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Variations in Weaning Practices and its Influence on Growth in Infants

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ABSTRACT

Weaning is defined as a transitional process of introducing soft, semisolid, solid foods gradually to replace breast feeding. Appropriate weaning practices starts at 6 months of age with age optimal minimum dietary diversity, minimum meal frequency and continued breast feeding. To identify the current variations in weaning practices among mothers and to assess the influence of early and delayed weaning on the infant's growth at 6 months and 1 year of life This prospective observational cohort study was conducted among all new-born's born at Rainbow Children's Hospital, Banjara Hills, Hyderabad during the study period and satisfying the inclusion criteria during study period: September 2019-April 2021. In this study, of the 300 women, the mean± SD age was 29.86±4.34 years and 156 (52%) women were in the age category of 30 to 35 years. Exclusive breast feeding for 6 months was followed in 40% and early weaning was introduced in 60% babies. Breast milk together with formula milk was the preferred feeding practices before starting weaning by mothers who initiated early weaning. There was a significant positive association regarding mother's educational qualification, occupation, socio economic class with weaning practices. There was no significant difference between percentage of working and not working mothers who initiated early weaning practices. There was a statistically significant difference in the weaning practices and mode of delivery (p = 0.003). Family's instruction (54%) played a significant role in deciding the time of initiation of weaning in our study. In our study, there was a statistically significant difference in the anthropometric parameters of timely and early weaned infants (p = 0.001). Early weaning practices were more frequently done than timely weaning practices. Early weaning was practiced by mothers with lesser education and in low socioeconomic group. Family's instruction was the main reason to initiate early weaning. First born babies were weaned early. Home-made food was the most preferred weaning diet; Raggi and rice powder were the commonest. Timely weaned babies were found to be bigger and taller when compared to the early weaned babies, however, it was not clinically significant. There was a significant increase in the head circumference of timely weaned infants both at 6 months and at 1 year.

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Key Words

Variations, weaning practices, influence, growth, infants

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INTRODUCTION

Minimum dietary diversity is feeding a child with ≥four food groups containing grains, roots, tubers, legumes, fruits and vegetables, dairy products, flesh foods and eggs. Minimum meal frequency is feeding 2 times per day for a child aged 6-8 months and 3 times/day for a child aged 9-23 months among breast-feeding mothers and 4 times/day among non breast-feeding mothers. Appropriate nutrition from the beginning of pregnancy to child's first birthday has profound impact on the future health, wellbeing, and success of a child. Rapid growth during child's first year of life requires proper and adequate nutrition. It is found that weaning practices varies from culture to culture in our diverse population and parents are vulnerable to a lot of misconceptions about feeding and weaning practices. Various unscientific weaning practises are followed by most of the Indian population which remains as a contributing factor for the persistence of malnutrition in a widespread manner.

The World Health Organisation (WHO) and the United Nations International Children's Education Fund (UNICEF) recommend early initiation of breastfeeding within one hour of birth, exclusive breastfeeding for the first six months of life, introduction of nutritionally adequate and safe complementary foods at six months together with continued breastfeeding up to 2 years of age or beyond[1]. Good complementary foods are rich in energy, protein, and micronutrient(particularly iron, zinc, calcium, vitamin A, vitamin C and folate), and is not spicy or salty, easy for the child to eat, locally available and affordable[2]. Recommendations on feeding and weaning practices is summarised in Guiding Principles for appropriate complementary feeding by the WHO[3].

Best complementary food for babies of weaning age includes the staple which provides most of the carbohydrates (starch) and other nutrients needed for growth. Examples of staples include cereals (rice, maize, wheat, oats, sorghum, millet), roots (potato, sweet potato, carrot), starchy fruits (banana). Variety of other foods should be added to the staple every day to provide other nutrients. These include pulses (peas, beans, soybeans), fruits and vegetables (carrot, pumpkin, mango, papaya, banana, spinach), foods from animals (meat, eggs) are good source of protein, iron, zinc; liver also provides vitamin A, and folate. Egg yolk is a good source of protein and vitamin A. Fats, and oils increase energy density of food and makes them tastier. There is a still a debate existing in our diverse population on when to introduce complementary feeding. Lack of knowledge regarding food, socio economic status, cultural beliefs and misbeliefs regarding food are factors that affect time of weaning. Diarrhoea, vomiting and infections are common problems associated with early weaning. Malnutrition and nutritional anaemia are problems associated with delayed weaning. However, many infants and children do not receive optimal feeding. Currently, in low income and middle-income countries only 37% of infants younger than 6 months of age are exclusively breast-fed[4]. It is found that there exists a lot of variations in weaning practices in our diverse population. This study is done to assess variations in weaning practices among mothers in our cohort population and to assess its impact on growth in infants till 1 year of life.

MATERIALS AND METHODS

This prospective observational cohort study was conducted among all new-born's born at Rainbow Children's Hospital, Banjara Hills, Hyderabad during the study period and satisfying the inclusion criteria during.

Study period: September 2019-April 2021.

Inclusion Criteria: Mothers in the post-natal ward of Rainbow Children's Hospital Banjara Hills, Hyderabad. India, meeting the following criteria were included into the study.

- 37 completed weeks of pregnancy
- No serious medical or obstetrical complications

Exclusion Criteria: Infants of mothers in the study meeting ANY of the following criteria will be excluded from the study.

- New-born with a birth weight <2.5 kg.
- New-born with serious medical or congenital malformations.
- Apgar score <8 at 5 mins of life.
- History of NICU admissions >48 hours after delivery.

Sample size: It was assumed based on previous study that about 60% mothers started weaning at 6 months. The sample size required was 370 with 80% power and 0.05 type 1 error. The sample size was estimated by using the following formula:

$n = Za^2 X P X (1-p)/ e^2$

where n = sample size

The required sample size for the study was 370 new-borns.

New-born babies of the mothers who had given written informed consent were screened through inclusion criteria, enrolled into the study and those meeting the exclusion criteria were excluded. During their post-partum stay, mothers were given an information leaflet regarding breastfeeding and weaning practices which was approved by the Scientific committee and Institutional Ethics Committee and

were requested to complete a basic socio-demographic questionnaire. The questionnaire included information about prenatal education, family support, family composition, and basic socioeconomic indicators (i.e., income, education and occupation). New-borns enrolled in the study were followed up from day 0 till 1 year of life. Anthropometric parameters of new-borns were assessed before discharge. Infant feeding and weaning data were collected after hospital discharge during follow up visit for vaccination at months 6 and 12.

Primary Outcome Measure: Assessment of weaning practices on the anthropometric parameters (weight in kg, length in cm, head circumference in cm) of infants at 6 months and one year of life.

Secondary Outcome Measure: Percentage of mothers who followed early and delayed weaning practices.

Statistical Analysis: The results were expressed as mean and standard deviation (SD) for continuous variables and as percentage of frequency distribution for categorical variables. Students t test, chi square test and proportion test were used for comparing between weaning practices and several factors. A $p<0.05$ with two sided was considered as significant. The statistical analysis was carried out by using statistical package for social sciences (spss 21st version).

RESULTS AND DISCUSSIONS

Of the 300 women, the mean±SD age was 29.86±4.34 years and 156 (52%) women were in the age category of 30-35 years. All mothers had formal education, of 300 mothers, 276 (92%) were at least graduates. There were168 (56%) homemakers while 132 (44%) were working women. The family income was ≥INR 50,000/month in 240 (80%). Out of the 300 mothers, (62%) were primiparous and 162 (54%) underwent caesarean section.

Infants: Out of the 300 infants, 153 were males (51%) and 147 were females (49%) with a sex ratio of 1.04. One hundred and twenty (40%) babies were exclusively breast fed for 6 months and followed appropriate weaning practices according to WHO guidelines. Early weaning was initiated in 180 (60%) babies. Ninety (30%) babies were exclusively breast-fed for 5 months, 60 (20%) for 4 months and remaining for <4 months (Table 1).

Among the babies who received formula feeds before weaning, 97% babies were given some breast-milk. One hundred and seventy-four (58%) babies were given formula milk along with breast milk. Formula feed was given to only six babies (2%) (Fig. 1). Family's instruction played a significant role in deciding the time of initiation of weaning in 162 mothers (54%) whereas 96 (32%) mothers followed doctor's instruction for the same. Homemade food was given as the first weaning food to 180 (60%) babies, ragi and rice powder were the commonest. Homemade food was given as the first weaning food to 180 (60%) babies, ragi and rice powder were the commonest.

We enquired regarding details of weaning habits and 156 (52%) babies were introduced to non-vegetarian diet. Chicken was the common non-vegetarian food and was given for the first time in 38% babies during 7-8th month and after 9 months in 62% babies. Egg was included in the weaning diet for 282 (95%) babies. It was given for the first time during 7-8th month in 66% babies and after 9 months in 8.5% babies. For 72 (25.5%) babies, eggs were introduced before six months. Fish was introduced as the weaning diet for 114 (38.8%) babies. Sixty babies (52.6%) were given fish at 7-8th month for the first time and for remaining 54 babies (47.4%) at >9 months. Cow milk was introduced to 48 (16%) babies after completion of six months. However, it was used for preparation of weaning food by mothers of 204 (69.4%) babies. Vegetables (n = 282, 94%) and fruits (n = 288, 96%) were given as part of weaning food, of which 186(65%) and 174(61%) received it in 7-8th month for the first time respectively. Weaning food was enriched with ghee/oil in 126 babies (43%).

We enquired on detail on who helps the infants to feed majority of times it was found that mother for 144 (49%) babies, caretaker for 114 (39%) and grandmother in 36 (12%) who fed the babies

Anthropometric Assessment: The anthropometric measurements of all infants in the study were

- The mean of birth weight (kg) was 3.04±0.434SD, length (cm) was 48.12±1.28SD and head circumference (cm) was 33.14±1.28
- At 6 months (mean±SD) were weight (kg) 7.13±0.46, length (cm) 64.98±2.56 and head circumference (cm) 43.54±1.12.
- At 1 year of age (mean±SD) were weight (kg) 8.91±0.75, length (cm) 73.44±3.19 and head circumference (cm) 45.95±0.87

Early weaning is more frequently done in boys when compared to girls. However, it was not found to be statistically significant. Education had an important role in initiating weaning practices. All women with lesser education started early weaning. Sixty percent of the graduates and 50% of the post graduates also initiated early weaning (Fig 2). The percentage of mothers following early weaning was found to be decreasing with increasing education. There was no

significant difference between percentage of working and not working mothers who initiated early weaning practices (p = 0.771). There was a positive association between socioeconomic class and weaning practices. Early weaning was seen in 80% of babies with family income of <50,000INR whereas, it was seen in 55% of babies with family income of >50,000INR and was statistically significant(p = 0.001). The trend of early weaning was decreasing with increasing family income.

Primi mothers are more likely to wean their babies early when compared to multi mothers. Out of the early weaned babies 70% were born to primi mothers and 47% were born to multigravidas and was found to be statistically significant (p = 0.001). There was a statistically significant difference in the weaning practices and mode of delivery (p = 0.003). Early weaning was practiced in 65% of babies delivered through normal vaginal delivery and in 55% of babies delivered through caesarean section. All mothers who exclusively breast-fed for 6 months were likely to follow timely weaning at 6 completed months when compared to mothers who started formula feeds who were likely to wean early, which was found to be statistically significant (p = 0.001).

Two hundred and seventy mothers (90%) had right knowledge on when to start timely weaning. However, 156 (57%) mothers started early weaning practices and was statistically significant (p=0.018). Almost all mothers (95%) who followed exclusive breast-feeding for 6 months followed timely weaning practices and only 6 mothers (5%) who followed timely weaning practices had given formula milk along with breast-milk. Mothers (96.7%) who have given formula feeds in the initial period of life were likely to follow early weaning practices (p = 0.001) and majority of mothers used formula milk along with breast-milk (Table 6). Mothers who started timely weaning were likely to introduce homemade food for weaning (70%) and mothers who followed early weaning were likely to introduce commercially available food for weaning (46%) which was found to be statistically significant (p = 0.004).

In our study, of the 300 women, the mean±SD age was 29.86±4.34 years and 156 (52%) women were in the age category of 30-35 years. In contrast, mothers were little younger (23.95±3.88) in a study reported by Koya *et al*.[5] Median age of mothers was 25 in a study conducted in Nigeria[6]. Despite massive awareness regarding the benefits of breast-feeding, recent reports mention that 54.9% infants are exclusively breast-fed for 6 months across the country. The prevalence of exclusive breast-feeding in Indian states is 35.8% in Meghalaya, 77.2% in Chhattisgarh[7] and 40% in our cohort population. In our study early weaning was introduced in 60% babies. Similar studies conducted in different parts of world reported that 52% of Indian mothers[8], 19% African mothers[9], followed the WHO guidelines of exclusive breast-feeding for 6 months. All mothers who exclusively breast-fed for 6 months were likely to follow timely weaning at 6 completed months when compared to mothers who started formula feeds who were likely to wean early, which was found to be statistically significant (p = 0.001).

There was a significant positive association regarding mother's educational qualification, occupation, socio economic class with weaning practices. In our study, the percentage of mothers

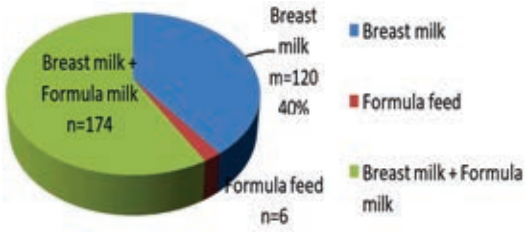

Fig. 1: Type of feed before weaning

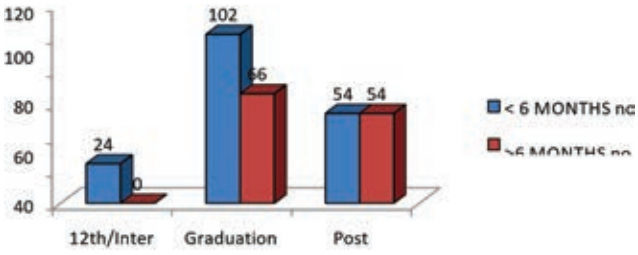

Fig. 2: Education qualification of mother and weaning practices

Table 1: Duration of Exclusive breast feeding

Duration of exclusive breast feeding	no.	percentage
1 month	6	2.0
2 months	12	4.0
3 months	12	4.0
4 months	60	20.0
5 months	90	30.0
6 months	120	40.0

Table 2: Reason for introducing solids at specified age

Reasons	no.	percentage
As per Doctor's instruction	96	32.0
As per family's instruction	162	54.0
Information from Internet	6	2.0
Others (Friends and Colleagues)	48	16.0
Dietician	24	8.0

Table 3: Food type used for weaning

First food used for weaning	no.	percentage
Home-made food	180	60.0
Commercially available product	120	40.0
Specific first food		
Arrowroot	18	6.0
Cerelac	120	40.0
Raggi	108	36.0
Rice powder	30	10.0
Mashed banana	24	8.0

Table 4: Weaning foods

	Introduced		Time of first use		
Food Item	Yes	No	<6 m	7-8 m	9< m
Chicken	150 (50%)	150 (50%)	0	60 (38%)	96 (62%)
Egg	282 (94%)	18 (6%)	72 (26%)	186 (66%)	24 (8%)
Fish	114 (38%)	186 (62%)	0	60 (53%)	54 (47%)
Vegetables	282 (94%)	18 (6%)	78 (27%)	186 (65%)	24 (8%)
Fruits	288 (96%)	12 (4%)	96 (33%)	174 (61%)	18 (6%)

Table 5: Exclusive breast feeding and weaning practices

	< 6 Months		>6 Months			
	n	percentage	n	percentage	Chi square	p-value
1month	6	3.3	0	0.0	276.19	0.001
2 months	12	6.7	0	0.0		
3 months	12	6.7	0	0.0		
4 months	60	33.3	0	0.0		
5month	90	46.7	0	0.0		
6 months	0	3.3	120	100.0		
Total	180	100.0	120	100.0		

Table 6: Mother's knowledge on timing of weaning and weaning practice

	< 6 Months		>6 Months			
	n	percentage	n	percentage	Chi square	p-value
5 months	24	13.3	6	5.00	5.568	0.018
6 months	156	86.7	114	95		

following early weaning was found to be decreasing with increasing education. Higher education was graduation and above (92%) in our study whereas a previous Indian study[5] has reported that 65% were educated up to high school. In contrast less than half of the mothers (49%) had proper knowledge on weaning in a previous Indian study done in Gujarat[10] where 53% mothers were illiterate or just literate. All women with lesser education started early weaning, 60% of the graduates and 50% of the the post graduates also initiated early weaning. Early weaning practices were significantly associated with lower education according to two previous Indian study[5,11]. In our study, there was a positive association between socioeconomic class and weaning practices. Early weaning was seen in 80% of babies with family income of <50,000 INR whereas it was seen in 55% of babies with family income of >50,000INR and was statistically significant (p = 0.001). The trend of early weaning was decreasing with increasing family income. Similar observation was seen in a previous Indian study[5] and in a study conducted in Ireland[12].

Time of weaning was not influenced on whether the mother is working or not working in our study. Homemakers were more than the working women in our study (56%). Similar observation was made in a previous Indian study (95%)[5]. Percentage of working mothers who followed timely weaning was more compared to the homemakers in a study reported from a low-income country[13]. Primiparous women were more in number in our study, which was similar to that in a previous Indian study[5] and primi mothers are more likely to wean their babies early when compared to multi mothers. In our study, out of the early weaned babies 67% were born to primi mothers and 47% were born to multigravidas and was statistically significant (p = 0.001). Similar Observation was seen in a previous Indian study[5] and in a study conducted in U.K by Valli *et al*.[14] In our study, early weaning was more frequently done for boys when compared to girls. However, it was not statistically significant. Males were weaned early in a study done by Koya *et al*.[5] and in a study done by valli *et al*[14].

There was a statistically significant difference in the weaning practices and mode of delivery (p = 0.003). For 54% of babies, weaning was started as per the family's instruction and doctor's instruction was the reason to start weaning in 32% babies. Mothers (81%) who followed doctor's instruction were likely to follow timely weaning practices when compared to mothers (25%) who followed family's instruction and information from internet who initiated early weaning practices which was statistically significant (p = 0.001). It is also noted from the other studies that majority of the Indian community start weaning as per family's instruction[15]. In our study, 60% of babies were given homemade food as the first weaning food, ragi and rice powder were the commonest which was similar to a previous Indian study[15] and is probably due to the traditionally followed custom in the Indian population. In contrast, in a western study, only 10% babies were given homemade food as the first weaning food[12]. In our study, cow milk was introduced to 16% babies after completion of six months. However, it was used for preparation of weaning food by 69.4% mothers. Similar observation was seen in a previous Indian study (80%)[15]. In low- income countries, cow milk was used in 17% of babies as weaning food [6].

In the study cohort, the mean birth weight (kg) and mean weight at 6 months were 3.04 (±0.434) and

(7.13±0.46 kg), respectively, which was marginally higher than that in a study from a low-income country (2.98±0.12) and (5.73±0.77)[6] where 78% babies received early weaning. Similar observations were reported in a study done by Joseph *et al* in South India [16]. In our study timely weaned babies were found to be bigger when compared to the early weaned babies. There was a statistically significant increase in the weight at 6 months in timely weaned babies however it was not clinically significant. Mean length (cm) at birth and at 6 months in our cohort were 48.12 (±1.28SD) and (64.98±2.56 cm) respectively whereas in a low-income country it was (61.5±1.5) and (70.2±1.80) (6) which is significantly more probably because of their genetic phenotype. In our cohort timely weaned babies were found to be taller and there was a statistically significant higher length at 6 months and 1year in timely weaned babies.

At 6 months mean of head circumference (43.54±1.1 cm) in our study cohort was higher than that reported in a low-income country (40.57)[6]. Head circumference was bigger in s timely weaned infants both at 6 months and at 1 year in our study. Koya *et al*.[5] reported that early weaned babies had 2.5 times higher odd's of being wasted. In contrast, Vyas *et al*.[8] reported that prevalence of malnutrition is higher in timely weaned babies where the frequency of weaning was found to be inadequate and the association was statistically significant.

CONCLUSION

In our study cohort, early weaning practices were more frequently done than timely weaning practices. Early weaning was practiced by mothers with lesser education and in low socioeconomic group. Family's instruction was the main reason to initiate early weaning. First born babies were weaned early. Home-made food was the most preferred weaning diet; Raggi and rice powder were the commonest. Timely weaned babies were found to be bigger and taller when compared to the early weaned babies, however, it was not clinically significant. There was a significant increase in the head circumference of timely weaned infants both at 6 months and at 1 year.

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