

The relation between pattern of feeding and behavior & mental health disorders among children

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Received: 28 February 2021

Revised: 22 March 2021

Accepted: 11 April 2021

Published: 28 September 2021

Egyptian Journal of Psychiatry 2021,
42:128–138

Introduction

The benefits of breastfeeding are innumerable, such as a reduction in the risk of acute otitis media, gastroenteritis, severe lower respiratory tract infections, atopic dermatitis, asthma (young children), obesity, type 1 and 2 diabetes, childhood leukemia, additionally may reduce the risk of psychological and behavioral disorders among children.

Aim

To evaluate the effect of breastfeeding on behavioral and mental health disorders of school-age children.

Patients and methods

This case–control comparative study was carried out on a group of children aged from 6 to 12 years, who were divided into two groups: the patient group included 50 children who were diagnosed with behavioral and mental health disorders according to DSM 5 criteria of diagnosis and were recruited from the outpatient psychiatry clinic of Al-Zahraa Hospital University during the period from March 2020 to September 2020 and a control group with apparently healthy children with no history of psychological manifestations matched in number, age, and sex with the patient group.

Result

The mean age was 8.4 ± 2.2 years. There were 15 (30.0%) female and 35 (70.0%) male patients, with the highest percentage having attention-deficit hyperactive disorder (ADHD) (72.0%), followed by obsessive-compulsive disorder (OCD) (24.0%), learning disorder (10.0%), and conduct disorder (2.0%). The majority of the cases (29) were mixed fed (58.0%), 11 (22.0%) were artificially fed, and 10 (20.0%) were breastfed. There was a highly statistically significant difference between artificial (bottle) feeding and mixed feeding regarding behavioral disease as ADHD and OCD were highly significant, with P value more than 0.001. Moreover, there was a highly statistically significant difference between the duration of breastfeeding less than or equal to 6 months and ADHD and OCD.

Conclusions

Breastfeeding has been demonstrated that is inversely associated to behavioral and mental health disorders as increase the duration of breastfeeding associated with decrease the incidence of psychological and behavioral disorders.

Keywords:

artificial feeding, behavioral, breast feeding, mental disorders, mixed feeding

Egypt J Psychiatr 42:128–138
© 2021 Egyptian Journal of Psychiatry
1110-1105

Introduction

Breastfeeding reduces the risk of some diseases that may occur at different stages of life (Victora *et al.*, 2016). A recent meta-analysis has shown that breastfeeding not only protects the child against infections but may also reduce the risk of overweight and diabetes and protect the mother against breast and ovarian cancer and type 2 diabetes (Victora *et al.*, 2016).

Moreover, children breastfed for at least 6 months have a higher intelligence quotient (IQ) in childhood (Fonseca *et al.*, 2013), and this effect is maintained into adolescence (Kafouri *et al.*, 2013) and adulthood (Victora *et al.*, 2015).

Researchers have increasingly investigated the relationship between breastfeeding and behavior disorders in childhood and adolescence (Krol and Grossmann, 2018). Some studies have reported benefits of breastfeeding on emotional and behavioral development in children and adolescents (Julvez *et al.*, 2014).

Behavior disorders have disruptive characteristics. Conduct disorder (CD), attention deficit, and

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challenging behavior are the most common manifestations of these disorders. The duration of breastfeeding seemed to be more important than the exclusive or nonexclusive pattern of breastfeeding (Poton *et al.*, 2018).

The evidence available for the association between breastfeeding and behavior disorders in childhood is indeed challenging, so this study was held.

Aim

The aim of our study was to evaluate the relation between pattern of feeding (breast feeding, mixed, and artificial feeding) in addition to duration of breastfeeding and behavioral and mental health disorders among children aged from 6 to 12 years old.

Patients and methods

This was a retrospective case–control comparative study carried out on a group of children aged from 6 to 12 years divided into two groups: the patient group included 50 children who were diagnosed with behavioral and mental health disorders according to DSM 5 criteria of diagnosis and were recruited consecutively from outpatient psychiatry clinic of Al-Zahraa Hospital University with history of 10 breastfed, 29 mixed fed, and 11 artificial (bottle) fed compared them with control group, which consisted of 50 apparently healthy children having acute, short-term illnesses with no history of psychological manifestations attended the outpatient pediatric clinic of Al-Zahraa Hospital University matched in age and sex, with history of exclusive breastfeeding.

Inclusion criteria

The following were the inclusion criteria:

- (1) Age range was 6–12 years old.
- (2) Both sexes were included.
- (3) Diagnosed with behavioral and mental health disorders according to DSM 5 criteria of diagnosis.
- (4) Had IQ more than 80.

Exclusion criteria

The following were the exclusion criteria:

- (1) Preterm – low birth weight.
- (2) Complicated pregnancy – history of admission to NICU.
- (3) History of maternal drugs or smoking during pregnancy.

- (4) History of chronic illness or drug intake (apart of psychological medication).
- (5) Those with intellectual disability having IQ less than 80 were not enrolled in this study.

All cases and control groups were subjected to the following:

- (1) Thorough full medical history taking according to a specially designed pediatric sheet with emphasis on nutritional (feeding) history, developmental, family, and social history.
- (2) The Revised Behavior Problem Checklist (Quay, 1983): it was an 89-item questionnaire used to assess parents' report of child problem behaviors under six constructs: CD, socialized aggression, attention problems/immaturity, anxiety/withdrawal, psychotic behavior, and motor excess using a three-point Likert scale (0=no problem and 2=severe problem). The administration and scoring are straightforward. The raters respond to the 89 items on the top page of the carbonless Test Booklet, and responses are transferred to the bottom sheet, which contains scoring instructions and a scoring key. The RBPC Profile Sheet is used to record the obtained raw and T-scores and to plot the pattern of the test results.

Ethical considerations

Informed written consent was obtained from all patients and control groups before getting them involved in the study. The steps of the study, the aims, and the potential benefits and hazards were discussed with the patients and control groups. Confidentiality of all data was ensured. The patients had the right to withdraw from the study at any time without giving any reasons.

Statistical analysis

- (1) The collected data were computerized and statistically analyzed using Statistical Package for Social Sciences (SPSS 24 Inc., Chicago, Illinois, USA).
- (2) Data were tested for normal distribution using the Shapiro–Wilk test.
- (3) Qualitative data were represented as frequencies and relative percentages.
- (4) χ^2 test and Fisher exact test were used to calculate difference between qualitative variables as indicated.
- (5) Quantitative data were expressed as mean \pm SD.

- (6) Independent *t* test was used to calculate difference between quantitative variables in two groups.
- (7) All statistical comparisons were two tailed, and significance level was set as follows: *P* value less than or equal to 0.05 indicates significant, *P* value less than 0.001 indicates highly significant difference, whereas *P* more than 0.05 indicates nonsignificant difference.

Results

The age of the studied children ranged between 6 and 12 years, with a mean age of 8.4 ± 2.2 and 8.8 ± 3.2 years for

Table 1 Comparison between the patient and control groups regarding age and sex

Variables	Control group <i>N</i> =50	Patient group <i>N</i> =50	Independent <i>t</i> test	
			<i>t</i> / <i>X</i> ²	<i>P</i> value
Age (years)				
Mean±SD	8.8±3.2	8.4±2.2	-0.728	0.468
Range	6–12	6–12		
Sex [<i>n</i> (%)]				
Female	16 (32.0)	15 (30.0)	0.047*	0.828
Male	34 (68.0)	35 (70.0)		

cases and control groups, respectively, with no statistical significant difference between them (Table 1).

Regarding sex distribution, 15 (30.0%) were females and 35 (70.0%) were males compared with 16 (32.0%) females and 34 (68.0%) males of control group, with no statistically significant difference between them (Table 1).

Regarding the type of feeding in the present study, 100 children were divided into 50 children diagnosed as having behavioral and mental health disorders, where the majority (29 children) were mixed fed (58.0%), 11 (22.0%) were artificially fed, and 10 (20.0%) were breastfed, and 50 (100.0%) children were exclusive breastfed as a control group, and there were highly statistically significant differences between them, with *P* value more than 0.001.

In the current study, there was a highly statistically significant difference between artificial (bottle) feeding and mixed feeding in behavioral disease, attention-deficit hyperactive disorder (ADHD), and obsessive-compulsive disorder (OCD), with highly significant difference (*P*>0.001), whereas there was no significant difference between other groups (Table 2).

Table 2 The relation between feeding type and behavioral and mental health disorders (*N*=100)

Diagnosis	Feeding type [<i>n</i> (%)]			Test	Significance
	Breastfeeding (<i>N</i> =60)	Mixed feeding (<i>N</i> =29)	Bottle feeding (<i>N</i> =11)		
Diseased					
Yes	10 (16.7)	29 (100.0)	11 (100.0)	66.7	<0.001
No	50 (83.3)	0	0		
ADHD					
Yes	10 (16.7)	18 (62.1)	8 (72.7)	24.7	<0.001
No	50 (83.3)	11 (37.9)	3 (27.3)		
ODD					
No	60 (100.0)	29 (100.0)	11 (100.0)	–	–
OCD					
Yes	0	9 (31.0)	3 (27.3)	20.6	<0.001
No	60 (100.0)	20 (69.0)	8 (72.7)		
ASD					
No	60 (100.0)	29 (100.0)	11 (100.0)	–	–
Anxiety disorder					
No	60 (100.0)	29 (100.0)	11 (100.0)	–	–
Depression					
No	60 (100.0)	29 (100.0)	11 (100.0)	–	–
Bipolar disorder					
No	60 (100.0)	29 (100.0)	11 (100.0)	–	–
Learning disorder					
Yes	0	3 (10.3)	2 (18.2)	8.9	0.012
No	60 (100.0)	26 (89.7)	9 (81.8)		
Conduct disorder					
Yes	0	1 (3.4)	0	2.5	0.29
No	60 (100.0)	28 (96.6)	11 (100.0)		

ADHD, attention-deficit hyperactive disorder; OCD, obsessive-compulsive disorder; ODD, oppositional defiant disorder.

In addition, regarding Revised Behavior Problem Checklist items, there was a highly statistically significant difference between artificial feeding and mixed feeding regarding CDs, including physical aggression, defiance, oppositionality, and psychotic behavior, including bizarre ideation and motor excess including jumpiness and restlessness and corrected score of Revised Problem Behavior Checklist, whereas psychotic behaviors including delusion and motor excess including tension were highly statistically significant, with *P* value less than 0.001 among mixed fed children, whereas there was no significant difference with other Revised Behavior Problem Checklist items and other corrected RBPC scores (Table 3).

Regarding the relation between duration of feeding and behavioral disorders, there was a highly statistically significant difference between duration less than or equal to 6 months in ADHD and OCD, whereas there was no significant difference in other groups (Table 4).

In addition, regarding the association between duration of feeding and Revised Behavior Problem Checklist items, there was a highly statistically significant difference regarding motor excess including jumpiness, restlessness, and tension with a duration of breastfed less than or equal to 6 months with a *P* value less than 0.001, whereas there was no statistically significant difference in other items (Table 5).

In the present study, we have analyzed the duration of feeding type into exclusive breastfeeding and nonexclusive breastfeeding and clarified the relation between behavioral disorders and analyzed duration. The results reported that there was a highly statistically significant difference between nonexclusive breastfeeding and exclusive breastfeeding duration less than 6 months in ADHD and OCD, whereas there was no other significant difference between other groups (Table 6).

Discussion

One of the major challenges facing communities is to generate knowledge needed to improve the children with behavior and mental health disorders.

Many studies have shown the benefits of breastfeeding for both children and mothers, regardless of socioeconomic status (Horta *et al.*, 2015).

Breastfeeding reduces the risk of some diseases that may occur at different stages of life. It not only protects

against infections but may also reduce the risk of overweight and diabetes and protect the mother against breast and ovarian cancers and type 2 diabetes (Victora *et al.*, 2016).

Moreover, children breastfed for at least 6 months have a higher IQ in childhood (Fonseca *et al.*, 2013), and this effect is maintained into adolescence (Kafouri *et al.*, 2013) and adulthood (Victora *et al.*, 2016).

The breastfeeding is independently associated with behavioral problems including oppositional defiant disorder, CD, and ADHD (Poton *et al.*, 2018).

The link between breastfeeding and children's behavior development depends on a higher frequency of breastfed meals and the duration of exclusive breastfeeding during the first year of life (Boucher *et al.*, 2017).

Cases were taken consecutively from outpatient psychiatry clinic of Al-Zahraa Hospital University during the period from March 2020 to September 2020.

All the children of studied group were full in term with normal birth weight, no history of NICU admission, and received their vaccination.

Regarding the behavior and mental health disorder in the current study, the result found that ADHD was the commonest, with the highest percentage (72.0%) followed by OCD (24.0%), learning disorder (10.0%), and CD (2.0%) among the studied children (Fig. 1).

This agrees with Al Hamed *et al.* (2008), who found that ADHD is one of the most common mental disorders that develop in children, and it becomes apparent in the preschool and early school years.

Moreover, regarding the sex distribution in the current study among children diagnosed as having behavioral and mental health, 70.0% of them were males and 30.0% were females. This was in agreement with Gimpel and Kuhn (2000) who found that males are more likely to exhibit ADHD behaviors than females.

A study by Sharma *et al.* (2020), which studied the prevalence and correlates of ADHD risk factors among school children aged 6 to 12 old years, found that sex-wise prevalence of ADHD to be high in boys to girls by ratio of 3:1.

Table 3 The correlation of feeding type into revised behavior problem checklist (N=100)

Revised behavioral problem checklist	Feeding type [n (%)]			Test	Significance
	Breastfeeding (N=60)	Mixed feeding (N=29)	Bottle feeding (N=11)		
Conduct disorder					
Physical aggression					
Yes	30 (50.0)	25 (86.2)	11 (100.0)	17.8	<0.001
No	30 (50.0)	4 (13.8)	0		
Difficulty controlling anger					
Yes	31 (51.7)	14 (48.3)	6 (54.5)	0.2	0.927
No	29 (48.3)	15 (51.7)	5 (45.5)		
Open disobedience					
Yes	23 (38.3)	17 (58.6)	8 (72.7)	6.3	0.044
No	37 (61.7)	12 (41.4)	3 (27.3)		
Defiance					
Yes	26 (43.3)	21 (72.4)	11 (100.0)	15.7	<0.001
No	34 (56.7)	8 (27.6)	0		
Oppositionality					
Yes	8 (13.3)	16 (55.2)	10 (90.9)	33.1	<0.001
No	52 (86.7)	13 (44.8)	1 (9.1)		
Socialized aggression					
Stealing					
Yes	1 (1.7)	4 (13.8)	1 (9.1)	5.3	0.07
No	59 (98.3)	25 (86.2)	10 (90.9)		
Truancy from school					
Yes	1 (1.7)	2 (6.9)	1 (9.1)	2.2	0.328
No	59 (98.3)	27 (93.1)	10 (90.9)		
Substance use in the company of others					
No	60 (100.0)	29 (100.0)	11 (100.0)	–	–
Gang membership					
Yes	5 (8.3)	8 (27.6)	5 (45.5)	11.2	0.004
No	55 (91.7)	21 (72.4)	6 (54.5)		
Laying					
Yes	26 (43.3)	17 (58.6)	6 (54.5)	2.0	0.371
No	34 (56.7)	12 (41.4)	5 (45.5)		
Attention problem – immaturity					
Short attention span					
Yes	25 (41.7)	11 (37.9)	1 (9.1)	4.2	0.12
No	35 (58.3)	18 (62.1)	10 (90.9)		
Diminished concentration					
Yes	17 (28.3)	9 (31.0)	1 (9.1)	2.1	0.353
No	43 (71.7)	20 (69.0)	10 (90.9)		
Distractibility					
Yes	42 (70.0)	18 (62.1)	8 (72.7)	0.7	0.707
No	18 (30.0)	11 (37.9)	3 (27.3)		
Impulsivity					
Yes	28 (46.7)	14 (48.3)	5 (45.5)	0.0	0.984
No	32 (53.3)	15 (51.7)	6 (54.5)		
Passivity					
Yes	23 (38.3)	9 (31.0)	2 (18.2)	1.8	0.398
No	37 (61.7)	20 (69.0)	9 (81.8)		
Undependability					
Yes	27 (45.0)	12 (41.4)	2 (18.2)	2.8	0.251
No	33 (55.0)	17 (58.6)	9 (81.8)		
Childishness					
Yes	11 (18.3)	15 (51.7)	6 (54.5)	12.9	0.002
No	49 (81.7)	14 (48.3)	5 (45.5)		
Anxiety withdrawal					
Poor self-confidence and self-esteem					
Yes	9 (15.0)	9 (31.0)	2 (18.2)	3.2	0.205

(Continued)

Table 3 (Continued)

Revised behavioral problem checklist	Feeding type [n (%)]			Test	Significance
	Breastfeeding (N=60)	Mixed feeding (N=29)	Bottle feeding (N=11)		
No	51 (85.0)	20 (69.0)	9 (81.8)		
Hypersensitivity to criticism					
Yes	37 (61.7)	21 (72.4)	5 (45.5)	2.6	0.272
No	23 (38.3)	8 (27.6)	6 (54.5)		
Rejection					
Yes	20 (33.3)	8 (27.6)	1 (9.1)	2.7	0.26
No	40 (66.7)	21 (72.4)	10 (90.9)		
Generalized fearfulness and anxiety					
Yes	14 (23.3)	11 (37.9)	3 (27.3)	2.1	0.355
No	46 (76.7)	18 (62.1)	8 (72.7)		
Reluctance to try new behaviors because of fear of failure					
Yes	12 (20.0)	5 (17.2)	3 (27.3)	0.5	0.778
No	48 (80.0)	24 (82.8)	8 (72.7)		
Psychotic behavior					
Speech disturbance					
Yes	3 (5.0)	6 (20.7)	1 (9.1)	5.4	0.069
No	57 (95.0)	23 (79.3)	10 (90.9)		
Bizarre ideation					
Yes	2 (3.3)	14 (48.3)	6 (54.5)	30.6	<0.001
No	58 (96.7)	15 (51.7)	5 (45.5)		
Delusions					
Yes	1 (1.7)	11 (37.9)	4 (36.4)	22.9	<0.001
No	59 (98.3)	18 (62.1)	7 (63.6)		
Impaired reality testing					
Yes	6 (10.0)	14 (48.3)	8 (72.7)	26.5	<0.001
No	54 (90.0)	15 (51.7)	3 (27.3)		
Motor excess					
Jumpiness					
Yes	37 (61.7)	28 (96.6)	11 (100.0)	16.9	<0.001
No	23 (38.3)	1 (3.4)	0		
Restlessness					
Yes	24 (40.0)	23 (79.3)	9 (81.8)	15.6	<0.001
No	36 (60.0)	6 (20.7)	2 (18.2)		
Tension					
Yes	9 (15.0)	19 (65.5)	6 (54.5)	24.6	<0.001
No	51 (85.0)	10 (34.5)	5 (45.5)		
Positive revised score					
No	50 (83.3)	10 (34.5)	4 (36.4)	27.6	<0.001
+Me 5	10 (16.7)	18 (62.1)	7 (63.6)		
CD + 22	0	1 (3.4)	0		

This can be explained by the fact that ADHD symptoms are missed in girls or that mental health problems in girls develop into problems other than ADHD (Martin *et al.*, 2018).

Our results showed that ADHD was associated with artificial feeding more than mixed feeding or breastfeeding; this highlights the importance of breastfeeding in lowering the risk of behavioral disorders among children.

This was similar to the study done by Adesman *et al.* (2017) in which they evaluated the prevalence of

ADHD among breast-fed and formula-fed infants, and they reported a statistically significant difference in formula-fed infants with 5-fold increase in prevalence of ADHD than breast-fed infants.

Our results agree with Adesman *et al.* (2017) study who evaluated prevalence of ADHD among breast fed and formula fed infants and reported statistically significance difference with P -value $<.05$ with formula fed had 5-fold increase in prevalence of ADHD than breast fed infants and explained this by the nutritional benefits of breast milk, and early exposure to bisphenol A (BPA), a neurotoxic

Table 4 Duration of feeding type in relation to behavioral and mental health disorders (N=89)

	Duration of feeding [n (%)]		Test	Significance
	<6 months (N=21)	≥6 months (N=68)		
Diseased				
Yes	21 (100.0)	18 (26.5)	47.1	<0.001
No	0	50 (73.5)		
ADHD				
Yes	13 (61.9)	15 (22.1)	18.3	<0.001
No	8 (38.1)	53 (77.9)		
ODD				
No	21 (100.0)	68 (100.0)		
OCD				
Yes	7 (33.3)	2 (2.9)	16.8	<0.001
No	14 (66.7)	66 (97.1)		
ASD				
No	21 (100.0)	68 (100.0)	–	–
Anxiety disorder				
No	21 (100.0)	68 (100.0)	–	–
Depression				
No	21 (100.0)	68 (100.0)	–	–
Bipolar disorder				
No	21 (100.0)	68 (100.0)	–	–
Learning disorder				
Yes	2 (9.5)	1 (1.5)	6.7	0.035
No	19 (90.5)	67 (98.5)		
Conduct disorder				
Yes	1 (4.8)	0	3.8	0.15
No	20 (95.2)	68 (100.0)		

ADHD, attention-deficit hyperactive disorder; OCD, obsessive-compulsive disorder; ODD, oppositional defiant disorder.

chemical found from epoxy-coated surfaces in infant formula.

Moreover, Park *et al.* (2014) found that a lack of breastfeeding was associated with increased morbidity of ADHD and internalizing and externalizing behavioral problems and low intelligence in childhood. They also explained the protective effect of breastfeeding on these behavioral problems and on the child's IQ.

Our study agrees with Stadler *et al.* (2016) who found that the breastfeeding duration predicts cognitive development as well as development of brain white matter connectivity in areas similar to those seen in ADHD, and shorter duration of breastfeeding is among several risk factors in early life associated with future ADHD. Breastfeeding provides nutrients or other benefits that reduce future chance of ADHD.

This also agrees with Boucher *et al.* (2017) who found that there was a positive association of breastfeeding with cognitive function apart from socio-environmental factors and also suggests a protective role against autistic traits, and the results are in agreement with

recommendations for prolonged breastfeeding duration to promote child development.

Our results were not in agreement with Waylen *et al.* (2009) and Kramer *et al.* (2008) who found no significant effects being breast fed or not on child behavior, and also Lind *et al.*, (2014) reported no significant difference in emotional disorders among the studied children being breast fed or not and explained this difference as these searches needed more adjustment to other factors that contribute to development of emotional and psychological disorders.

Our result was in agreement with Poton *et al.* (2018), who found that the breastfed children for at least three to 4 months had fewer total behavior and CDs in childhood, and breastfeeding for more than three or 4 months is inversely associated with total behavior and CD in childhood and other types of behaviors such as hyperactivity, personal and social skills, social competence, somatic complaints, internalized and externalized behavior problems.

In the study by Boucher *et al.*, 2017, there was a statistically significant relation between breastfeeding

Table 5 The correlation of duration of feeding type into revised behavior problem checklist (N=89)

	Duration of feeding type [n (%)]		Test	Significance
	<6 months (N=21)	≥6 months (N=68)		
Conduct disorder				
Physical aggression				
Yes	18 (85.7)	37 (54.4)	13.4	0.001
No	3 (14.3)	31 (45.6)		
Difficulty controlling anger				
Yes	11 (52.4)	34 (50.0)	0.1	0.952
No	10 (47.6)	34 (50.0)		
Open disobedience				
Yes	12 (57.1)	28 (41.2)	4.7	0.097
No	9 (42.9)	40 (58.8)		
Defiance				
Yes	15 (71.4)	32 (47.1)	12.9	0.002
No	6 (28.6)	36 (52.9)		
Oppositionality				
Yes	11 (52.4)	13 (19.1)	25.7	<0.001
No	10 (47.6)	55 (80.9)		
Socialized aggression				
Stealing				
Yes	2 (9.5)	3 (4.4)	1.0	0.621
No	19 (90.5)	65 (95.6)		
Truancy from school				
Yes	2 (9.5)	1 (1.5)	3.5	0.17
No	19 (90.5)	67 (98.5)		
Substance use in the company of others				
No	21 (100.0)	68 (100.0)	–	–
Gang membership				
Yes	5 (23.8)	8 (11.8)	7.9	0.019
No	16 (76.2)	60 (88.2)		
Laying				
Yes	12 (57.1)	31 (45.6)	1.0	0.604
No	9 (42.9)	37 (54.4)		
Attention problem – immaturity				
Short attention span				
Yes	9 (42.9)	27 (39.7)	4.2	0.123
No	12 (57.1)	41 (60.3)		
Diminished concentration				
Yes	8 (38.1)	18 (26.5)	3.1	0.211
No	13 (61.9)	50 (73.5)		
Distractibility				
Yes	13 (61.9)	47 (69.1)	0.5	0.775
No	8 (38.1)	21 (30.9)		
Impulsivity				
Yes	12 (57.1)	30 (44.1)	1.1	0.576
No	9 (42.9)	38 (55.9)		
Passivity				
Yes	7 (33.3)	25 (36.8)	1.5	0.481
No	14 (66.7)	43 (63.2)		
Undependability				
Yes	10 (47.6)	29 (42.6)	2.8	0.244
No	11 (52.4)	39 (57.4)		
Childishness				
Yes	9 (42.9)	17 (25.0)	5.2	0.073
No	12 (57.1)	51 (75.0)		
Anxiety withdrawal				
Poor self-confidence and self-esteem				
Yes	6 (28.6)	12 (17.6)	1.2	0.543

(Continued)

Table 5 (Continued)

	Duration of feeding type [n (%)]		Test	Significance
	<6 months (N=21)	≥6 months (N=68)		
No	15 (71.4)	56 (82.4)		
Hypersensitivity to criticism				
Yes	15 (71.4)	43 (63.2)	2.1	0.351
No	6 (28.6)	25 (36.8)		
Rejection				
Yes	2 (9.5)	26 (38.2)	8.8	0.012
No	19 (90.5)	42 (61.8)		
Generalized fearfulness and anxiety				
Yes	7 (33.3)	18 (26.5)	0.4	0.828
No	14 (66.7)	50 (73.5)		
Reluctance to try new behaviors because of fear of failure				
Yes	4 (19.0)	13 (19.1)	0.4	0.815
No	17 (81.0)	55 (80.9)		
Psychotic behavior				
Speech disturbance				
Yes	4 (19.0)	5 (7.4)	2.4	0.294
No	17 (81.0)	63 (92.6)		
Bizarre ideation				
Yes	9 (42.9)	7 (10.3)	17.5	<0.001
No	12 (57.1)	61 (89.7)		
Delusions				
Yes	7 (33.3)	5 (7.4)	11.9	0.003
No	14 (66.7)	63 (92.6)		
Impaired reality testing				
Yes	9 (42.9)	11 (16.2)	17.9	<0.001
No	12 (57.1)	57 (83.8)		
Motor excess				
Restlessness				
Yes	19 (90.5)	28 (41.2)	19.2	<0.001
No	2 (9.5)	40 (58.8)		
Tension				
Yes	13 (61.9)	15 (22.1)	13.7	0.001
No	8 (38.1)	53 (77.9)		
Jumpiness				
Yes	21 (100.0)	44 (64.7)	14.9	0.001
No	0	24 (35.3)		

and decreased ADHD among the studied infants. Moreover, in a birth-cohort study conducted in Australia, breastfeeding for more than or equal to 6 months was associated with decreased internalizing and externalizing behavior problems from infancy to adolescence in comparison with breastfeeding less than 6 months (Oddy *et al.*, 2010).

Poton *et al.* (2018) found the duration of breastfeeding particularly when longer than 3 or 4 months is more important than the breastfeeding pattern (exclusive breastfeeding or nonexclusive breastfeeding) in the association with child behavior.

This was in agreement with Huang *et al.* (2019) who found that children who were breastfed for more than or equal to 6 months were significantly associated with

reduced risk of internalizing behavioral problems particularly depression compared with those who were never breastfed, whereas differences were not found in externalizing behavioral problems.

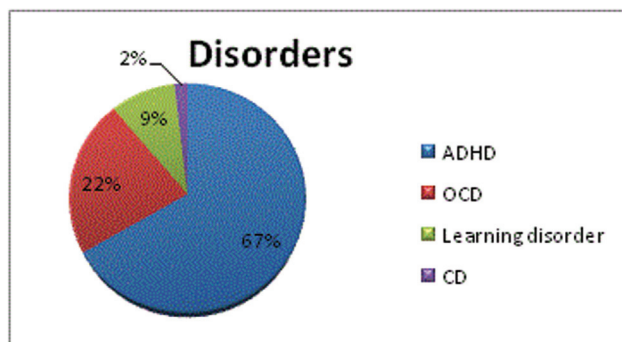
Catalano *et al.* (2005) followed children from birth to 18 years or the completion of high school. Their study showed that breastfed children were found to be more cooperative and socially adept students when drop-out rates were calculated, and the rate was higher among children who had been bottle fed. This can be explained by the developmental domains of adaptability and communication, which are responsive to the effects of breast feeding and its duration.

Formula feeding is associated with infantile infections and chronic illness which can cause delayed

Table 6 The relation between analyzed duration of feeding type (exclusive and nonexclusive breastfeeding) into behavioral and mental health disorders (N=89)

	Duration of feeding [n (%)]				Test	Significance
	<6 months total (N=21)		≥6 months total (N=68)			
	EBF (N=10)	NEBF (N=11)	EBF (N=50)	NEBF (N=18)		
Diseased						
Yes	10 (100.0)	11 (100.0)	0	18 (100.0)	47.1	<0.001
No	0	0	50 (100.0)	0		
ADHD						
Yes	4 (40.0)	9 (81.0)	0	15 (83.0)	18.3	<0.001
No	6 (60.0)	2 (18.0)	50 (100.0)	3 (16.0)		
ODD						
No	–	–	50 (–)	–	–	–
OCD						
Yes	2 (20.0)	5 (45.4)	0	2 (11.1)	16.8	<0.001
No	8 (80.0)	6 (54.5)	50	16 (88.0)		
ASD						
No	–	–	50		–	–
Anxiety disorder						
No	–	–	50		–	–
Depression						
No	–	–	50		–	–
Bipolar disorder						
No	–	–	50		–	–
Learning disorder						
Yes	–	2 (18.0)	0	1 (5.50)	6.7	0.035
No	–	9 (81.0)	50	17 (94.4)		
Conduct disorder						
Yes	–	1 (9.00)	0		3.8	0.15
No	–	10 (90.0)	50			

ADHD, attention-deficit hyperactive disorder; EBF, exclusive breastfeeding; NEBF, nonexclusive breastfeeding; OCD, obsessive-compulsive disorder; ODD, oppositional defiant disorder.

Figure 1

Distribution of behavior and mental health disorder among the patient group (N=50).

developmental delay and later cognitive development (Tasnim, 2014).

Feldman and Eidelman (2003) reported that breast feeding is associated with improved social skills, but other authors have not found an effect on emotional regulation and behavioral disruption and concluded

that further studies are needed for further research on breast feeding and child psychodevelopment (Hayatbakhsh *et al.*, 2012).

The study by Kim *et al.* (2017) was performed to evaluate the associations between breastfeeding and cognitive function and learning skills and found a statistically significant difference in learning scores, with *P* value more than 0.001, having higher learning scores among breastfed children than those with other types of feeding.

In addition, breastfeeding has been associated with greater cognitive development in childhood (Belfort *et al.*, 2013), ADHD, and other externalizing and internalizing behavioral problems (Liu *et al.*, 2014).

Conclusion

Breastfeeding can reduce the risk of many behavioral and developmental problems such as ADHD, OCD, anxiety problems, and attention problems.

Breastfeeding duration has a positive association with behavioral and mental health disorders, with shorter duration of breastfeeding being a risk factor for behavioral problems.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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