

Effect of Breastfeeding Practices on Psychomotor Development of Infants

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ABSTRACT

Young children must rapidly develop, grow, and reach significant milestones from birth to three in order to lay the groundwork for future development. One area of newborn and toddler development is psychomotor development. According to the WHO, inadequate nursing practices are linked to severe undernutrition in young children, as well as to poor weight gain and stunted growth. In view of this, a differential design was conducted with an objective to study the "Effect of breastfeeding practices on psychomotor development of infants" in the year 2015-17. The population of the study consisted of 180 mother-infant dyads, where the infants were in the age group of 3 to 24 months and their mothers from rural as well as urban area of northern Karnataka, India. The tools used for the study were SES scale developed by Aggarwal, et al. [1] and a self-structured questionnaire to document the feeding practices, patterns, maternal and child health indicators, BSID-3 (Bayley's Scale of Infant Development -III, 2006 to assess psychomotor development, anthropometric tools and WHO growth indicator charts to assess the physical growth. It was observed that majority (84.50%) of the exclusively breastfed children (for first six months) had average motor ability, followed by high (13.10%) and low (2.40%) motor ability. With respect to complementarily breastfeeding practices, majority (76.40%) were having average motor ability, followed by low (20.80%) and high (2.80%) motor ability. Regarding never breastfed infants, majority (66.70%) were in average motor ability category, followed by low (33.30%) and none of them were in high category significant difference was observed between all the three breastfeeding categories with respect to motor development where exclusively breastfed infants were better on motor abilities compared to complementarily breast-fed infants. Home environment was found to be the most important predicting factor of motor development.

Keywords: Breastfeeding; Infant; Psychomotor Development; Assessment

Introduction

The intrinsic qualities of the child and the mother's skill in childcare form a complex interaction that affects the child's growth and nutritional outcomes. According to the estimates, 178 million (or one-third of all children) worldwide suffer from stunting, 112 million are underweight, 55 million are wasting, 19 million are suffering from severe acute malnutrition, and 13 million infants are born each year with intrauterine growth retardation. Combined, they are responsible for 21% of all deaths among children under five. Black, et al. [2] According to Simpson [3], the psychomotor domain comprises physical growth, coordination, and utilisation of

the motor-skill regions. Physical bodily changes are referred to as physical development. From infants' first naturally occurring waving and kicking motions to the adaptive control of reaching, locomotion, and complicated sport abilities, the term «motor development» refers to changes in children's ability to regulate their body's movements. Adolph, et al. [4] The word «motor behavior» refers to all bodily motions, including eye movements (such as gazing) and an infant's developing head control. The movement of the entire body, such as when walking, or massive limbs are examples of gross motor activities. Fingers can be used to grab and handle items as part of fine motor skills. Exploratory behavior includes motor actions like reaching, touching, and grasp. Adolph [5].

Few studies have looked at the connection between baby feeding practices and psycho-motor development, despite the fact that research repeatedly shows a good relationship between breastfeeding and intellectual development. This may be due to the lack of evidence linking early motor development to later linguistic and cognitive development in populations who receive adequate nutrition. Yet, in populations that are undernourished, motor development may be a good indicator of future human function. They could not have any advantages for gaining weight and are linked to slowing growth Vestergaard, et al. [6] found a positive relationship between breastfeeding duration and an earlier ability to crawl and perform the “pincer grip”. It was also observed that babies who were exclusively breastfed for six months were significantly more likely to be walking by one year compared with those who were exclusively breastfed for four months (60 vs. 39%). According to the research, there is conflicting evidence regarding the relationship between breastfeeding and early motor development. Some studies (such as those by Marques, et al. [7,8]) show a positive influence, while other studies find no connection between breastfeeding and motor development (Oddy, et al. [9]). Nonetheless, there is general agreement regarding breastfeeding’s advantages for a baby’s development and health, especially in developing nations where it may be the only way to prevent malnutrition and a high risk of morbidity and death in the first year of life. In context of this, the current study was carried out to determine the impact of breastfeeding practises on an infant’s physical and motor development.

Material and Methods

Population and Sample

The target population of the study was mother –infant dyads. The infants in the age group of 3 months to 24 months and their mothers from rural as well as urban area of Dharwad district of Northern Karnataka based were selected using purposive proportionate random sampling method to select based on District Level Household and Facility Survey-4 (DLHS-4) fact sheets, 2013. The final sample of the study consisted of 180 mother –infant dyads, where the infants were in the age group of 3 months to 24 months and their mothers in the age range of 18-40 years.

Tools Used for the Study

The tools used for the study included a self-structured questionnaire to collect personal information of mother and child, breast feeding practices and infant illness. Socio-economic status scale was used to measure socio-economic status (SES) of the families. The growth of the infant was assessed based on WHO growth indicators utilizing child’s weight-for-age. The infants were classified by using corresponding Z-scores ranging from -3 to + 3

according to growth indicators. The Bayley [10] scale of infant and toddler development, third Edition (Bayley-III, 2006) was used to measure the psychomotor development of infants and toddlers from one to 42 months of age. The motor scale is also divided into two sub tests; fine (66 items) and gross motor sub tests (72 items). Raw scores are converted to scaled scores individually and the sum of the scaled scores of fine and gross motor subtests is used to score the motor development composite scores. The home environment was measured using Home Observation Inventory Caldwell [11] to know the impact of home environment on infant development outcomes. The scale has a total of 45 items to observe during the time of visit to the child’s family. These 45 items measure six factors viz. responsivity (11 items), acceptance (8 items), organization (6 items), learning materials (9 items), involvement (6 items) and variety (5 items). The total possible score is 45 and median score is 32. Higher the score, higher is the home environment. A pilot study was conducted before collecting data and the tools were pretested and found highly reliable. Data was entered in CSPro (6.3) version and analysed using SPSS 16.0 Version. A differential design was used to compare the physical and psychomotor development of infants with different breastfeeding practices. The study was approved by ethical committee of University of Agricultural Sciences, Dharwad.

Results and Discussion

Table 1 represents familial characters of the sample. Majority of the infants (71.70%) belonged to rural area and 28.30 per cent belonged to urban area. With respect to religion, majority (96.11%) was Hindu and remaining Muslims (3.90%). The table indicates that 60.60 per cent of the infants were from joint families, while 39.40% were from nuclear families. 50 per cent of infants were from medium sized families, followed by small families (34.40%) and large families (15.60%). Regarding socio economic status (SES) of the family, the majority (78.30%) belonged to middle SES, followed by high SES (15.60%) and low SES (6.10%). The percentage distribution of the children based on breast feeding practices (Table 2) revealed that 46.7 per cent children were exclusively breast fed, while 40 per cent were complementarily breastfed and 13.3 per cent were bottle fed. Majority (40.48%) of the exclusively breastfed children and complementarily breast fed (41.67%) had normal weight. Regarding the never breastfed children, the majority (50%) were normal, followed by underweight (25%), wasted (18.89%), severely wasted (5%), overweight (6.10%) and obese (2.80%). A significant association between breastfeeding practices and weight for age of the child. The percentage of underweight and wasted children was high among exclusively breast fed and complementarily breastfed children (Table 3). However, the percentage of obese and overweight children was high among breast fed children. 80 per cent among obese children were never breastfed babies.

Table 1: Familial Characteristics of the Sample (Mother-Child Dyads).

Characteristics	Category	N	Percentage
1. Locality	Rural	51.00	28.30
	Urban	129.00	71.70
2. Religion	Hindu	173.00	96.11
	Muslim	07 .00	3.90
4. Family Type	Nuclear	71 .00	39.40
	Joint	109.00	60.60
4. Size of family (No. Of members)	≤ 4	62.00	34.40
	5-10	108 .00	60.00
	>10	10.00	5.60
5. SES of the family	Low	11.00	6.10
	Middle	141.00	78.30
	High	28.00	15.60

Note: N=180

Table 2: Breast Feeding Practices in Mothers.

Characteristics	Category	N (%)
Category of Breast Feeding (WHO 2008)	Exclusively Breast Fed	84 (46.70)
	Complementarily Breast Fed	72 (40.00)
	Bottle Fed/ not fed with breast milk	24 (13.30)
	Total	180 (100.00)
Total Duration of Breast Feeding (months)	< 3	15 (8.30)
	3-6	06 (3.30)
	6-12	07 (3.90)
	12-24	23 (12.80)
	>24	06 (3.30)
	Still Feeding (< 24 months)	123 (68.30)
	Total	180 (100.00)
	Average	13.20
	Range	0-24

Table 3: Association between Breast Feeding and Weight for Age of the Child.

Growth Indicator	Breast Feeding Practice				Chi-Square	P-value
	Exclusively Breast Fed for Six months	Complementarily Breast Fed for Six months	Never Breast Fed	Total		
	N (%)	N (%)	N (%)	N (%)		
Normal	34 (40.48)	30 (41.67)	12 (50.0)	76 (42.22)	27.111**	0.003
Under weight	23 (27.4)	19 (26.4)	3 (12.50)	45 (25.0)		
Wasted	19 (22.6)	14 (19.4)	1 (4.17)	34 (18.89)		
Severely Wasted	5 (6.00)	4 (5.6)	0 (0.00)	9 (5.00)		
Over Weight	3 (3.57)	4 (5.6)	4 (16.70)	11 (6.10)		
Obese	0 (0.00)	1 (1.2)	4 (16.70)	5 (2.80)		
Total	84 (100.0)	72 (100.0)	24 (100.0)	180 (100.0)		

None of the exclusively breastfed babies were obese. However, no significant association ($\chi^2=3.17$, $P=0.793$) in growth between the children among three categories of breastfeeding with respect length/height of the children (Figure 1). The influence of breast feeding practices and motor development in infants indicates that majority (84.50%) of the exclusively breast fed (for first six months) children had average motor ability, followed by high (13.10%) and very less (2.40%) had poor motor ability. The motor development in complementarily breastfed infants showed that the majority (76.40%) had average motor ability, and only 2.80 per cent were with high motor ability. Similarly, the majority (66.70%) of never-breastfed infants, were in average motor ability category. However, 20.80%

of complementarily breast fed and 33 per cent of never-breastfed infants had low-motor abilities and none of the never-breastfed infants had high motor abilities. A significant difference (ANOVA) was observed between all the three breastfeeding categories with respect to motor development where exclusively breastfed infants were better on motor abilities compared to complementarily breastfed infants. The motor abilities were lowest among never breastfed babies, compared to the other two categories. The mean motor ability scores of exclusively breastfed children was 16.96 points higher than never breast fed children and it was 12.52 points higher than complementarily breast fed children.

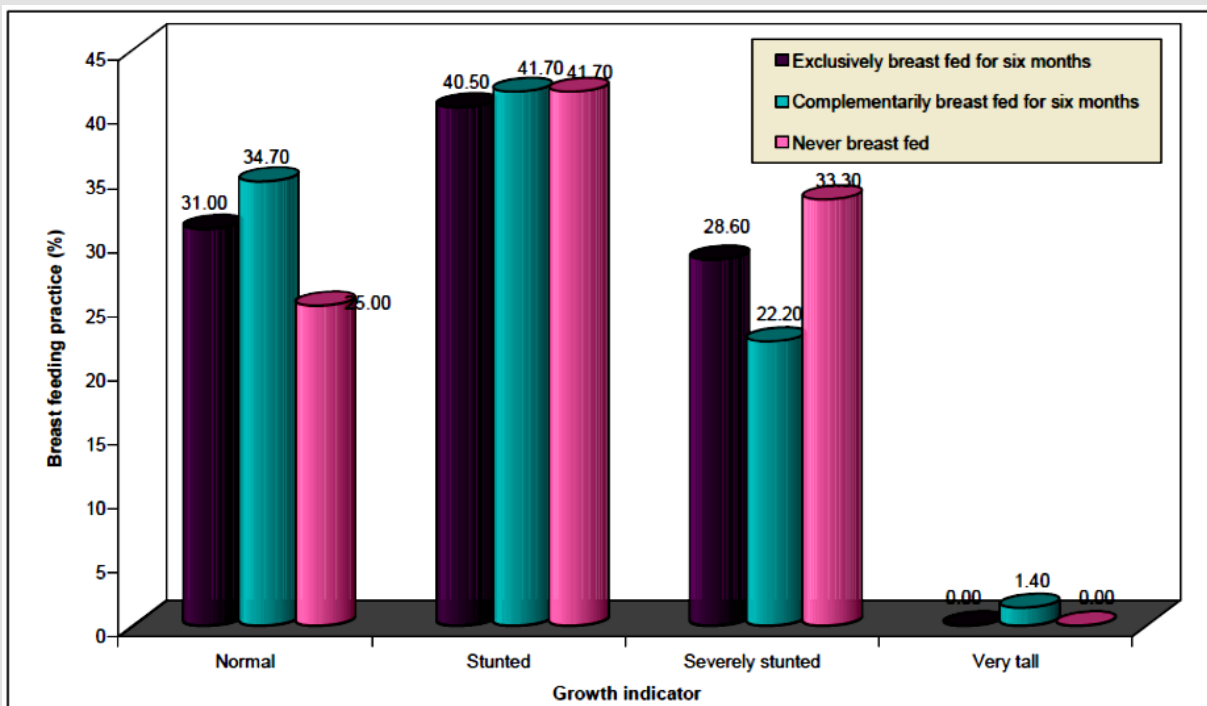


Figure 1: Breast feeding practices and length/height for age of the child.

The influence of breastfeeding duration on motor development of infants clearly indicates that 33.70 per cent of children breast fed for less than three months had low motor abilities and most of the children who were breast fed for more than 3 months had average motor abilities. However, high motor abilities were exhibited by children breast fed for more than 6 months. A significant association (χ^2) and positively significant correlation between (19.40%) motor development and breastfeeding duration was found; indicating longer the duration of breastfeeding, better will be the motor development (Table 4). The direct and indirect effects of selected factors like mother’s and father’s age, education, occupation, breastfeeding duration, socio-economic status (SES) and home environment clearly

indicates significant correlation with motor development of infants (Table 5 & Figure 2). It is clearly evident that home environment had the highest significant direct effect on motor development of infants (42.45%) followed by SES (7%) and breastfeeding accounted for 1.50 per cent direct effect on motor development. With respect to indirect effect, mother’s education, followed by father’s education, mother’s age, SES, father’s occupation, breastfeeding duration, mother’s occupation and home environment had significant indirect effect in descending order on motor development and these factors indirectly influenced the breastfeeding duration and the direct effect of breastfeeding duration was 0.0798.

Table 4: Influence of breastfeeding duration on psychomotor development of infants.

Breast feeding duration (months)	Psychomotor development			Chi- square	r
	Low	Average	High		
	n (%)	n (%)	n (%)		
< 3	5 (33.30)	10 (66.70)	0 (0.00)	51.104*	0.194**
3-6	0 (0.00)	60 (100.00)	0 (0.00)		
6-12	2 (28.60)	4 (57.10)	1 (14.30)		
12-24	4 (17.40)	17 (73.90)	2 (8.70)		
>24	14 (10.85)	105 (81.40)	10 (7.75)		

Note: N=180

Note: *Significant at 5% level

** - Significant at 1 %level

Table 5: Direct and indirect effect of selected factors on psychomotor development.

Variable	Correlation coefficient (r)	Direct effect	Total indirect effect	Partial R ²	Total R ²	Residual effect
Mother's age	0.2066**	-0.1045	0.3111	-0.0216	0.4539	0.4390
Mother's education	0.3318***	-0.1729	0.5047	-0.0574		
Mother's occupation	0.2109***	0.1082	0.1027	0.0228		
Father's Age	0.1679*	0.1514	0.0165	0.0254		
Father's education	0.3189***	-0.0507	0.3696	-0.0162		
Father's occupation	0.2414**	-0.0391	0.2805	-0.0094		
Breast feeding duration	0.1944**	0.0783	0.1161	0.0152		
SES	0.4428***	0.1593	0.2835	0.0705		
Home environment	0.6291***	0.6748	-0.0457	0.4245		
Significance levels	0.05	0.01	0.005	0.001		
If r ≥	0.1463	0.1915	0.2084	0.2433		

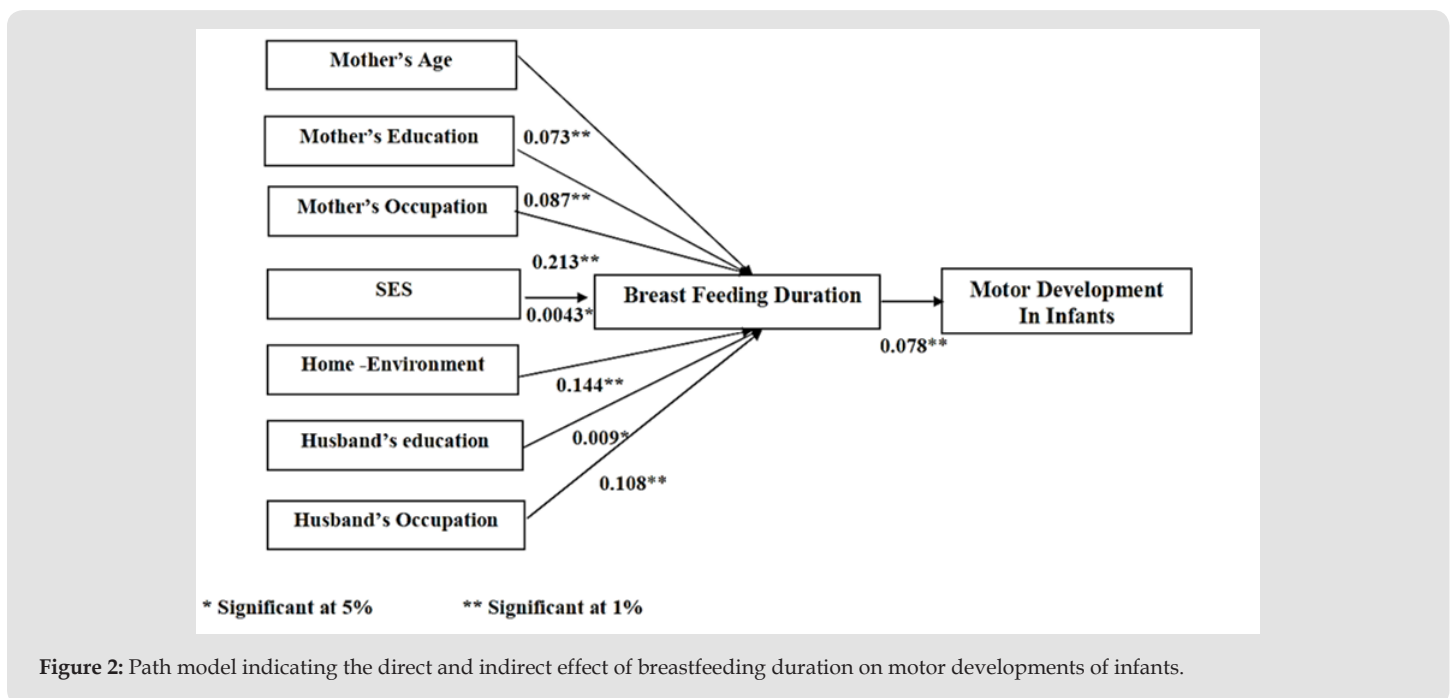


Figure 2: Path model indicating the direct and indirect effect of breastfeeding duration on motor developments of infants.

Also, these factors were found to mediate indirect influence on cognitive development of the infants by directly influencing the breastfeeding duration. The mechanism/s underlying these effects are likely to be linked to the high nutritional sensitivity of physical, motor and brain development in the critical early period of life which can be achieved by practicing successful breastfeeding practices. Home environment, mother's occupation, husband's occupation, mother's age and SES were found to strongly and positively influence the breast feeding duration (Figure 2).

Discussion

WHO strongly advocates mothers to exclusively breastfeed infants for the child's first six months with continued breastfeeding along with appropriate complementary foods up to two years of age or beyond to achieve optimal growth, development and health. In the present study only 46.70 per cent of children were exclusively breast fed (EBF) which is lower than national average (64%) and the average duration of breast feeding was 13.20 months (Table 2). Similar results were found by Arya, et al. [12] where only 30% of mothers practiced exclusive breast feeding for six months and majority (84%) breastfed for more than one year. Similar results were found by (Joshi, et al. [13,14]) who also observed more than fifty per cent of mothers did not practice EBF. The reason for the prevalence of underweight and wasted children in exclusive breastfed category may be due to improper and delayed weaning practices for more than seven months and not having minimum dietary diversity in their diet. However, the percentage of obese and overweight children was high among never breastfed children. 80 per cent among obese children were never breastfed babies. None of the exclusively breastfed babies were obese (Table 3). Results in the present study were in line with Sachwani, et

al. [15] who showed that being breast fed for less than 12 months, having a history of not being exclusively breast fed, exclusively breast fed for less than 3 months and exclusively breast fed for 4-5 months in school going children was associated with a higher obesity risk.

Oddy, et al. [16] found that longer breastfeeding (in months) was associated with reductions in weight z-scores between birth and one year. Jones, et al. [17] conducted a meta-analysis to determine cross-country patterns of associations of WHO infant and child feeding indicators with child stunting, wasting also found similar results. It is evident from the results that exclusively breastfed, complementarily breastfed infants and never breastfed infants significantly differ from each other in their motor abilities. Though majority of infants in each category had average motor abilities, a large percentage of infants with low motor ability were found in never breastfed category, followed by complementarily breastfed infants. The percentage of infants with high motor ability was more among exclusively breastfed infants. The mean motor ability scores also indicate that exclusively breastfed infants had high motor abilities, followed by complementarily breastfed infants and it was found to be lowest among never breastfed infants. The results also revealed that longer duration of breastfeeding improves cognitive development (Table 6 & Figure 2). Home environment, SES, father's age, mother's education, mother's occupation and age, breastfeeding duration, father's education and occupation had significant direct effect on motor abilities. The highest direct effect was by home environment (46.70%) followed by SES (7%) and breastfeeding accounted for 1.60 per cent direct effect. Similar results are found by Nguyen, et al. [18] who observed living in a high-quality learning environment at home was associated with an average of 0.3 SD higher motor development domains.

Table 6: Breast feeding practices and motor development in infants.

Category	Motor development (%)			Mean motor scores ± SD	F	CD ± SEM
	Low	Average	High			
Exclusive breast feeding for first six months	03 (2.40)	70 (84.50)	11 (13.10)	106.13a ± 2.28	28.973*	1.65±0.84
Complementarily breast feeding	15 (20.80)	55 (76.40)	02 (2.80)	93.61b ± 11.96		
Bottle fed/not fed with breast milk	08 (33.30)	16 (66.70)	00 (0.00)	89.17c ± 12.91		
Chi-square	25.607**					

Poor growth during the first 500 days of life (pregnancy and the first year) negatively influenced child development at 24 months. Early interventions aimed at improving pregnancy outcomes and child growth, along with promoting a good quality home environment were found to be critical to ensure optimal child development. The results by Abbot, et al. [19] reported that at eight months mothers

had high expectation of eight-month motor performance, and both mothers and infants scored higher than normative samples as well as infant motor development suggesting that more supportive and stimulating home environments are associated with higher infant motor development scores [20-23].

Conclusion

The prevalence of exclusive breastfeeding up to six months (42.20%) in Dharwad district of northern Karnataka was less than the national average. These findings indicate that the breastfeeding support provided by health services is weak. Hence, there is a need for promotion of EBF during the first six months of life, early initiation of breastfeeding, importance of colostrum feeding, continuation of breastfeeding after six months and practicing appropriate weaning practices. And Infants exclusively breast fed for the first six months and breastfeeding for longer duration (for more than 12 months) showed high motor development scores when compared with complementarily breastfed and never breastfed infants. With respect to direct effect of breastfeeding, on psychomotor development was 1.60 per cent. The mechanism/s underlying these effects are likely to be linked to the high nutritional sensitivity of physical, motor and brain development in the critical early period of life which can be achieved by practicing successful breastfeeding practices. Home environment emerged as a major predictor of different infant development outcomes. This emphasizes the role of stimulating early home environment on child's development and stresses the need to provide intervention to parents in promoting good quality environment.

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