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# Assessment of Psychosocial Development in Breastfed Children at 6 Years of Age

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## Abstract

**Background:** Breast-fed children develop fewer psychological, behavioral and learning problems as they grow older.

**Aim:** To assess the relationship between the duration of breastfeeding and psychosocial development in children at 6 years of age.

**Participants and methods:** A cross sectional study conducted over 200 children, who were at 6 years old age and admitted to an educational institution. Children with chronic mental or motor disability, chronic medical diseases, psychic diseases and children suffering from congenital anomalies were excluded from the study. Overall breastfeeding duration and exclusive breastfeeding were reported. All studied children were subjected to assessment of children's personal history and maternal personal and sociodemographic history, assessment of intelligence level using Pictorial Intelligence Test (prepared by/Ahmed Zaki Saleh,1987) and lastly Strength & difficulties questionnaire (SDQ) with 5 scales (Emotional symptoms, conduct problems, hyperactivity, Peer relationship problems, Prosocial behavior).

**Results:** Caesarean sections and birth order affect exclusivity and duration of breastfeeding in children. Children with exclusive breastfeeding had a better academic achievement and IQ than artificially fed. Children with exclusive breastfeeding had less emotional symptoms and total difficulties than all other groups. A significant negative correlation between breastfeeding duration and emotional symptoms, conduct symptoms and total difficulties but a positive correlation with prosocial behavior.

**Conclusion:** Breastfeeding improves psychological health of children with a positive effect on children's intelligence and academic achievement.

**Keywords:** Breast feeding; Intelligence; Psychological health; Behavior

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## Introduction

As breastfeeding is considered the normative standard for infant nutrition, the American Academy of Pediatrics recommends exclusive breastfeeding for 6 months with continuation of breastfeeding for 1 year or longer [1]. Significant evidence suggested that breast-fed children develop fewer psychological, behavioral and learning problems as they grow older [2]. For instance, children who were breastfed ≥ 10 months and exposed to active bonding during feeding displayed the lowest risks of internalizing behavior problems at the age of six years [3]. Likewise, breastfeeding for a longer duration with exclusive breastfeeding was associated with significant increases in child's IQ by age of six years [4].

There is an association between breastfeeding duration, receptive language, and verbal and nonverbal intelligence later in life [5]. As evidenced by a study, breastfed children had significantly higher IQ scores, larger whole brain, total gray matter, total cortical gray matter, and subcortical gray matter volumes compared with the non-breastfed children [6].

The aim of our study was to determine the relationship between the exclusivity, duration of breastfeeding, and psychosocial development in children at the age of six.

## Participants and Methods

A cross sectional study conducted over 200 children who were recruited from the outpatient clinics of Maghagha and Elidwa general hospitals, Minia governorate, after the study was approved by the local ethical committee of the Faculty of Medicine, Minia University at September 2015.

Caregivers were requested to participate in our study after explaining the study purpose to them when they came to hospital asking for a medical advice about their children's

medical condition. The study included six years old children at educational institutions. However, Children with chronic mental or motor disability, chronic medical diseases, psychic diseases (e.g. autism, depression, attention deficit / hyperactivity disorder) and children suffering from congenital anomalies were excluded from the study.

## Methods

Mothers were asked about the duration of breastfeeding and their infant's age when they completely stopped breastfeeding. The children then were classified into 4 groups:

Group 1: Breastfed ≥ 6 months + exclusive breastfeeding ≥ 3 months.

Group 2: Breastfed ≥ 6 months + exclusive breastfeeding < 3 months.

Group 3: Breastfed < 6 months.

Group 4: Never breastfed.

All participants were subjected to personal history (age, sex, birth order, residence, developmental, and educational history), assessment of maternal personal, sociodemographic history (social state, occupation, education, medical and psychiatric disorders. and medical treatment), and assessment of intelligence level (By the Pictorial Intelligence Test (prepared by Ahmed Zaki Saleh, 1987) [7].

### Detection of child psychiatric disorders

SDQ (http://www.sdqinfo.com) is a brief behavioral screening questionnaire developed by United Kingdom child psychiatrist Robert N. Goodman for children and young adolescents between 3-16-year olds. It exists in several versions to meet the needs of researchers, clinicians, and educationalists. Each version includes 25 items on psychological attributes. These 25 items are divided between 5 scales:

1) Emotional symptoms (5 items).
2) Conduct problems (5 items).
3) Hyperactivity (5 items).
4) Peer relationship problems (5 items).
5) Prosocial behavior (5 items).

First 4 scales were added together to generate a total difficulties score based on 20 items. (1 for each item, the box was marked for Not True, Somewhat True, or Certainly True). The scale took about 10 minutes to complete. Parent's reports of children's emotions and behavior were usually more reliable than those of the children themselves. Answers were given on the basis of child's behavior over the last six months. Score is an indicator for child's psychiatric health if normal, borderline, or abnormal.

### Statistical methods

The collected data were coded, tabulated, and statistically analyzed using SPSS program (Statistical Package for Social Sciences) software version 20. Descriptive statistics were done for numerical data by mean, standard deviation, minimum and maximum of the range for parametric quantitative data, and by median and interquartile range for non-parametric quantitative data while they were done for categorical data by number and percentage. Analyses were done for parametric quantitative data between the three groups using One Way ANOVA, test followed by Post hoc Tukey correction between each two groups.

Analyses for non-parametric quantitative data were done by Mann Whitney test while Analyses for qualitative data were done using Chi square test. Correlation between ordinal variable were done by using non-parametric Spearman's rho correlation coefficient.

## Results

We found that mothers who gave birth by caesarean section had a significantly less chance to breastfeed their babies ($p<0.005$ & $<0.004$ in group III and IV respectively). The first child had more chance to have exclusive breastfeeding than next children ($p<0.001$ in group I). Maternal occupation affects breastfeeding as a higher number of nonworking mothers were encountered in group I than group II and III ($p<0.021$).

Exclusive breastfeeding decreases the frequency of infections and hospital admission ($p<0.001$). A higher frequency of neurotic traits in group III than those in group IV. Children with exclusive breastfeeding (group I) had a better academic achievement than group II and good relations with teachers than group III (**Table 1**).

**Table 2 and Figure 1** showed that children in group I have a higher IQ than other groups but without statistical significance between the four groups.

Group I had less emotional symptoms and total difficulties than all other groups. Also, group I had less conduct symptoms than group IV and less hyperactivity than group II while group IV had less prosocial behavior than all other groups (**Table 3 and Figure 2**).

Significant negative correlations between breastfeeding duration and emotional symptoms, conduct symptoms, and total difficulties were found, but was a positive correlation between breastfeeding duration and prosocial behavior. Regarding the IQ, a significant positive correlation has been detected between breastfeeding duration and IQ of the examined children (**Table 4**).

## Discussion

The decision to breastfeed is an early parental decision that may have important consequences for a child's later cognitive and behavioral functioning. Impaired emotional development is a problem faced by children which can negatively impact on function, development and readiness of their school and these brain development needs was assumed to be met by exclusive breastfeeding [8].

Our study showed that birth order affects negatively breastfeeding. On the other hand, Taylor et al., concluded that American mothers are likely to choose the same feeding method for each of their children, independent of the number of children they have [9].

**Table 1:** School achievement of studied children.

| | Group I (n=50) | Group II (n=50) | Group III (n=50) | Group IV (n=50) | p value | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | I vs II | I vs III | I vs IV | II vs III | II vs IV | III vs IV |
| **Education Level** | | | | | | | | | | |
| **Kindergarten** | 12(24%) | 4(8%) | 4(8%) | 1(2%) | 0.029* | 0.029* | 0.001* | 1 | 0.169 | 0.169 |
| **Primary** | 38(76%) | 46(92%) | 46(92%) | 49(98%) | | | | | | |
| **Academic Achievement** | | | | | | | | | | |
| **Average** | 29(58%) | 35(70%) | 30(60%) | 36(72%) | | | | | | |
| **Below aver** | 4(8%) | 9(18%) | 7(14%) | 5(10%) | 0.021* | 0.504 | 0.190 | 0.201 | 0.415 | 0.448 |
| **Above aver** | 17(34%) | 6(12%) | 13(26%) | 9(18%) | | | | | | |
| **Relation with teachers** | | | | | | | | | | |
| **Excellent** | 7(14%) | 10(20%) | 21(42%) | 12(24%) | 0.424 | 0.002* | 0.202 | 0.017* | 0.629 | 0.056 |
| **good** | 43(86%) | 40(80%) | 29(58%) | 38(76%) | | | | | | |

Chi square test for qualitative data
*: significant difference at p value <0.05

**Table 2**: IQ of studied children.

| | Group I (n=50) | Group II (n=50) | Group III (n=50) | Group IV (n=50) | p value | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | I vs II | I vs III | I vs IV | II vs III | II vs IV | III vs IV |
| **IQ** | | | | | 0.823 | 0.465 | 0.546 | 0.680 | 0.793 | 0.740 |
| Genius | 1(2%) | 0(0%) | 0(0%) | 0(0%) | | | | | | |
| Very smart | 5(10%) | 4(8%) | 6(12%) | 5(10%) | | | | | | |
| Smart | 13(26%) | 11(22%) | 7(14%) | 8(16%) | | | | | | |
| Average smart | 23(46%) | 26(52%) | 29(58%) | 25(50%) | | | | | | |
| Failed | 8(16%) | 9(18%) | 8(16%) | 12(24%) | | | | | | |
| **IQ** | | | | | 0.540 | 0.559 | 0.226 | 1 | 0.939 | 0.930 |
| Range | (22.6-92.24) | (35.8-86.79) | (40.5-85.96) | (37.3-85.8) | | | | | | |
| Mean ± SD | 67.96±13.30 | 64.79±11.76 | 64.86±10.84 | 63.42±11.45 | | | | | | |

One-way ANOVA test with post Hoc analysis for parametric quantitative data (IQ)

*: significant difference at p value < 0.05

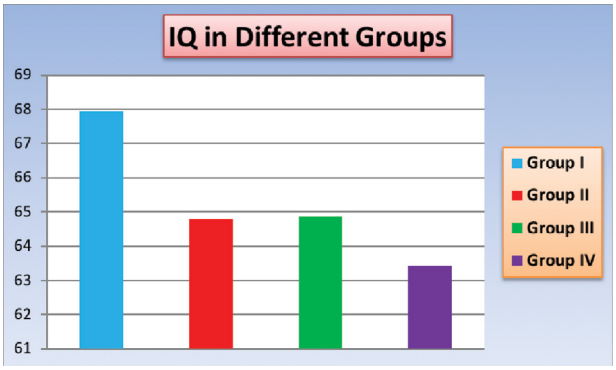


**Figure 1** Comparison between score of IQ in different groups according to breastfeeding duration.

Studied children who were born by C-section were noticed to have less chance of breastfeeding. Similarly, Hobbs et al., Albokhary and James and Regan et al., found that women who delivered by planned C-section had no intention to breastfeed or did not initiate breastfeeding with higher percentage of breastfeeding difficulties when compared to vaginal delivery [10-12]. Moreover, they found that working mothers had less chance to give exclusive breastfeeding, and this was documented in our study. In contrast, Al-Ruzaihan et al. concluded that maternal occupation was not observed to be a barrier to prevent mothers from breastfeeding but still affecting the duration and frequency of breastfeeding per day and the health status of their babies [13].

Duration of breastfeeding did not affect early sphincter control in our studied children. However, De Oliveira et al. concluded that

**Table 3:** Strengths and Difficulties Questionnaire of studied children.

| | Group I (n=50) | Group II (n=50) | Group III (n=50) | Group IV (n=50) | p value | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | I vs II | I vs III | I vs IV | II vs III | II vs IV | III vs IV |
| **Emotional symptoms** Median IQR | 0 (0-1) | 1 (0-2) | 1 (0-1.25) | 1 (0-2) | 0.010* | 0.013* | 0.019* | 0.811 | 0.807 | 0.982 |
| **Conduct Symptoms** Median IQR | 0 (0-1) | 1 (0-1) | 1 (0-1) | 1 (0-2) | 0.122 | 0.051 | 0.002* | 0.622 | 0.051 | 0.132 |
| **Hyperactivity** Median IQR | 0 (0-1) | 1 (0.75-1) | 1 (0-1) | 1 (0-1) | 0.011* | 0.088 | 0.076 | 0.422 | 0.462 | 0.941 |
| **Peer Problems** Median IQR | 0 (0-0.25) | 0 (0-0.25) | 0 (0-1) | 0 (0-1) | 0.861 | 0.935 | 0.348 | 0.784 | 0.244 | 0.374 |
| **Pro-social Behavior** Median IQR | 10 (9-10) | 10 (9-10) | 10 (9-10) | 8 (7.75-9) | 0.899 | 0.106 | <0.001* | 0.113 | <0.001* | <0.001 * |
| **Total Difficulties** Median IQR | 2 (1-3.25) | 3 (2-4) | 3 (2-4) | 4 (2-4.25) | 0.001* | <0.001* | <0.001* | 0.876 | 0.360 | 0.353 |

Mann Whitney test for non-parametric quantitative data

*: significant difference at p value<0.05

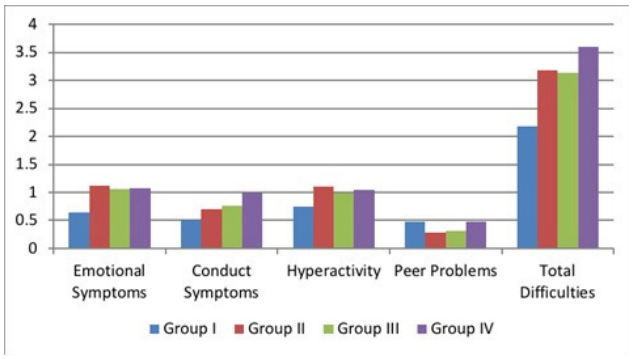


**Figure 2** Comparison between score of total difficulties and the four scales in generating it (emotional symptoms, conduct symptoms, hyperactivity and peer problems) in different groups according to breastfeeding duration.

**Table 4**: Correlation of breastfeeding duration with different items of Strengths and Difficulties Questionnaire and IQ of studied children.

| | Breastfeeding duration | |
|---|---|---|
| | r | p value |
| **Emotional symptoms** | -0.155 | 0.028* |
| **Conduct Symptoms** | -0.235 | 0.001* |
| **Hyperactivity** | -0.102 | 0.152 |
| **Peer Problems** | -0.072 | 0.308 |
| **Pro-social Behavior** | 0.301 | < 0.001* |
| **Total Difficulties** | -0.272 | < 0.001* |
| **IQ** | 0.152 | 0.032* |

Spearman's rho correlation

*: Significant correlation at p value <0.05

duration of exclusive breastfeeding for less than 4 months was strongly associated with primary enuresis [14].

We have documented a better academic achievement in relation to breastfeeding duration. In accordance to our results, Dalmeijer et al. and Oddy et al. found an association between infant milk feeding and cognition which was also associated with a better academic achievement in children [15,3] moreover, Longer duration of breast feeding was associated with increased scores in cognitive, language and motor development at 18 months of age, independently from a wide range of parental and infant characteristics [16]. However, Gibbs and Forste, found little-to-no relationship between infant feeding practices and the cognitive development of children [17].

Concerning IQ of studied children, group I had the highest IQ score while group IV had the lowest IQ score at the Pictorial Intelligence Test with a significant positive correlation with breastfeeding duration. Luby et al., suggested that the effects of breastfeeding on child IQ are mediated through subcortical gray volume and supported the importance of breastfeeding in mental health promotion. Also, Deonia et al., and Quigley et al., concluded that breastfeeding has a positive impact of brain development, particularly in children born preterm, this may be related to fatty acid Docosahexaenoic acid (DHA) in breastmilk which accumulate in neural membranes during infancy [18-21]. A recent study documented that the duration for which the child is breast-fed is integral for his language and cognitive development [22].

Some studies had shown different results and mentioned that breastfeeding has little benefit for early life intelligence and cognitive growth [23,24].

By SDQ, we found a better psychological state in children who had exclusive breastfeeding and most of these parameters were closely correlated with breastfeeding duration. These findings in our study might be explained by the stimulation associated with maternal contact during breastfeeding that had a positive effect

on the development of neuroendocrine aspects of the stress response, which may affect later child development [25]. Also, the hormone leptin in breast milk may reduce stress in infants through its action on the hippocampus, hypothalamus, pituitary gland, and adrenal gland [26]. Indeed, attachment and bonding between the mother and the infant may decrease maternal depression that influence positively the child's psychological development into adulthood.

There are similarities between our findings and previous studies which concluded that children who were breastfed for ≥ 6 months with exclusive breastfeeding for ≥ 3 months had decreased odds of difficulties with emotional symptoms, conduct problems, and total difficulties compared with children who were never breastfed [27-29].

Some studies were not in line with our findings and showed no evidence of risks or benefits from prolonged and exclusive breastfeeding for child or maternal behaviour [30,31].

In conclusion, exclusive breastfeeding improves psychological health in children with a positive effect on their intelligence. So, we recommend more attention towards maternal education about the benefits of breastfeeding and its advantages to the child's physical, psychological health, and mental growth.

## Acknowledgement

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