Citation: Wisal, S., Ullah, I., Saifullah, & Gul, A. (2021). Nutritional Status of Breast Fed and Formula Fed Children: A Comparative Study. *Global Drug Design & Development Review, VI*(III), 43-52.
https://doi.org/10.31703/gdddr.2021(VI-III).05

DOI: 10.31703/gdddr.2021(VI-III).05 **p- ISSN:** 2788-497X **e- ISSN:** 2788-4120

Pages: 43 – 52 Vol. VI, No. III (Summer 2021) URL: http://dx.doi.org/10.31703/gdddr.2021(VI-III).05

Nutritional Status of Breast Fed and Formula Fed Children: A Comparative Study

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Abstract: *The study was conducted in different areas of Charsadda to compare the nutritional status of breastfed and formula-fed children aged 0 to 2 years. The data was collected from 100 children, 25 boys and 25 girls who were breastfed and 25 boys and 25 girls who were formula fed. A questionnaire was used to collect data on the patients' socio-demographic characteristics, anthropometric characteristics, symptoms, feeding practises, and dietary intake. The mean age of breastfed and formula fed subjects was 12.445.15 (months) and 13.905.86 (months), respectively (months). Some (10.0 percent) of the breast-fed subjects and the majority (58.0 percent) of the formula-fed subjects were discarded. Some (24.0%) of the breast-fed subjects and the majority (56.0%) of the formula-fed subjects were stunted. According to BMI for percentile of the subjects, the majority of breastfed (72.0 percent) and some formula fed (16.0 percent) subjects were normal. Some breastfed (16.0 percent) and most formula fed (76.0 percent) subjects had diarrhoea.*

Key Words: Underweight, Wasted, Stunted, Breast Fed, Formula Fed

Introduction

Breast feeding is an encouraging and conventional method of furnishing a new born child with basic supplements that in return helps the baby in growth and development and improvement. It is recommended that breast feeding should be started within an hour after the child birth. The recommended method of feeding infants is breastfeeding, and Healthy People 2010 aims to increase the number of mothers in the United States who breastfeed their infants at six months of age. Breastfeeding has been associated with mental capacity and academic performance [Schultz et al., 2006].

Growth patterns differ between breastfed and bottle fed infants, and at 12 months, breastfed infants weigh 400-600g more than breastfed infants. Body composition changes rapidly and indirectly during the first year of life, so comparisons between individual studies based on postnatal age, in which measurements are also made, are important [Gail et al., 2012].

In Pakistan, the birth weight of a newborn is below the average weight than in other countries. The main reason for this is socioeconomic factors, cultural and educational background of the parents. Discarding colostrums and delayed initiation of breastfeeding is common in many communities. Various misconceptions regarding diet among breastfeeding mothers are also responsible. Mothers diet directly affects the quantity and quality of breast milk, which in turn affects the baby. Many mothers either chose not to breastfeed or avoid certain diet. Anecdotal evidence suggests that mothers avoid strongly flavored foods as it may change the taste of their milk. However, fetuses swallow amniotic fluid during pregnancy, so they are accustomed to a variety of taste and may enjoy breast milk flavors. The food restriction among breastfeeding mothers lacks an evidence base and is culturally driven,

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e.g. Asian mothers avoid cold foods, Hispanic mothers avoid pork, chilies and tomatoes and Korean mothers avoid spicy food while many others avoid cows milk as these are considered harmful for the breastfeeding infants. Although there are some nutritional guidelines for breastfeeding mothers, many cultural traditions had no scientific basis and based on popular myths in the community [Sethi et al., 2007].

Exclusive breast feed is recommended up to 6 months of ages, no other food should be given to the child up to 6 months of age other then only vitamin D can be provided through sunlight. After proper exclusive breast feed the breast milk can be continued up to two years of age. According to global breast feeding scorecard only 4 out of 10 of the infants are breast fed exclusively by providing nothing else than breast milk [Victora et al., 2016].

On the other hand in Pakistan only 2 out of 10 of the mother initiated in first hour of birth whereas only 37% of the mothers continued it up to 6 month of age, whereas rest of them are formula feed [UNICEF. 2009].

This research was aimed to emphasize the importance of breast feeding and formula feeding among the children of Charsadda. This research will expose nutritional status of breast feeding and formula feeding childrens in the rural and urban areas of Charsadda. Through this research the significance among the cases under study will help the Health Department and other organization to focus on the issues arising from these practices among mothers and their children. The government will also plan their policies for the health of the mothers and their children.

Methodology

Site of Study

The study was carried out at different areas of Charsadda to compare the nutritional status of breast fed child with formula fed child between 0-2 years of age.

Design of Study

The research was conducted through a community-based cross-sectional study. The data was collected from 100 normal children that consisted of 25 boys and 25 girls being breast fed whereas 25 boys and 25 girls being formula fed.

Data Collection

The data was collected in three different phases. In the first phase data regarding socio demographic status and birth history of the child was collected from their mothers. In the 2nd phase of the data collection the type of feeding was assessed while in the third and the last phase data regarding anthropometric characteristics and clinical complication was evaluated. A pre-planned questionnaire was used for this purpose to collect data on social demographics, anthropometric features, clinical signs and symptoms, and feeding methods.

Statistical Analysis

All of the data was entered into social science statistical software (SPSS version 21). Descriptive statistics were used to determine the frequencies of various variables, and the mean of continuous variables was calculated using a simple mean and an independent t-test. The ANOVA test was used to determine association. At (p0.05), the entire test will be considered significant.

Result and Discussion

The current study compared the nutritional status of breastfed children to that of formula-fed children in various rural and urban areas of District Charsadda. The study came to the following conclusions:

Socio Demographic Features of the Subjects

Table 1 shows the socio-demographic characteristics of breastfed and formula-fed subjects. All variables of socio-demographic characteristics of both subjects showed a non-significant difference (p>0.05). The average age of breastfed and formula fed subjects was 12.44 5.15 (months) and 13.90 5.86 (months), respectively The mean number of siblings of breast and formula fed subjects was 3.06 1.62 and 2.94 1.80. In the rural area of District Charsadda (56.0%) breast fed while (40.0%) were formula fed. Literacy rate was noticed for breast fed (38.0%) and formula fed (54.0%) for the mothers of the subjects.

On the basis of housewives the mothers for breast fed was (86.0%) while for formula fed it was (68.0%). On the basis of their income, the income of breast feeding mothers were (38.0%) and the income of formula feeding subjects mothers were (48.0%) were enjoying average income for their livelihood. For this research the subjects were selected from urban and rural areas of District Charsadda as per plan in which (56.0%) breast fed and (40.0%) formula fed subjects belonged to rural area. The ratio for the literacy rate of mothers for breast fed (38.0%) and formula fed (54.0%) were also recorded.

The study's findings are consistent with the findings of (Kumar et al., 2006), who conducted a study on the influence of infant-feeding practices on

nutritional status of under-five children and discovered that the mean age of breast-fed children was 18.4 17.8months.

These results, on the basis of literacy rate, are in agreement with the research work done by (Dewey *et al. 1992),* (Dewey *et al. 1993)* has conducted a study to determine that Breast-fed infants are leaner than formula-fed infants at one year of age and found out that mean age of formula fed child was 9.76 3.12 (months) whereas mothers of formula fed (72.0%) children were uneducated.

Table 1. Socio Demographic Characteristics of the Subjects

Variables		N (%) Mean S.D Mode of feeding		p-value
		Breast feed	Formula feed	
Age (months)		12.44 5.15	13.90 5.86	0.189
Gender	Female	25 (50)	25 (50)	1.000
	Male	25 (50)	25 (50)	
No of siblings		3.06 1.62	2.94 1.80	0.727
Locality	Rural	28 (56.0)	20 (40.0)	0.109
	Urban	22 (44.0)	30 (60.0)	
Family type	Joint	30 (60.0)	33 (66.0)	0.534
	Nuclear	20 (40.0)	17 (34.0)	
Mother education	Illiterate	19 (38.0)	27 (54.0)	0.220
	Primary	9 (18.0)	3 (6.0)	
	Middle	10 (20.0)	8 (16.0)	
	Matriculate	1 (2.0)	4 (8.0)	
	Intermediate	9 (18.0)	6 (12.0)	
	Graduate	2 (4.0)	2 (4.0)	
Father education	Illiterate	9 (18.0)	15 (30.0)	0.137
	Primary	4 (8.0)	0 (0)	
	Middle	4 (8.0)	1 (2.0)	
	Matriculate	13 (26.0)	14 (28.0)	
	Intermediate	15 (30.0)	12 (24.0)	
	Graduate	5 (10.0)	8 (16.0)	
Mother job	Housewife	43 (86.0)	34 (68.0)	0.032
	Working lady	7 (14.0)	16 (32.0)	
Father job	Government	24 (48.0)	25 (50.0)	0.375
	Labor	15 (30.0)	19 (38.0)	
	Private	11 (22.0)	6 (12.0)	
Monthly income (Rs)	Average	19 (38.0)	24 (48.0)	0.036
	Good	16 (32.0)	20 (40.0)	
	Poor	15 (30.0)	6 (12.0)	

Rs= Rupee Test applied: Independent T-test and Chi Square test

Anthropometric Parameters of the Subjects

Anthropometric features of Breastfeed and Formula feed Subjects are shown in Table No 2. A significant difference ($p<0.05$) was observed for the weight, Head circumference, MUAC, weight for age, height for age, BMI for percentile and BMI for percentile categories. The mean height of Breastfeed and Formula feed Subjects were 68.05 13.97 (cm) and 67.06 11.31 (cm). The mean weight of the Breastfeed and Formula feed Subjects were 9.72 2.63 (kg) and 8.56 2.48 (kg). It was during the study that (10.0%) Breastfeed and (58.0%) Formula feed Subjects were wasted. Stunted growth was observed during study in (24.0%) Breastfeed and (56.0%) Formula feed Subjects. It was also noticed during study that (72.0%) Breastfeed and (16.0%) Formula feed Subjects, were normal according to BMI for percentile of the Subjects.

The findings for wasted, stunted, and BMI for percentile agree with those of (Domelles et al. 2007), who conducted a study on nutritional status, breast

feeding, and evaluation of infants with acute viral bronchitis. and found that breast fed children were well nourished (73%) and had normal nutritional status, among them only 10.9% were overweight, whereas 81% of the subjects being undernourished were not exclusively breast fed.

In addition, (Kulwa et al. 2007) conducted a study to assess child-care practises and nutritional status of infants and young children with the goal of improving feeding practises and child nutritional status. and the results shows that formula fed and complementary fed child were stunted (43%), underweight (22%),

Table 2. Anthropometric Parameters of the Subjects

Variable		N (%) Mean S.D Mode of feeding		p-value
		Breast feed	Formula feed	
Height (cm)		68.05 13.97	67.06 11.31	0.696
Weight (kg)		9.72 2.63	8.56 2.48	0.025
MUAC (cm)		13.14 1.78	11.96 3.03	0.019
Head circumference		30.58 4.80	25.84 4.79	0.000
Weight for age	Normal	35 (70.0)	10 (20.0)	0.000
	Overweight	10 (20.0)	11 (22.0)	
	Wasted	5 (10.0)	29 (58.0)	
Height for age	Normal	36 (72.0)	21 (42.0)	0.005
	Stunted	12 (24.0)	28 (56.0)	
	Taller	2 (4.0)	1 (2.0)	
BMI for percentile		45.26 13.0	24.11 5.2	0.000
BMI for percentile categories	Normal	36 (72.0)	8 (16.0)	0.000
	Overweight	9 (18.0)	13 (26.0)	
	Underweight	5 (10.0)	29 (58.0)	

Kg= kilogram cm=centimeter Test applied: Independent T test and Chi Square test.

Clinical Signs and Symptoms of the Subject

Table 3 shows the clinical signs and symptoms of the subjects. In the cases of diarrhoea, dehydration, urination, frequency of diarrhoea, and days of diarrhoea, there was a significant difference ($p<0.05$). Some of the breast fed (16.0%) whereas most of the formula feed (76.0%) subjects were having diarrhea. Dehydration was common in (8.0%) of the breast fed as well as (86.0%) of the formula fed subjects. Some of the breast fed (12.0%) and majority of the formula fed subjects (72.0%) was having more than 6 times of urination in a day. Most of breast fed (86.0%) and some of the formula fed (6.0%) subjects were having 1 to 3 times of period of diarrhea in a day. Some of breast fed (18.0) and most of the formula feed (52.0%) were having diarrhea for more than 6 days of diarrhea infection.

The study's findings are strongly related to the findings of (Dewey et al. 1995), who conducted a study on the difference in morbidity between breastfed and formula fed infants and concluded that breastfed (9.0 percent) and formula fed (69.0 percent) subjects had diarrhoea. (Chandra et al., 1979) conducted a study on Prospective studies of the effect of breast feeding on the incidence of infection and allergy and discovered that some (5.7 percent) of the breast fed subjects were severely dehydrated, whereas the majority (71 percent) of the formula fed subjects were severely dehydrated..

Table 4. Clinical Signs and Symptoms of the Subject

Variable		N (%) Mode of feeding		p-value
		Breast feed	Formula feed	
Diarrhea	No	42 (84.0)	12 (24.0)	0.029
	Yes	8 (16.0)	38 (76.0)	
Dehydration	No	46 (92.0)	7 (14.0)	0.016
	Yes	4 (8.0)	43 (86.0)	

Variable		N (%) Mode of feeding		p-value
		Breast feed	Formula feed	
Urination	1 to 3 times	43 (86.0)	3 (6.0)	0.036
	4 to 6 times	1 (2.0)	11 (22.0)	
	More than 6 times	6 (12.0)	36 (72.0)	
Sweating	No	49 (98.0)	3 (6.0)	0.053
	Yes	1 (2.0)	47 (94.0)	
Tears	No	49 (98.0)	3 (6.0)	0.067
	Yes	1 (2.0)	47 (94.0)	
Frequency of diarrhea	1 to 3 times	43 (86.0)	3 (6.0)	0.025
	4 to 6 times	4 (8.0)	7 (14.0)	
	More than 6 times	3 (6.0)	40 (80.0)	
Days of diarrhea	1 to 3 days	33 (66.0)	11 (22.0)	0.039
	4 to 6 days	8 (16.0)	13 (26.0)	
	More than 6 days	9 (18.0)	26 (52.0)	

Test applied= chi square test

Breastfeeding PRACTICES in relation to the Nutritional Status of the Breast Fed Child

Table 4 shows breastfeeding practises in relation to the nutritional status of a breastfed child. In relation to the nutritional status of the breastfed child, a significant difference (p0.05) was found for the first food after birth, initiation of breast milk, duration of breast milk, reason for stopping breast fed, and mother awareness regarding breast feeding.

These findings of the study strongly correlate with the findings of (Cohen et al., 1994) who conducted a study in Honduras called Effects of age of introduction of complementary foods on infant breast milk intake, total energy intake, and growth: a randomised intervention study and found a significant relationship between the first food being introduced to a newly born child and their nutritional status. If the child is given breast milk after birth, the child will most likely have a healthy nutritional status. (Suzely et al., 2008) found that the introduction of a first food has a significant impact on the nutritional status of a breastfed child.

Table 4. Breast Feeding Practices in Relation to Nutritional Status of Breastfed Child

Variable		N (%) Nutritional status of breast fed child			p-value
		Normal	Overweight	Underweight	
First food after birth	Breast milk	35 (97.2)	7 (77.8)	5 (100)	0.015
	Green tea	1 (2.8)	2 (22.2)	0 (0)	
Initiation of breast milk	1st hour	32 (88.9)	5 (55.6)	3 (60.0)	0.039
	2nd hour	3 (8.3)	4 (44.4)	2 (40.0)	
	Late	1 (8.2)	0 (0)	0 (0)	
Duration of breast milk	1 to 3 time	3 (8.3)	2 (22.2)	0 (0)	0.014
	4 to 6 times	28 (77.8)	7 (77.8)	3 (60.0)	
	More than 6 time	5 (13.9)	0 (0)	2 (40.0)	
Breast milk	1 to 3 months	3 (8.3)	0 (0)	1 (20.0)	0.009
	4 to 6 months	14 (38.9)	3 (33.3)	2 (40.0)	
	After 6 months	19 (52.8)	7 (77.6)	2 (40.0)	
Reason of stopping	Insufficient milk	11 (30.6)	1 (11.1)	2 (40.0)	0.320
	Mother illness	23 (63.9)	8 (88.9)	2 (40.0)	
	No reason	2 (5.6)	0 (0)	1 (20.0)	
Mother awareness	Friends	29 (80.6)	5 (55.6)	3 (60.0)	0.012
	Others	4 (11.1)	0 (0)	1 (20.0)	
	Tv shows	3 (8.3)	3 (33.3)	1 (20.0)	

Variable		N (%)			p-value
		Nutritional status of breast fed child			
		Normal	Overweight	Underweight	
	Not aware	0 (0)	1 (11.1)	0 (0)	

Test applied= chi square test (descriptive statistics

Bottle Feeding Practices in Relation to Nutrition Status of Bottle Feed Child

Table 5 shows bottle feeding practises in relation to the nutritional status of bottle-fed children. The dilution of bottle feed and the duration of bottle feed had a significant difference (p0.05) in relation to the nutritional status of Bottle fed subjects.

The study's findings are similar to those of (Al-Nahedh et al., 1994), who discovered a significant relationship between the dilution of bottle feeding and its effect on the nutritional status of the child. (Greiner et al. 1981) concluded that there is a significant relationship between bottle feeding dilution and the nutritional status of the child.

Table 6. Bottle Feeding Practices in Relation to the Nutrition Status of Bottle Feed Subjects

Variable		N (%)			p-value
		Nutritional status of breast fed child			
		Normal	Overweight	Underweight	
Type of botte feed	Cow/goat	36 (100)	9 (100)	5 (100)	***
	Formula	0 (0)	0 (0)	0 (0)	
Dilution	Improper	4 (11.1)	1 (11.1)	1 (20.0)	0.045
	Proper	32 (88.9)	8 (88.9)	4 (80.0)	
Amount of bottle feed	1 to 3 times	33 (91.7)	8 (88.9)	5 (100)	0.032
	4 to 6 times	2 (5.6)	0 (0)	0 (0)	
	More than 6 times	1 (2.8)	1 (11.1)	0 (0)	
Sterilization	5 min	29 (89.6)	9 (100)	5 (100)	0.531
	Less than 5 min	5 (13.9)	0 (0)	0 (0)	
	Never	2 (5.6)	0 (0)	0 (0)	

Test applied= chi square test (descriptive statistics)

Complementary Feeding Practices in Relation to Nutrition Status of Breast Feed Subjects

Table 7 shows the effect of complementary feeding on the nutritional status of breast-fed subjects. In relation to the nutritional status of the breastfed subject, there was a significant difference (p0.05) in the age of complementary food and use of boiled water.

The study's findings are consistent with the findings of (WHO. 2003), who stated that the earlier complementary foods are introduced to children, the better their nutritional status will be. (Wamani et al. 2002) has also discovered a link between complementary foods and children's nutritional status. (Meshram et al. 2012) conducted a study on the Impact of feeding and breastfeeding practises on the nutritional status of infants in an Andhra Pradesh district, India, and discovered a significant relationship between the start of complementary feeding and its effect on the nutritional status of the child.

Table 7. Complementary Feeding in Relation to the Nutrition Status of Breastfed Child

Variables		N (%)			p-value
		Nutritional status of breast fed child			
		Normal	Overweight	Underweight	
Age of complementary feeding	1 to 3 months	0 (0)	0 (0)	0 (0)	0.012
	4 to 6 months	21 (58.3)	3 (33.3)	4 (80.0)	
	After 6 months	15 (41.7)	6 (66.7)	1 (20.0)	
Source of water	Government	25 (69.4)	6 (66.7)	3 (60.0)	0.910
	Hand pump	11 (30.6)	3 (33.3)	2 (40.0)	
Boiled water	No	5 (13.9)	2 (22.2)	0 (0)	0.017

Variables		N (%)			p-value
		Nutritional status of breast fed child			
		Normal	Overweight	Underweight	
	Yes	31 (86.1)	7 (77.8)	5 (100)	

Test applied= chi square test (descriptive statistics)

Conclusion

The current study concluded that majority of the breast feed subjects were normal whereas most of the formula feed subject were underweight according to BMI for percentile of the subjects. Furthermore the current study concluded with a significant difference ($p<0.05$) for the diarrhea, dehydration, urination, frequency of diarrhea, days of diarrhea, first food after birth, initiation of breast milk, duration of breast milk, reasons or stopping breast feeding, mother awareness regarding breast feeding practices, dilution and duration of bottle feeding, using of boiled water and immunization status in relation to the nutritional status of the breast feed subjects.

Recommendation

The current study concluded with the following few useful recommendation

- Breast milk should be initiated to the newly born child in the very hour of birth.
- The child should be exclusively breast feed up to 6 months of birth
- The child should be breast feed every after 15 minutes up to more than 6 times a days
- Bottle feeding can be initiated to the child after 6 months of age
- Bottle feeding should be properly diluted and sterilized up to 5 min before feeding the child.
- Complementary feedings should be started after 12 months of age.
- The raw water should be properly boiled before giving it to your child.
- Furthermore nutrition related conference should be launched in order to educate the mother regarding exclusive breast feeding and its advantages.

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