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EFFECT OF EXCLUSIVE BREASTFEEDING ON THE DEVELOPMENT OF CHILDREN'S COGNITIVE FUNCTION IN THE KRAKOW PROSPECTIVE BIRTH COHORT STUDY

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Abstract

The main goal of the study was to assess the effect of exclusive breastfeeding on the neurodevelopment of children over a seven-year follow-up period and to test the hypothesis that the observed cognitive gain in breastfed children in the first years of life is a strong predictor of their cognitive development trajectory, which may be continued in later life.

The analysis is based on data from the seven-year follow-up of 468 term babies (>36 weeks of gestation) born to non-smoking mothers participating in an ongoing prospective cohort study. The cognitive function of children was assessed by psychometric tests performed 5 times at regular intervals from infancy through the preschool age. The study included valid neurodevelopmental assessment of the children – 443 participants were evaluated least twice, 425 – three times and 307 five times in the follow-up period. The association between the cognitive achievements of preschool age children and exclusive breastfeeding of various duration was performed using the GEE (General Estimation Equation) longitudinal model, adjusted for major confounders such as maternal education, gender, parity, and weight gain in pregnancy.

Children breastfed exclusively for up to 3 months had IQs that were on average 2.1 points higher compared to the others (95%CI: 0.24 – 3.9); children breastfed for 4 – 6 months scored higher by 2.6 points (95%CI: 0.87 – 4.27); and the benefit for children breastfed even longer (>6 months) increased by 3.8 points (95%CI: 2.11 – 5.45). Other predictors were maternal education, gender of the child, having an older sibling, and weight gain during pregnancy.

The results of the study support the WHO expert recommendations on exclusive breastfeeding for six months; moreover, they provide evidence that even a shorter duration of exclusive breastfeeding in early infancy produces beneficial effects on the cognitive development of children. The breastfeeding-related IQ gain observed already at the age of 1 was sustained through preschool age and the difference in terms of IQ score between breastfed children and the reference group (mixed breastfeeding) held constant over the whole preschool period.

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Keywords

breastfeeding; cognitive function in early childhood; prospective birth cohort study

Introduction

It is well documented that cognitive development in childhood is vital for an individual's capacity to learn and take advantage of the opportunities available within a particular environment. Individuals scoring higher on intelligence tests in early childhood are usually more successful in professional careers and achieve a higher level of education and better socio-economic status, which may in turn positively affect their health status [7,13, 22, 23].

The effect of feeding type on infant health and development was first observed more than seven decades ago when breastfeed infants were shown to have an advantage in cognitive function over non-breastfed infants [12]. Long-term beneficial consequences of breastfeeding for a child's mental health may result from the fact that maternal milk is a rich source of fatty acids and other bioactive components essential for the brain development of infants [6, 19, 25]. Two fatty acids are associated with the development of nerve cells, retina and the brain: docosahexaenoic acid (DHA) and arachidonic acid (ARA). Both are present in breastmilk, but absent from infant formula and cow's milk. Both have also been shown in experiments to improve eyesight and some motor responses in infants and young children [1, 4, 5, 10, 18, 27].

The results of many clinical studies suggest that breastfed children score higher on tests of cognitive function than do formula-fed children. Yet, there is still some controversy as to whether these beneficial effects result from breastfeeding itself, and the most frequent criticism is that the evidence suffers from confounding by factors such as socio-economic status or maternal education. Numerous studies have suffered from a retrospective design, inadequate number of psychometric measurements, small sample size, and limited generalizability. Moreover, many studies disregard the difference in effects of exclusive breastfeeding and combined breast-and-bottle feeding, which could be another source of biased results.

The main goal of the present study was to measure the effect of exclusive breastfeeding on the neurodevelopment of children over a seven-year follow-up period. The estimated effect of the exclusive breastfeeding was adjusted for important confounding covariates such as child's gender, maternal education, parity and weight gain in pregnancy. The secondary purpose of the analysis was to test the hypothesis that the cognitive gain in breastfed children in the first years of life is sustained and may be a strong predictor of the cognitive development trajectory in children, which may be continued in later life.

Material and Methods

This study is part of an ongoing, longitudinal investigation of the health effects of prenatal exposure to outdoor and indoor air pollution on infants and children in Krakow, Poland. As described previously [15], between January 2001 and February 2004, we recruited a total of 505 women between 8 and 13 weeks pregnant, who registered at prenatal healthcare clinics in the central area of Krakow, where they had also lived for at least a year before screening. Pregnant women visiting the prenatal clinic received a letter of introduction and answered a short screening questionnaire to determine whether they met the eligibility criteria – age ≥ 18 years, non-smoking, singleton pregnancy, no current occupational exposure to known developmental toxicants, no history of illicit drug use, pregnancy-related diabetes, or hypertension. After delivery medical information was extracted from the mothers' and

infants' hospital records. The full enrollment in the study included women who provided prenatal questionnaire data, completed prenatal air monitoring data, and had a blood sample collected at delivery either from the mother and/or her newborn child. A total of 468 pregnant women who gave birth between January 2001 and February 2004 met these criteria and gave birth to term babies (>36 weeks of gestation), 460 of whom were subsequently assessed for neurodevelopment least twice, 425 – three times and 307 five times in the follow-up period. Informed consent was obtained from all subjects. The study was approved by the Jagiellonian University ethics committee.

Detailed data on maternal education was used as a proxy for social class, intellectual ability and quality of parenting. Breastfeeding initiation and its duration were defined based on the answers from interviews taken at regular 3-month intervals over the postpartum period. Mothers were asked whether the infant had ever been breastfed, and, if so, the age of the baby (in months) when exclusive breastfeeding was stopped. Exclusive breastfeeding was assumed if the child received only breast milk, and no other liquids or solids with the exception of medicine, or mineral supplements. mixed feeding was assumed when the child received both breast milk and formula or only formula since birth.

Weight gain in pregnancy was defined as the difference between the self-reported weight before pregnancy and the weight measured in the maternal ward before delivery. For the purpose of the analysis, weight change during pregnancy was divided in tertiles and the excessive weight gain was defined as values above the highest tertile (>17 kg).

Follow-up assessments were performed at age 1, 2, 3, 6 and 7 and included general health interviews administered by the trained personnel, pediatric health check-ups and mental development testing. Maternal IQ testing was performed in 293 women.

Maternal IQ measurements

As maternal intelligence is a known correlate of child cognitive development [17, 21, 26], we administered the Test of Nonverbal Intelligence (TONI-3) to the mothers at the 4th year of follow-up. The TONI-3 is a language-free measure of general intelligence, considered to be relatively free of cultural bias [8].

Mental development testing in children

In the first three years of the follow-up the Bayley Mental Scales of Infant Development – second edition (BSID-II) were used (17), which assess habituation, problem solving, early number concepts, generalization, classification, memory, vocalization, language and social skills of children. The BSID-II test was administered to children within 4 weeks of the target age at the Chair of Epidemiology and Preventive Medicine by five trained examiners, who were unaware of the child's feeding type. The interpretation of the Bayley test was based on the detailed manual instructions for evaluators (Bayley Scales of Infant Development – Manual). Standardization of mental performance scoring was done in the course of team practice session with the team leader (Ilona Lisowska-Miszczyk), who had been trained at Columbia University, while follow-up surveillance of the assessors was provided by Dr J. Jankowski from Albert Einstein College of Medicine in New York.

At the age of 6 and 7 the Wechsler intelligence test for children (WISC-R) was administered [28, 29]. This intelligence and neuropsychological assessment tool has regularly been used by researchers in many areas of psychology and child development as a valid and reliable measure of general intelligence. It has been found to be a good measure of both inductive and deductive reasoning, but also measures knowledge and skills primarily influenced by biological and socio-cultural factors. Tasks on the WISC-R include questions of general

knowledge, traditional arithmetic problems, vocabulary, completion of mazes, and arrangements of blocks and pictures. The WISC-R yields three IQ (intelligence quotient) scores, based on an average of 100, as well as subtest and index scores. WISC-R subtests measure specific verbal and performance abilities. The Wechsler scales were standardized for the Polish population of children and are meant to be representative of the Polish population. Practical execution of tests in the field was done in the course of team practice sessions with Ms Maria Butscher, a psychologist from the Jagiellonian University Medical College, who evaluated the scoring.

Statistical data analysis

The descriptive analysis considered the distribution of various parameters related to women and newborns under study, reflected by breastfeeding practices. Chi-square statistics (nominal variables) and analysis of variance (numerical variables) tested differences between subgroups. The relationship between breastfeeding and IQ scores was evaluated with linear multivariate regression. In order to assess the average effect of maternal milk exposure on the cognitive function measured at 1, 2, 3, 6 and 7 years of age, the Generalized Estimating Equations (GEE) model was applied [11]. GEE model utilizes data on all respondents, including those with incomplete protocols, and permits simultaneous modeling of the relationship (regression) of specific risk factors with IQ scores and all five measurements over the follow-up. GEE estimates regression coefficients taking into account the correlation between scores at all ages. The described models computed regression coefficients of the dependent variable (standardized IQ scores) on the main predictor variable (exclusive breastfeeding) and potential confounders or modifiers (child's gender, maternal education, parity, maternal weight gain in pregnancy). In the GEE model all IQ test scores measured in the follow-up were normalized to a mean of 100 and SD of 10. Statistical analyses were performed with STATA 11.1 version for Windows.

Results

While 32.9% of babies in the study received both breast milk and formula since birth (mixed breastfeeding), 67.1% mothers reported exclusive breastfeeding over different lengths of time. Table 1 compares the birth outcomes data and other characteristics of the study sample at the entry to the study. It demonstrates that mothers who exclusively breastfed their infants up to 3 months were older, better educated, had already had other offspring and gained less weight in pregnancy. There was no difference in birth outcomes between the exclusively breastfed and mixed breastfeeding groups. Girls dominated among children fed exclusively with maternal milk (52.9 vs. 47.1%). Children who were breastfed up to 3 months scored on average by 4 – 5 points higher on all psychometric tests at each of the IQ check-ups. As the characteristics of the children who completed the follow-up did not differ significantly from those who failed to attend it, we may assume that the followed group was representative of the initially recruited sample (Table 2).

Table 3 shows the unadjusted cognitive test scores for the children with different breastfeeding patterns over the infancy period. The data confirm that children on mixed breastfeeding achieved lower total IQ scores at each of IQ check-ups compared with those who were exclusively breastfed. The analysis also revealed that exclusive breastfeeding had a significant beneficial effect in one-year-olds even if the period of exclusive breastfeeding was relatively short. Moreover, we found a strong positive trend for the IQ scores and the duration of the exclusive breastfeeding at each of the check-up time points.

Relative importance of a child's gender, maternal education and exclusive breastfeeding for cognitive function assessed by partial correlation was different in very early childhood (<= 3

years old) and mid-childhood period (6 – 7 years old). While in very early childhood child's gender was significant and accounted for about 3.8 – 6.3% of variability in cognitive function, it became insignificant in older children. The effect of maternal education, insignificant in infancy, became gradually significant later and at the age of 7 explained about 5% of IQ variability. In contrast, the effect of exclusive breastfeeding held constant over the follow-up and ranged from 1.2% – 1.9%.

The longitudinal analysis of the association between cognitive achievements of preschool age children and exclusive breastfeeding was performed with the GEE model. As the correlation coefficients between cognitive scores achieved by children in the course of the follow-up and maternal education (number of schooling years) and maternal IQ assessed by TONI test did not differ (table 4), in the multivariable approach we have chosen to consider only maternal education as a proxy for maternal care. The GEE analysis (Table 5) confirmed that children breastfed exclusively for at least 3 months had significantly higher total IQ by 2.1 points (95%CI: 0.24 – 3.9), those breastfed for 4 – 6 months scored higher by 2.6 points (95%CI: 0.87 – 4.27) and the benefit for children breastfed even longer (>6 months) increased up to 3.8 points (95%CI: 2.11 – 5.45). Out of cofactors introduced in the GEE model, only the excessive weight gain in pregnancy and parity had negative impact on the cognitive development. Children whose mothers gained more than 17 kg over pregnancy had a significantly lower score by 1.7 points (95%CI: -3.36 to -0.18) in comparison to those whose mothers had gained less. Children who had older siblings also scored significantly lower by 1.4 points (95%CI: -2.73 to -0.15). On average, girls scored significantly higher than boys by 2.7 points (95%CI: 1.47 – 3.94). The adjusted dose-effect relationship between the duration of exclusive breastfeeding and the cognitive function of children was similar in boys and girls (Table 6).

On average, the group of children who were examined at the age of 7 scored relatively high (mean 125.5; range 90 – 153 points). Out of all children attending the check-up, 30.5% could be defined as having very high or high IQ scores (above 133 points), 50.0% were classified as having IQ above the average (116 – 132 points) and the remaining 19.5% were at the average IQ level (85 – 115). The results of multivariable regression analysis performed in the latter group were consistent with the previous set of results and showed a strong beneficial effect of exclusive breastfeeding on cognitive ability of seven-year-olds. There was also a significantly better chance of getting a very high IQ at the age of seven (OR = 2.51, 95%CI: 1.05 – 6.02) for those children who were exclusively breastfed over 6 months or longer.

Discussion

This is the first longitudinal analysis of cognitive development in Poland aiming at assessing the relationship between exclusive breastfeeding in infancy and the long-term cognitive benefits in term children. The GEE longitudinal model revealed that exclusive breastfeeding over 6 months or longer was associated with an average 3.8-point higher gain in IQ score during the seven-year follow-up, in comparison with the mixed feeding practice. The findings confirm that exclusive breastfeeding in infancy enhances cognitive ability in children who were exclusively breastfed; moreover, a beneficial effect was observed after shorter periods of breastfeeding. Generally, increasing duration of breastfeeding was accompanied by a gradual increase in cognitive developmental score. Moreover, it was shown that the breastfeeding effect on children's IQ trajectory was consistent and stable over the entire follow-up period.

In addition, the enhanced cognitive development of exclusively breastfed children was observed already in the first year of age, when maternal education and other cofactors

considered appeared to be insignificant. The beneficial effect of exclusive breastfeeding on IQ score gained at the age of 1 was sustained through preschool age and the difference in terms of IQ score between breastfed children and the reference group (mixed breastfeeding) was uniform over the whole preschool period. The latter observation may suggest that exclusive breastfeeding in early infancy may set the trajectory of cognitive development of children at a higher level, and may possibly affect cognitive ability in adolescence and adulthood as well.

The consistency of the cognitive gain over subsequent checks-ups may be an indication of a strong biological effect of exclusive breastfeeding on the neonatal brain. In this context we would like to refer to a very recent study which has shown that the development of brain electrical activity during infancy differs between those who are breastfed and those fed either with cow's milk or soy milk [16]. The authors suggest that the differences in brain electrical activity between breastfed and milk-formula-fed infants could have been influenced by omega-3 polyunsaturated fatty acids that are normally present in breast milk or other bioactive components essential for development.

There are other possible mechanisms that may explain the association between breastfeeding and child cognitive function since breastfeeding may be an indicator of a safe and sound maternal attachment status, which has been shown to have a positive influence on the child's psychological development into later age [14, 20, 24]. The amount of mutual touch, physical stimulation and mother's gaze to infant are significantly elevated during breastfeeding compared with bottle-feeding. Breastfeeding may also be a marker of other unmeasured maternal characteristics such as maternal intelligence. In our analysis we did not consider maternal intelligence as it was found that maternal education correlated significantly with maternal cognitive capacity.

Our longitudinal cohort study is in good agreement with very recent results of the ten-year follow-up study done in Australia on the relation between breastfeeding duration in infancy and language ability of children at the age of 10 [30]. The authors found that children who were predominantly breastfed for more than 6 months scored higher (by 4 points on average) on the language ability test when compared with children who had never been breastfed. Our observations are also consistent with the results of the meta-analysis of 20 controlled studies [2], which showed that breastfeeding was associated with a cognitive development score 3.2-point higher than after formula-feeding, adjusted for key cofactors. These results were homogeneous and significant ($P < 0.001$). Similarly to our findings, the enhanced cognitive development of breastfed compared with formula-fed children was manifested early in the development and sustained throughout childhood and adolescence. On the other hand, our results are firmly at odds with the recent reanalysis of the large prospective study published by Der et al. [9] who concluded that breastfeeding has little or no effect on child's intelligence. However, the latter study only considered two broad categories of children who were and were not breastfed and failed to consider exclusive breastfeeding. Children who were classified as breastfed could in fact have followed mixed feeding and doses of breast milk they received might have been too small.

Up to now, the role of excessive gestational weight gain on cognitive development of the offspring has received no attention and most studies consider gestational weight gain only in terms of premature birth rates, complications at delivery or as a possible determinant of obesity in the offspring. The reason for the observed moderate but significant deficit of cognitive function over the follow-up associated with the excessive gestational weight gain is not clear. It does not imply a cause-effect relationship between cognitive development of children and gestational weight gain because the relationship could be spurious and result from other unmeasured variables. As the gestational weight gain was found to be associated

with offspring overweight, it is probably the latter factor that could have been implicated in poorer cognitive function.

A definite strength of our study is the cohort design, the multiple measures of cognitive ability, and control for several major confounding covariates. The study had the sufficient sample size (power of the study = 90%, at alpha = 0.05) and enabled us to limit measurement error in assessing the exclusive breastfeeding and mixed feeding practices by regular interviews with mothers at three-months intervals over infancy. Many previous studies disregarded exclusive breastfeeding and compared only the cognitive function between “never breastfed” and “ever breastfed” children. In earlier studies, information on breastfeeding practices and the duration of breastfeeding was often obtained retrospectively at the time of cognitive measurements. The multiple measurement of the cognitive development of children over the follow-up was carried out by the trained staff using the Polish version of the Wechsler-R intelligence, adapted and standardized by the Polish Psychological Society. Our analysis included important potential confounders of the relationship between breastfeeding and cognitive development and other factors potentially associated with cognitive development of children, such as chronic diseases of mothers or maternal active tobacco smoking, which have been removed through entry criteria. Furthermore, the longitudinal statistical analysis (the GEE model) of intelligence test scores achieved by children from infancy through preschool age was used to present a cognitive development of preschool age children related to exclusive breastfeeding.

In conclusion, the results of our study support the WHO expert recommendations on exclusive breastfeeding for six months [31, 32]. Moreover, our study also provides evidence that even shorter duration of exclusive breastfeeding in the initial period of infancy brings about beneficial effects in the cognitive development of children. In epidemiologic studies the potential association between prenatal or postnatal exposure to ambient hazards and cognitive function should always be adequately adjusted for exclusive breastfeeding, as one of the strongest confounders on the effect.

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Table 1

Characteristics of the study sample over the follow-up by the type of breastfeeding

Variables		Type of breastfeeding		
		Complementary N =154	Exclusive N=314	P for difference between groups
Maternal age	mean	26.53	28.09	0.0000
	SD	3.799	3.290	
Maternal education (years of schooling)	mean	14.58	16.08	0.0000
	SD	2.651	2.623	
Maternal IQ pregnancy (kg) Missing data	mean	104.31	110.01	0.0097
	SD	16.67	17.72	
		62	113	
Maternal weight gain over pregnancy (kg)	mean	16.183	15.163	0.0461
	SD	6.034	4.695	
Parity: 1	n (%)	107 (69.5)	188 (59.9)	0.0547
≥ 2	n (%)	47 (30.5)	126 (40.1)	
Gender: Boys	n (%)	89 (57.8)	148 (47.1)	0.0386
Girls	n (%)	65 (42.2)	166 (52.9)	
Bayley – MDI 12	mean	98.73	102.35	0.0004
	SD	11.199	9.874	
Bayley – MDI 24	mean	98.30	102.95	0.0004
	SD	12.924	12.978	
	Missing data	9	16	
Bayley – MDI 36	mean	100.70	104.42	0.0006
	SD	10.655	9.839	
	Missing data	23	37	
WSIC IQ at age 6	mean	117.73	122.26	0.0028
	SD	12.214	11.826	
	Missing date	63	110	
WSIC IQ at age 7	mean	121.00	125.86	0.0014
	SD	10.714	10.946	
	Missing data	79	142	

Table 2

Characteristics of the study sample, which completed the seven-year follow-up and the group of children who failed to complete the follow-up

		Follow-up completed N=295	Follow-up not completed N=173	P for difference between groups
Maternal education (years of schooling)	mean	15.65	15.47	0.4842
	SD	2.675	2.807	
Pre-pregnancy maternal weight (kg)	mean	58.325	57.838	0.5515
	SD	8.110	9.223	
Maternal weight gain over pregnancy (kg)	mean	15.396	15.671	0.5815
	SD	5.129	5.298	
	Missing date	2	0	
Parity: 1	n (%)	189 (64.1)	106 (61.3)	0.6131
≥ 2	n (%)	106 (35.9)	67 (38.7)	
Gender: Boys	n (%)	146 (49.5)	91 (52.6)	0.5798
Girls	n (%)	149 (50.5)	82 (47.4)	
Gestational age:(weeks) > 36	mean	39.54	39.52	0.8645
	SD	1.139	1.159	
Breastfeeding exclusive ≥ 3 months	n (%)	204 (69.2)	110 (63.6)	0.2561
Bayley – MDI 12	mean	101.55	100.49	0.2897
	SD	9.504	11.905	

Table 3

Trends for cognitive function (mean unadjusted data together with 95%CI) in children assessed over the follow-up by the breastfeeding type *

Cognitive scores achieved in the follow-up	Breastfeeding type				Non-parametric Test for trend
	I	II	III	IV	
1st year	N = 154	N = 85	N = 110	N = 119	
	87.9	101.4	100.7	101.2	Z = 2.65
	96.2, 99.6	99.1, 103.6	99.1, 102.2	99.6, 102.9	P = 0.008
2nd year	N = 153	N = 82	N = 107	N = 118	
	97.6	99.6	100.6	102.9	Z = 4.38
	96.0, 99.1	97.5, 101.8	98.9, 102.3	101.0, 104.8	P = 0.000
3rd year	N = 139	N = 73	N = 100	N = 113	
	97.4	100.2	100.7	102.4	Z = 4.06
	95.7, 99.2	98.0, 102.4	98.9, 102.4	100.5, 104.3	P = 0.000
6th year	N = 95	N = 47	N = 78	N = 87	
	97.3	99.4	101.8	101.6	Z = 3.61
	95.2, 99.4	97.0, 101.9	99.4, 104.3	99.7, 103.6	P = 0.000
7th year	N = 78	N = 39	N = 67	N = 72	
	96.7	99.4	102.3	101.7	Z = 3.56
	94.5, 98.9	96.1, 102.8	99.9, 104.8	99.5, 103.9	P = 0.000

* I = complementary breastfeeding, II = exclusive breastfeeding up to 3 months, III = exclusive breastfeeding 4–6 months, IV = longer than 6 months

Table 4

Correlation coefficients between cognitive scores of children in the course of the follow-up and maternal education (number of schooling years) and maternal IQ (TONI-3)

	Cognitive scores achieved by children at particular ages				
	1st year	2nd year	3rd year	6th year	7th year
Number of Schooling years	0.03 (0.5765)	0.21 (0.0004)	0.22 (0.0002)	0.25 (0.0.0001)	0.25 (0.0003)
Maternal IQ score	0.12 (0.0591)	0.18 (0.0016)	0.21 (0.0003)	0.26 (0.0000)	0.23 (0.0000)

Table 5

Cognitive development of children monitored over the follow-up estimated from the GEE model

Predictors	Coef.	z	P>z	[95% Conf.	Interval]
Child's gender (girls)	2.70	4.28	0.000	1.47	3.94
Maternal education *	2.94	3.88	0.000	1.46	4.43
Parity **	-1.44	-2.18	0.029	-2.74	-0.148
Exclusive breastfeeding					
<=3 months	2.08	2.22	0.027	.24	3.92
4 – 6 months	2.57	2.97	0.003	.87	4.27
> 6 months	3.78	4.44	0.000	2.11	5.45
Weight gain in pregnancy					
< 14 – 17 kg	.04	0.06	0.955	-1.42	1.50
> 17 kg	-1.72	-2.20	0.028	-3.26	-0.19
_cons	98.32	123.40	0.000	96.75	99.88

* Maternal education dichotomized in two levels:1 = more than 13 years of schooling, 0 = lower or equal to 13 years of schooling

** Parity dichotomized in two levels: 1 = presence of at least one older sibling, 0 = no older siblings

Table 6

Adjusted effects of breastfeeding type on the cognition score achieved by gender children over the follow-up (adjustment based on GEE model)

	Coefficient	z	P value	95%CI
Boys Breastfeeding type *				
I	Reference category			
II	2.75	2.08	0.038	0.15, 5.34
III	2.01	1.59	0.112	-0.10, 4.50
IV	3.35	2.81	0.005	1.01, 5.69
Girls Breastfeeding type *				
I	Reference category			
II	0.86	0.65	0.516	-1.74, 3.47
III	2.26	1.88	0.061	-0.10, 4.63
IV	3.05	2.54	0.011	0.70, 5.41

* I = complementary breastfeeding, II = exclusive breastfeeding up to 3 months, III = exclusive breastfeeding 4–6 months, IV = longer than 6 months