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original article

# Motor and cognitive development of infants of adolescent and adult mothers: longitudinal study

## *Desenvolvimento motor e cognitivo de bebês de mães adolescentes e adultas: estudo longitudinal*

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**Abstract** – The aims of this study were to investigate in infants of adolescent and adult mothers: (1) the risk factors for child development; (2) changes in cognitive and motor development over four months of follow-up, (3) correlation between cognitive and motor development over four months of follow-up. This is a longitudinal study with 40 infants, 20 infants of adolescent mothers and 20 of adult mothers from Porto Alegre and Butiá, state of Rio Grande do Sul, Brazil. Three evaluations of motor and cognitive development were performed using the Alberta Motor Infant Scale (AIMS) and the Bayley Scale Infant Development II. Significant difference in the supine position of AIMS was observed between groups in the third evaluation. Infants of adolescent mothers showed lower scores than those of adult mothers. The motor scores of each position and total AIMS score showed significant difference during overall time and in each group. The Bayley-II mental score also showed significant difference during overall time and in each group. There was a positive, strong and significant association between AIMS and Bayley scores in all three evaluation stages as in the group of infants of adolescent and adult mothers. It was concluded that infants of adolescent mothers showed worse results in the supine position during the third evaluation than those of adult mothers. There was a significant association between motor and cognitive development in both groups of infants over time.

**Key words**: Infant development; Longitudinal study; Pregnancy in adolescence.

**Resumo** – *Este estudo teve como objetivos investigar em bebês de mães adolescentes e adultas: (1) os fatores de risco para o desenvolvimento infantil; (2) as mudanças cognitivas e motoras ao longo de quatro meses, (3) as correlações entre o desenvolvimento motor e cognitivo ao longo de quatro meses. Estudo longitudinal com 40 bebês, 20 nascidos de mães adolescentes e 20 de mães adultas, provenientes dos municípios de Porto Alegre e Butiá, no Rio Grande do Sul, Brasil. Foram realizadas três avaliações do desenvolvimento motor e cognitivo, utilizando a Alberta Motor Infant Scale (AIMS) e Bayley Scale of Infant Development II. Na postura supina da AIMS, observou-se diferença significativa entre os grupos na terceira avaliação. Os bebês das mães adolescentes apresentaram escores mais baixos em relação aos bebês de mães adultas. Os escores motores de cada postura da AIMS e o escore total AIMS apresentaram diferença significativa ao longo do tempo em geral e em cada grupo. O escore mental bruto da Bayley-II também apresentou diferença significativa ao longo do tempo em geral e em cada grupo. Observou-se associação positiva, forte e significativa entre os escores totais da AIMS e Bayley em todos os três momentos de avaliação no grupo de bebês de mães adolescentes e adultas. Pode-se concluir que bebês de mães adolescentes apresentaram-se piores na postura supina em relação aos bebês de mães adultas. Os desenvolvimentos motor e cognitivo se associaram significativamente em ambos os grupos ao longo do tempo.*

**Palavras-chave**: *Desenvolvimento infantil; Estudo longitudinal; Gravidez na adolescência.*

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## INTRODUCTION

The greatest risks for adolescent mothers and their babies are not only the result of maternal biological immaturity, but also of environmental factors such as low parental education and the poverty situation in which most of them are inserted[1,2]. Despite all vulnerability situation, when there is an effective social support structure, adolescent mothers are more likely to adapt and learn to face motherhood in a more positive and safe way[3], which can thus promote child development.

The changes over development stem from the multiple opportunities experienced in this context and include maturation, growth and perception aspects and cognitive processes[4]. The multifactorial nature of child development indicates the importance of providing continuous monitoring, especially for more vulnerable populations[5], in which longitudinal follow-up is considered the most appropriate way to detect development problems[6]. In addition, when considered vulnerable for being exposed to risk factors for developmental delay, the infant can resist the negative effects of this exposure if delays are early detected. Early detection enables interventional practices that when established in periods of high neural plasticity, lead to motor and cognitive behavioral gains[7].

The sensorimotor experience is of great importance to the development of cognitive skills, since cognition is built based on perception and motor action[8]. The motor development boosts cognitive development, especially in the aspect of language, requiring greater attention on these areas during early childhood in order to guarantee adequate child development[9]. This study aimed to investigate in infants of adolescent and adult mothers: (1) the risk factors for child development; (2) changes in cognitive and motor development over four months of follow-up, (3) correlation between cognitive and motor development over four months of follow-up.

## METHODOLOGICAL PROCEDURES

### Participants

This longitudinal study[10] included 40 infants, 20 of adolescent mothers (age 15-19 years) and 20 of adult mothers (age 25-39 years), from Early Childhood Education Schools and residences in the outskirts of the cities of Porto Alegre and Butia, Rio Grande do Sul, Brazil. The contexts in which assessments were performed had similar socioeconomic characteristics such as adequate housing, basic sanitation, electricity and access to potable water. Houses were mostly of masonry, of similar size and had 5-7 rooms including bathroom, located on neighborhoods of medium and medium-low socioeconomic status. Participants aged 0-18 months were included in the study with prior authorization from institutions and parents. The study was approved by the Ethics Research Committee of UFRGS under number 2008018.

## Instruments

To evaluate the motor development of infants, the Alberta Infant Motor Scale (AIMS)[11,12] was used, which is an evaluative scale of observation that basically assesses the motor development functional acquisitions of infants up to 18 months or until the acquisition of independent walking. AIMS has been validated by Valentini and Saccani[13] for Brazilian children and is intended for full-term and preterm infants with corrected age containing 58 items grouped into four subscales describing the development of spontaneous movement and motor skills in prone (21 items), supine (9 items), sitting (12 items) and standing positions (16 items)[11]. Cognitive development was assessed by the Bayley Scale of Infant Development II[14], which is a test for children aged 1-42 months to determine the current behavior and establish early intervention strategies[14]. There are three scales that comprise the Bayley-II: mental, motor, and behavioral. This study used only the mental scale that evaluates the response to the environment and sensory, mnemonic, and learning skills and language / early communication. a questionnaire was delivered to parents and / or guardians to identify the individual factors containing pre-, peri- and post-natal characteristics of babies such as birth date, sex, delivery type, gestational weeks, Apgar score, birth weight, birth length, head circumference, time (days) in the intensive care unit (ICU), period (days) on mechanical ventilation. The questionnaire also contained a question related to the monthly income of the participant's family.

## Procedures

Day care centers and preschools and community workers of the outskirts of Porto Alegre and Butiá were contacted. A letter of study presentation and the free and informed consent form were sent to children's parents or guardians. Once signed and returned, questionnaires were sent to parents and assessments were performed with children. Three evaluations were performed in the period from January to May 2013, with an interval of two months between assessments. Evaluations lasted about 30 minutes and were held in the home environment or classroom in the presence of a caregiver or family member. All evaluations were performed by the same researcher, being filmed and analyzed by two independent evaluators with a high level of agreement in order to minimize possible errors.

## Data Analysis

Longitudinal data were analyzed using Generalized Estimating Equations and the Bonferroni test to determine where the differences were. The Spearman correlation test was used for associations between quantitative variables, the independent Student t test or Mann-Whitney test were used comparisons between groups of quantitative variables and for qualitative variables, the chi-square or Fisher exact test were used. The level of statistical significance was set at 5% (p£0.05) and for correlation coefficients, values above 0.60 were considered strong correlation; between 0.30 and

0.60, moderate correlation; values below 0.30, weak correlation[10]. All analyses were performed using SPSS (Statistical Package for Social Sciences) - Version 20.0.

## RESULTS

As shown in Table 1, significant differences were found between groups in variables family income (F (39.1) = 8.15, p = 0.011), exclusive breastfeeding time (F (39.1) = 6.69, p = 0.017); mother working outside home (F (39.1) = 31.17, p <0.001); maternal (F (39.1) = 10.94, p = 0.003) and paternal education (F (39.1) = 82.46, p = 0.013). Regarding age, the average age of infants remained similar ($M_{total}$=6.46, $SD_{total}$=3; $M_{evaluation1}$=6.48, $SD_{evaluation1}$=2.96; $M_{evaluation2}$=8.63, $SD_{evaluation2}$=3.27; $M_{evaluation3}$=10.73, $SD_{evaluation3}$=3.30) over the three evaluation times (first evaluation: F (39.1) = 0.003, p = 0.958; second evaluation: F (39.1) = 0.11, p = 0.740; third assessment: F (39.1) = 0.11, p = 0742. The other variables did not show significant differences between groups.

The group of infants of adolescent mothers had lower family income, shorter exclusive breastfeeding time and lower maternal and paternal educational level in relation to the group of infants of adult mothers. But the frequency of mothers who work out of their homes was higher in the group of adult mothers. The fact that adolescent mothers had lower educational level and lower income confirm the socioeconomic vulnerability of this population.

As shown in Table 2, the motor development of babies by scores of each posture in AIMS (prone: F (37.3) = 40.19, p = 0.000; supine: F (37.3) = 20.34, p = 0.000 ; sitting: F (37.3) = 27.13, p = 0.000; standing: F (37.3) = 28.69, p = 0.000) and the total AIMS score (F (37.3) = 142.55 $p_t$ <0.001) showed significant changes over time in general and in each group ($p_{int1}$ <0.001). With regard to cognitive development, babies showed significant changes over time in the Bayley-II scores of the sample in general (F (37.3) = 211.60, $p_t$ <0.001) and in each group ($p_{int1}$ <0.001). Pt refers to the significance probability values over the three evaluation times, regardless of group and $p_{int1}$ represents the significance values for each group over time.

Significant differences between the performance of groups of infants of adolescent and adult mothers in the AIMS scores were observed in prone (F (38.2) = 0.001, p = 0.934), supine (F (38.2) = 0.61, p = 0.447), sitting (F (38.2) = 0.000, p = 0.947) and standing positions (F (38.2) = 0.56, p = 0.351), total AIMS score (F (38.2) = 0.085, p = 0.755) and AIMS percentile (F (38.2) = 0.003, p = 0.874). However, in the supine position, significant difference between groups in the third assessment time was observed ($p_{int2}$ = 0.046). The group of infants of adolescent mothers had lower scores compared to the group of infants of adult mothers. In Table 2, the $p_g$ values relate to significant differences between groups, when analyzing the $p_{int2}$ values, concerning differences between groups in each moment.

**Table 1.** Sample characterization and comparison between groups

| Variables | Adolescent mothers | Adult mothers | P (≤0.05) |
|---|---|---|---|
| Age (months) –mean ± SD | 6.45 ± 3.03 | 6.50 ± 2.97 | 0.958 |
| Gestational age (weeks) - mean ± SD | 37.3 ± 2.7 | 38.7 ± 2.4 | 0.083 |
| Maternal age (years) - mean ± SD | 17.5 ± 1.4 | 32.1 ± 4.5 | <0.001 |
| Paternal age (years) - mean ± SD | 20.8 ± 4.1 | 35.0 ± 5.6 | <0.001 |
| Sex – n (%) | | | 1.000 |
| Male | 11 (55.0) | 11 (55.0) | |
| Female | 9 (45.0) | 9 (45.0) | |
| Delivery type - n (%) | | | 0.057 |
| Normal | 14 (70.0) | 7 (35.0) | |
| Cesarean | 6 (30.0) | 13 (65.0) | |
| Prematurity - n (%) | | | 1.000 |
| Yes | 5 (25.0) | 5 (25.0) | |
| No | 15 (75.0) | 15 (75.0) | |
| Birth weight (g) - mean ± SD | 2914 ± 734 | 3194 ± 539 | 0.178 |
| Height at birth (cm) - mean ± SD | 47.1 ± 3.8 | 48.3 ± 2.7 | 0.257 |
| Head circumference (cm) - mean ± SD | 33.0 ± 2.4 | 33.9 ± 1.2 | 0.200 |
| APGAR 1st minute – mean ± SD | 8.42 ± 1.07 | 8.89 ± 0.66 | 0.109 |
| APGAR 5th minute – mean ± SD | 9.26 ± 0.65 | 9.37 ± 0.76 | 0.650 |
| ICU hospitalization time (days)) - md (P25 – P75) | 0 (0-2) | 0 (0-0) | 0.698 |
| Family income (Brazilian currency) - md (P25 - P75) | 1000 (605-1950) | 2900 (1050-4875) | 0.011 |
| Received exclusive breastfeeding – n (%) | | | 1.000 |
| Yes | 17 (85.0) | 18 (90.0) | |
| No | 3 (15.0) | 2 (10.0) | |
| Breastfeeding Time (months) – md (P25 – P75) | 1.5 (1-3) | 5 (4-6) | 0.0017 |
| Maternal education – n (%) | | | 0.003 |
| 1st to 4th years | 2 (10.0) | 2 (10.0) | |
| 5th to 8th years | 8 (40.0) | 1 (5.0) | |
| High-school | 10 (50.0) | 7 (35.0) | |
| Higher education | 0 (0) | 8 (40.0) | |
| Post-graduation | 0 (0) | 2 (10.0) | |
| Paternal education – n (%) | | | 0.013 |
| 1st to 4th years | 5 (26.3) | 2 (10.0) | |
| 5th to 8th years | 7 (36.8) | 1 (5.0) | |
| High-school | 6 (31.6) | 8 (40.0) | |
| Higher education | 1 (5.3) | 5 (25.0) | |
| Post-graduation | 0 (0.0) | 4 (20.0) | |
| Mother working out home – n (%) | | | <0.001 |
| Yes | 6 (30.0) | 19 (95.0) | |
| No | 14 (70.0) | 1 (5.0) | |
| Parents live together – n (%) | | | 0.157 |
| Yes | 12 (60.0) | 17 (85.0) | |
| No | 8 (40.0) | 3 (15.0) | |

In both groups, the majority of infants presented motor development within normal values as shown in Figure 1.

Figure 2 shows that the cognitive performance of infants in both groups presented no significant difference over time ($F(37.3) = 2.71$, $p = 0.338$

$p_{groupxtime}$), with most normal development in the three evaluation times.

**Table 2.** Motor and cognitive performance in each group

| | Mean±SE | | | GEE | |
|---|---|---|---|---|---|
| | M1 | M2 | M3 | $P_t$ | $P_g$ |
| Prone | | | | <0,001 | 0,934 |
| Adolescents | 9,40 ± 1,33[a] | 14,40 ± 1,51[b] | 16,50 ± 1,42[c] | $P_{int1}$<0,001 | |
| Adults | 10,05 ± 1,40[a] | 13,90 ± 1,41[b] | 16,55 ± 1,08[c] | $P_{int1}$<0,001 | |
| $P_{int2}$ | 0,736 | 0,809 | 0,978 | | |
| Supine | | | | <0,001 | 0,447 |
| Adolescents | 6,60 ± 0,48[a] | 7,95 ± 0,29[b] | 8,35 ± 0,27[b] | $P_{int1}$<0,001 | |
| Adults | 7,00 ± 0,49[a] | 8,00 ± 0,35[b] | 8,90 ± 0,07[c] | $P_{int1}$<0,001 | |
| $P_{int2}$ | 0,558 | 0,913 | 0,046* | | |
| Setting | | | | <0,001 | 0,974 |
| Adolescents | 7,15 ± 1,00[a] | 9,05 ± 0,80[b] | 10,50 ± 0,56[c] | $P_{int1}$<0,001 | |
| Adults | 7,00 ± 0,880[a] | 9,05 ± 0,72[b] | 10,60 ± 0,48[c] | $P_{int1}$<0,001 | |
| $P_{int2}$ | 0,911 | 1,000 | 0,893 | | |
| Standing | | | | <0,001 | 0,351 |
| Adolescents | 3,05 ± 0,43[a] | 5,70 ± 0,98[b] | 8,85 ± 1,19[c] | $P_{int1}$<0,001 | |
| Adults | 3,65 ± 0,31[a] | 7,25 ± 0,82[b] | 9,05 ± 1,05[c] | $P_{int1}$<0,001 | |
| $P_{int2}$ | 0,256 | 0,225 | 0,900 | | |
| AIMS scale | | | | <0,001 | 0,755 |
| Adolescents | 26,20 ± 2,93[a] | 37,10 ± 3,26[b] | 44,20 ± 3,17[c] | $P_{int1}$<0,001 | |
| Adults | 27,70 ± 2,74[a] | 38,30 ± 2,98[b] | 45,10 ± 2,40[c] | $P_{int1}$<0,001 | |
| $P_{int2}$ | 0,708 | 0,786 | 0,821 | | |
| AIMS percentile | | | | 0,147 | 0,874 |
| Adolescents | 33,05 ± 5,92[a] | 46,32 ± 6,96[ab] | 48,47 ± 6,42[b] | $P_{int1}$0,021 | |
| Adults | 40,07 ± 6,91 | 39,45 ± 5,56 | 43,07 ± 6,44 | $P_{int1}$0,814 | |
| $P_{int2}$ | 0,441 | 0,441 | 0,553 | | |
| Bayley scale | | | | <0,001 | 0,661 |
| Adolescents | 56,80 ± 4,16[a] | 68,85 ± 3,87[b] | 80,15 ± 3,33[c] | $P_{int1}$<0,001 | |
| Adults | 58,95 ± 3,95[a] | 71,80 ± 3,31[b] | 81,75 ± 3,30[c] | $P_{int1}$<0,001 | |
| $P_{int2}$ | 0,708 | 0,562 | 0,733 | | |
| Bayley MDI | | | | 0,057 | 0,758 |
| Adolescents | 88,95 ± 2,19 | 92,55 ± 2,07 | 92,85 ± 1,92 | $P_{int1}$0,294 | |
| Adults | 90,10 ± 2,03 | 92,75 ± 2,46 | 93,45 ± 1,99 | $P_{int1}$0,099 | |
| $P_{int2}$ | 0,700 | 0,950 | 0,828 | | |

Legend: SE: standard error; GEE: Generalized Estimating Equations (unstructured working correlation matrix; gamma scale response with log link; factor model). En: Ptime (over time, regardless of group); Pg: Pgroup (between groups, regardless of time); Pint1: Pgroup-time (within each group over time); Pint2: Ptime-group (between groups at each time). Bonferroni test to identify differences: [a,b,c] for comparisons over time within each group * $p \leq 0.05$.

The results show positive, strong and significant association between total AIMS (motor) and Bayley-II scores (cognitive) in all three evaluation times in both groups, as shown in Figure 3.

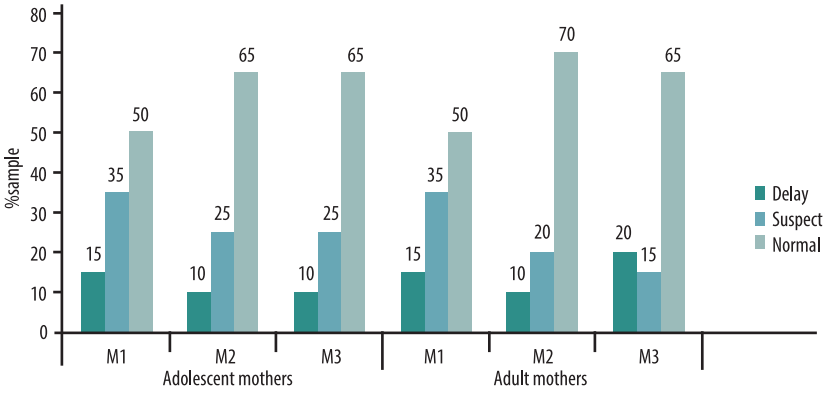


**Figure 1.** Categorization of the total AIMS score on three times in groups of infants of adolescent and adult mothers


**Figure 2.** Categorization of the total Bayley score on three times in groups of infants of adolescent and adult mothers

## DISCUSSION

This study aimed to investigate in infants of adolescent and adult mothers the biological and environmental risk factors for child development and the cognitive and motor changes and the correlations between motor and cognitive development of babies of adolescent and adult mothers over four months.

The risk factors for the development of infants of adolescent and adult mothers were quite similar. With respect to biological variables, both groups showed no significant differences in gender, prematurity, age, gestational age, birth weight and length, Apgar score in 1st and 5th minutes, head circumference and ICU time. These results contradict previous study that showed the highest prevalence of biological risk factors such as low birth weight, prematurity and low apgar index among adolescent mothers[15]. However, higher prevalence of risk factors such as prematurity and low birth weight has been reported for adolescent mothers with earlier ages[16], compared to those of the present study.

In relation to socioeconomic variables, maternal and paternal educational level showed differences, being unfavorable to adolescents. The educational level of younger mothers was lower compared to adult mothers. This result demonstrates the social and educational vulnerability of families of adolescent mothers and their babies. Previous studies with adolescent

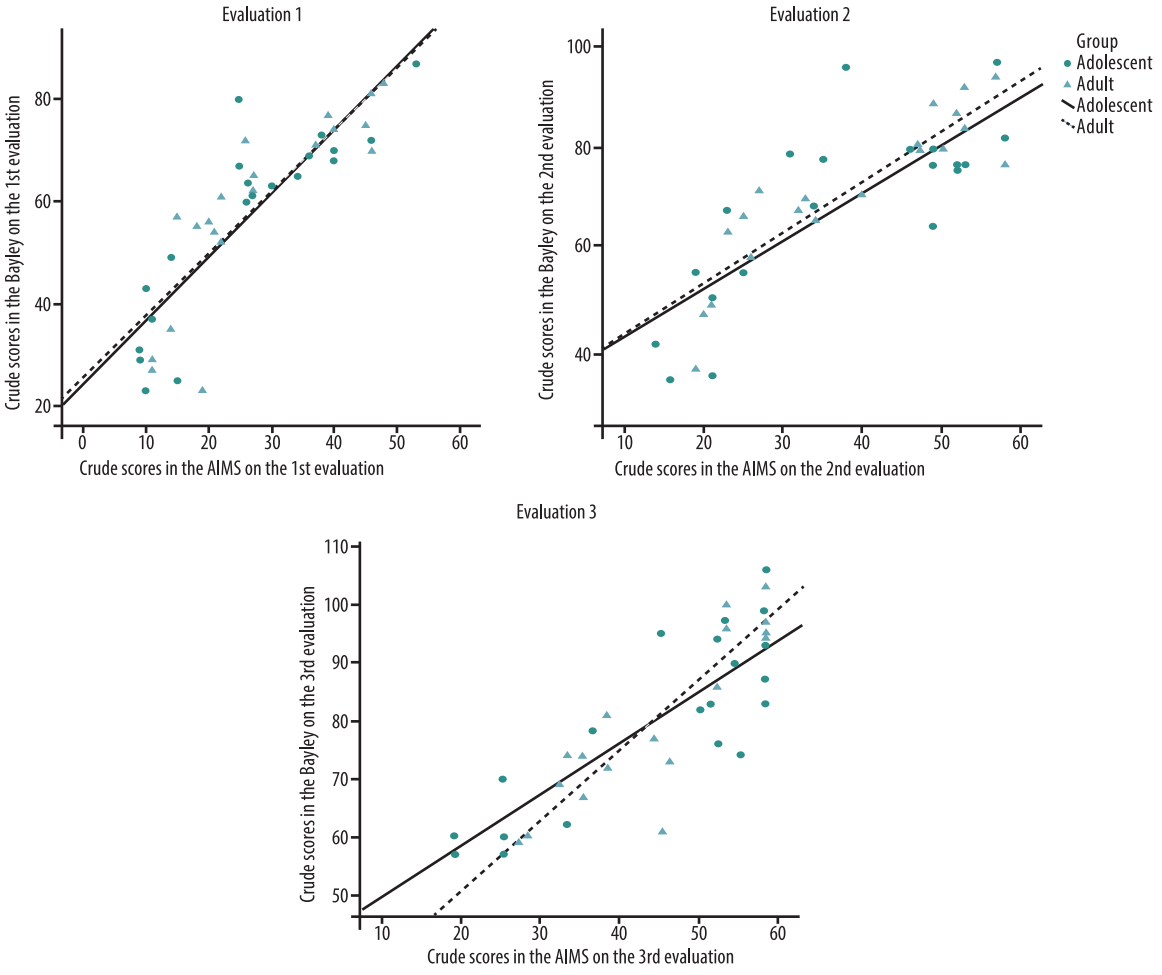


**Figure 3.** Correlations between AIMS and Bayley scores on the three evaluative times.

mothers also reported low educational level in this population[1,2,16], a fact of concern for subsistence and offer of development opportunities. The little schooling of adolescent mothers can result in environment of poor quality of stimuli for the infant. On the other hand, it is emphasized that this unfavorable situation is more common in younger adolescent mothers[17]. The average age of adolescent mothers in this study was 17.5 years, characterizing as mothers who became pregnant not so early, so the risk factors are somewhat mitigated. Similar results were found by Camarotti et al.[18].

Higher parental educational level has been positively associated with appropriate motor and cognitive[19,20] performance of children of different ages [19]. However, despite the lower educational level of adolescent mothers in our study, the development of their babies was similar to that of infants of adult mothers during the evaluations, unlike previous results[19].

Although literature reports that most young women do not receive family support or are abandoned by their partners[15], this fact was not observed in this study. The support from partner, frequently observed in the families of adolescent mothers may have benefited the child development trajectory in this group. In the study by Queiroz et al.[2], most adolescent mothers analyzed

lived with a partner, agreeing with the results of this study. The quality of marital and family relations contributes to better maternal acceptance of unplanned pregnancies and may favor child development[21]. It is worth mentioning the importance of evaluating the father's role and his involvement with the child care and stimulation, as well as other family members, especially the maternal grandmother, which should encourage and strengthen the adolescent mother's skills and the mother and child relationship[22,23].

In addition, adolescent mothers who remain living with their parents after the child's birth have the support of family members in the tasks with the baby[24]. The contact between mother and baby and the family support can act as compensating factors or protection for child development[22], even in pregnancy during adolescence. Therefore, this fact can be responsible for the adequate performance of most babies of adolescent mothers in this study. Future research should focus on the role of other caregivers in child development. The fact is that in this study, infants of adolescent mothers, even in a situation of greater social vulnerability, showed no risk in their development process over the 4-month follow-up period.

Regarding family income, the vulnerable socio-economic situation of the group of infants of adolescent mothers stands out. Previous studies have also reported the vulnerable socio-economic situation of families of adolescent mothers[18]; and the lower the family income, the greater the vulnerability of the child development process[6]. However, in this study, the socioeconomic status did not impact the development of babies of adolescent mothers, since over time, babies of adolescent and adult mothers had similar motor and cognitive development.

Although working less outside their home, the exclusive breastfeeding duration among adolescent mothers was lower compared to adult mothers, adolescent mothers showed an average of 1.5 months of exclusive breastfeeding duration. This result is similar to those obtained by Camarotti et al.[18], in which the vast majority of adolescent mothers continued exclusive breastfeeding only after one month after birth. However, the prolonged breastfeeding of adult mothers did not result in motor or cognitive benefits, similarly to another study[25].

One result of extreme importance of this study concerns the comparisons of scores of babies of mothers studied. While current literature[1,5,15,26] expresses concern about pregnancy in adolescence for possible delays in child development due to the combination of biological and environmental risks, they were not found in most positions and motor skills in the different development periods, and significant differences in the motor development of infants of adolescent and adult mothers were not found in this longitudinal study. The only exception was observed in the supine position on the third evaluation, where babies of adolescent mothers had lower scores compared to infants of adult mothers. Although previous study in groups of mothers of socioeconomic status similar to those of this study have reported lower motor performance of babies of adolescent mothers compared with those of adult mothers[26], motherhood in adolescence did not represent a persistent risk for infants in this study.

Moreover, no significant differences were found between groups with respect to cognitive development, similar to results of previous studies[9,27]. Most infants were found with performance within normality, confirming results with American and Brazilian children. For example, in a study with 10-month-old babies of Mexican adolescent mothers in the United States, cognitive development (also measured with the Bayley Mental Scale-II) was within the expected average mental development index of 93.29 (± 7.15)[27], similar to average values of our sample, in which 89.5% of babies showed development within normal limits.

In the longitudinal perspective, the results of this study are similar to those reported by Campos et al.[9], when comparing the motor and cognitive development of children with typical development during the first year of life. The significant changes observed over time reflect a continuous development, probably due to appropriate practices and adequate development conditions[4,8,13,20] offered by adolescent and adult mothers.

This longitudinal study on child development allowed verifying changes over time, enabling a more reliable and accurate analysis of the development trajectory. Many studies that have pointed out differences and risks of adolescent mothers to the development of their children are studies involving a single measurement in a specified period. The longitudinal design provides an overview of the process required to research this phenomenon. In addition, if we consider that from the point of view of biological and environmental risks, since isolated, these factors as occurred in the present study by the similarity of groups, maternal age itself was not considered as a factor of influence. Therefore, it is suggested that the methodological design proposed in this longitudinal study and controlling the factors involved, may be a more precise alternative to investigate whether it is adolescence or other factors associated with it that negatively influence child development.

Another important result of this study is related to associations observed between motor and cognitive development. Although literature has discussed this relationship [4,8], it still lacks results mainly of longitudinal surveys, unique feature of the present study. During the early years of the child's life, motor and cognitive development seems to be synchronous, particularly from the six months of age[9]. Statistically significant correlation between the results of the AIMS and Bayley-II scales in children at 6 and 12 months[28] and in preterm infants of 12 and 18 months[29] have been reported, confirming our results. Recent study found a positive correlation of motor skills with cognitive skills[30], a result similar to the present study.

The fact that maternal age is not extreme, for example, adolescent mothers under 15 years and adult mothers over 35 years of age can be considered a study limitation. Our sample did not include adolescent mothers under the age of 15 years, which are those that offer higher risks for the development trajectory of their children.

## CONCLUSIONS

With regard to risk factors, it could be concluded that the fact that adolescent

mothers had shorter breastfeeding time, lower educational level, employment rate and lower income confirm the socioeconomic vulnerability of this population.

However, despite the socio-economic vulnerability of families of adolescent mothers, according to the results of this study, maternal age did not negatively affect the motor and cognitive development of babies and cannot be considered as an independent risk factor for delayed child developmental. The scores of babies of adolescent mothers clearly show the absence of risks in the period investigated for motor and cognitive development over the four-month study period.

Whereas motherhood during adolescence has multifactorial origins, the idea that this phenomenon is acute and has a single cause must be ruled out. Therefore, no single factor alone may be responsible for the trajectory of child development, such as maternal age, for example. Motherhood in adolescence can be positively and adaptively experienced over time, especially when there is support from family, partner and society to assist young mothers to perform their duties.

With regard to motor and cognitive development of infants of adolescent and adult mothers, no significant differences over the four-month study period were observed between the groups in this study. The only exception was observed in the supine position on the third evaluation, where babies born of adolescent mothers had lower scores compared to infants of adult mothers.

The results of this study also showed positive, strong and significant association between motor and cognitive development in all three evaluation times in both groups evaluated.

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