.

In relation to gender, the boys had a frequency of 41 (45.5%) cases and a greater association with the DNPM delay in the first year of life, which was similar to studies Magellan et al. (2001), in which the male sex, low gestational age and gestational complications harmed children's performance on a test for cerebral palsy at four months corrected age. Consistent with this latest research, it was found that the male was associated with an increased risk of fetal distress, and the female has a protective effect according to Cunha, *et al.* (2004).

According to the study Hitz *et al*. (2006), the male is an intrinsic risk factor for psychomotor retardation, however, there was no postnatal intervention that could reverse this. In the same study, the reasons are not fully understood, but it is believed that genetic factors, fetal, hormonal and changes in neuroimaging of the fetus as brain degenerative changes due to the low PaCO2 compared to females, require a inotropism high-to satisfactory cerebral perfusion with the metabolic needs. Discordant hypothesis, Stoelhorst *et al*. (2003) point out that this difference between the sexes was due to comorbidities such as, hypotension, bronchopulmonary dysplasia, dependence on oxygen for more than 28 days, the male preterm infants are more likely to develop it.

In this study, almost all of the sample, 85 (94.4%) had an *Apgar* score of 5 minute greater than or equal to seven, which is consistent with studies of Rades et al. (2004) that the assessed premature, only 9.1% had the 5 minute *Apgar* score of less than seven. CARAVALE, and Allemand Libenson (2003) and Dias *et al*. (2005) correlate the *Apgar* score at 5 minutes under five as a predictor of risk of fetal neurological impairment, since newborns at risk of *Apgar* had significantly more likely to have a neurological manifestation. However, this study was divergent, since newborns with *Apgar* 5 minutes longer than seven showed a significant delay in psychomotor development in the first year of corrected age compared with patients who had Apgar score at 5 minutes index below seven, probably because it is known that there are other associated factors in the admission phase and post-discharge which are decisive for delay Psychomotor development are together or separately. The Apgar score is affected, reports Rades *et al*. (2004), by prematurity, because of fetal immaturity, not being a good parameter for the RN oxygenation status. Moreover, in his study, there was no *Apgar* ratio of the fifth minute with the development of comorbidities in children because of the small sample.

In Filipouski *et al*. (2011) studies, 161 preterm infants, the group that uses exclusive breastfeeding (EBF) had lower frequency of risk in development compared to the group that consumed artificial infant milk (AIM) in the following areas: personal-social (3% in EBF and 7% in AIM), large motor skills (40% in EBF and 73% in AIM) and overall (43% in EBF and 23% in AIM). In this study, 69 (76.6%) infants did not use EBF for at least six months. According Filipouski, weight gain in

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children born underweight during the hospital stay, through breastfeeding, influence the neuronal development of RN's, improving their prognosis, since fat milk contributes to the process of myelination. In this study, it was found that children who did EBF consumption for less than six months, revealed a worse prognosis in relation to its DNPM in the first year of life, thus demonstrating the importance of breastfeeding for neuronal development.

Conclusion

The psychomotor development is a multifactorial determination, in which the accumulation of risk factors determines a greater impact on delayed child development. Prematurity proved to be of major importance as a determining factor for neurological development, with significant differences in development between children born prematurely extreme, moderate or borderline. Similarly birth weight was also an important risk factor for the development of these children. These conditions require more therapeutic interventions and longer hospital stays, generating a strong challenge for professionals pediatricians to early fetal complications and late as delays in gross motor development, and adaptive fine, language and social personnel. So there is the need to expand assistance in prenatal care through quality care to pregnant women in order to identify the biopsychosocial risk and minimize the chances of premature births and fetal and maternal morbidity and mortality.

There was still high proportion of children which the Denver test shows, carries an increased risk of developmental delays, especially in children born with gestational age of 34 weeks, during which can be seen most organic immaturity. Among the evaluated, delays can be noted that the first year of life to change in the overall motor development prevailed, but from the second year delay in the area of language prevailed, an important factor since it can culminate in deterioration in school performance, lower IQ, behavioral disorders and attention disorders, and if the child is unaccompanied and these delays are not detected early can be the consolidation of irreparable consequences for these children.

This study has also shown very restricted access and low structuring in the network in relation to the care provided to premature infants, both in relation to intensive care units, with deficit in the number of beds and lack up to date and modern equipment, and in relation to monitoring of their psychomotor development, as this allows early diagnosis and treatment of possible consequences minimizing its impact.

Interest in the formation of these clinics is still incipient having shortage of medical specialties and rehabilitation therapy resources. So there is the need to invest resources for the care of this population of children and the recognition of this reality is important for administrators when planning these actions, either through joint clinics in cities with levels of increasing complexity and meets the need of rehabilitation of these children, avoiding the establishment of irreversible consequences.

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