

Infant and young child feeding (IYCF) practices from birth to 2 years: A longitudinal follow-up study in healthy children from Colombo, Sri Lanka

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Abstract

Introduction: Optimal infant and young child feeding (IYCF) has the greatest potential impact on child survival and is the most important investment for good nutrition in the first 1000 days of life. Most available Sri Lankan IYCF data are cross-sectional making this the first longitudinal study undertaken from birth to 2 years on IYCF practices in Sri Lanka.

Objective: To describe adherence to IYCF guidelines in a group of healthy infants born at term gestation, from birth to 2 years of age, who were individually counselled at each visit

Method: Descriptive longitudinal study from 2015-2019, in Colombo, Sri Lanka. Babies without morbidity born to non-smoking mothers with a singleton pregnancy, at term gestation, aged more than 18 years, living in Colombo District, who intended to breastfeed and gave informed written consent, were recruited prior to delivery. All caregivers were counselled individually and followed up monthly and two-monthly in the first and second years respectively. IYCF practices were defined per 2021 UNICEF/WHO guideline.

Results: A total of 374 babies were recruited at birth. Exclusive Breast Feeding (EBF) was 100%, 96%, 92% and 72% at birth, 2, 4 and 6 months

respectively. Formula feeding was 1-3%. Solid and semi-solid food (SSSF) were initiated between 6-8 months in 82%. Growth faltering was the commonest reason for early initiation of SSSF at 4-6 months. Minimum meal frequency was 98-100% at all ages. Minimum dietary diversity, minimum acceptable diet and egg and flesh food consumption were seen in 95% from 9-24 months. Responsive feeding was seen in 93% at 18-24 months.

Conclusions: Our study population demonstrated high adherence to IYCF guidelines most probably due to individualized counselling at each visit.

(Key words: IYCF, Longitudinal, Sri Lanka, Birth to 2 years, Individual counselling)

Introduction

Optimal infant and young child feeding (IYCF) has the greatest potential impact on child survival¹ and is the most important investment for good nutrition in the first 1000 days of life². Optimum nutrition across the first 1000 days of life appears essential for prevention of adult obesity and non-communicable diseases (NCDs)³. Although breastfeeding practices in South Asia are high compared to other regions, complementary feeding (CF) practices, including the introduction of solid / semi-solid food (SSSF), diversity and adequacy are lower⁴. A desk review on CF from 2006–2017 reported that Sri Lanka demonstrated the best indicators for minimum meal frequency (MMF), minimum diet diversity (MDD) and minimum adequate diet (MAD) in the South Asian region but needed improvement in the composition of CF⁵. Further, an emphasis on MDD instead of focusing solely on quantity is a necessary step in addressing the double burden of malnutrition⁵. Feeding behaviour has been shown to influence both acceptance of food as well as dietary intake⁶. A review on responsive feeding in Sri Lanka reported the need for improvement in most parts of the country⁷. Most available data on CF in Sri Lanka are from observational, cross-sectional studies. This longitudinal follow-up study was undertaken to fill this gap in knowledge and is the first study undertaken from birth to 2 years on IYCF practices in Sri Lanka.

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Objective

To describe adherence to IYCF guidelines, and the challenges faced, in a group of healthy infants born at term, from birth to 2 years of age, who were regularly followed up and individually counselled regarding IYCF guidelines in Colombo, Sri Lanka.

Method

This was a descriptive longitudinal study conducted from July 2015 to December 2019, at Professorial Unit, De Soysa Hospital for Women, Colombo, Sri Lanka. Non-smoking mothers with a singleton pregnancy, between 37 weeks and 41 weeks+ 6 days period of amenorrhoea (POA), aged more than 18 years, living in the study area (Colombo District), who intended to breastfeed and gave informed written consent, were recruited prior to delivery. All newborns who did not have morbidity were included in the study. Women who lived outside the study area were excluded. Babies with an Apgar score <8 at 5 minutes of age or had congenital anomalies or required admission to the neonatal intensive care unit, or had morbidity were excluded.

Study participants were followed up monthly in the first year and two-monthly during the second year. Anthropometry and dietary data were recorded at each visit. Dietary data were collected via 24-hour dietary recall and interviewer-administered questionnaire. Dietary components, consistency, timing of meals / water / breastfeeds, mealtime behaviour, and resultant effect on feeding behaviour and growth charts were discussed and the agreed plan was documented in the participant’s clinic-book, in the preferred language, at each visit by the same investigator. In addition, a 24-hour-hotline was provided for troubleshooting. Indicators for assessing IYCF practices were defined according to

the 2021 UNICEF/WHO guideline⁸ whereas age-appropriate consistency and quantity were defined according to latest Sri Lankan guideline of 2007⁹.

Ethical issues: The Ethics Review Committee of the Faculty of Medicine, University of Colombo reviewed the protocol and approved the study (No. EC-14-145). Informed written consent was obtained from the recruited mothers prior to delivery, Participant anonymity was ensured.

Statistical analysis: This was completed using SPSS version 27.0 for Mac and data were presented as mean and standard deviation (SD). Data were analysed both cross-sectionally and longitudinally. The age at each visit was calculated using the date of visit and date of birth. Each 30-day range was taken as a month. Cross-sectional analysis included data collected during all infant visits during a 30-day period. Longitudinal analysis used only a single visit per infant at a given time, where the visit with the worst outcome was selected to represent each time in case of different outcomes in multiple visits within the same 30-day period. Any baby who was fed formula milk (FM) or received predominant breastfeeding (PBF) at any time within the first 6 months, was taken as FM fed or PBF for longitudinal analysis.

Results

A total of 374 babies were recruited at birth. Breastfeeding was initiated during the first hour of birth in all babies. All babies were exclusively breastfed (EBF) in the first 2 days of life as well as on discharge. The sociodemographic and baseline characteristics of the study population are given in Table 1.

Table 1: Baseline characteristics of the study population

Characteristic	Result
Maternal Age (years) - Mean ± SD (Range)	29 ± 6 (19 – 44)
Maternal years of formal education - Mean ± SD (Range)	11 ± 3 (0 – 17)
Maternal employment - n (%)	208 (61.7)
Paternal age (years) - Mean ± SD (Range)	32 ± 6 (19 – 52)
Paternal years of formal education - Mean ± SD (Range)	11 ± 2 (0-17)
Paternal employment - n (%)	334 (99.1)
Monthly family income (SLR) - Median (interquartile range)	30,000 (25,000 – 45,000)
1 st quintile (Less than 23,518) - n (%)	75 (22.4)
2 nd quintile (23,519 – 36,445) - n (%)	144 (42.7)
3 rd quintile (36,446 – 51,862) - n (%)	65 (19.3)
4 th quintile (51,863 – 81,371) - n (%)	33 (9.7)
5 th quintile (81,371 upwards) - n (%)	20 (5.9)
<i>Characteristics at birth</i>	
Male newborns	51.4%
Apgar at 5 min	10
Vaginal delivery	62.6%
Low birth weight	16.3%
Mean birth weight (kg)	2.9 ± 0.4
Mean birth length (cm)	48.5 ± 2.3

Total numbers of babies followed up in each age group were 49, 138, 142, 118, 111 and 116 at 0-30, 31-60, 61-90, 91-120, 121-150, 151-180, 181-210

days respectively. Details regarding feeding are given in Figure 1.

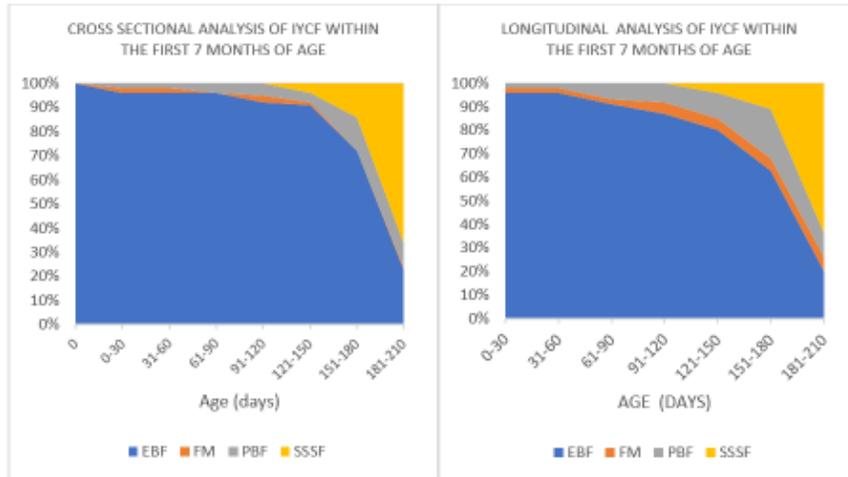


Figure 1: Cross-sectional (A) and longitudinal (B) analyses of IYCF during the first 7 months of age
 EBF: exclusive breastfeeding, FM: formula milk, PBF: predominant breastfeeding, SSSF: solid, semi-solid or soft food

Cross-sectional analysis revealed that EBF was 100% during the first 48 hours, 96% at 3 months and 92% at 4 months of age. EBF decreased by 4%, 14% and 66% to 91%, 72% and 23% respectively with increasing SSSF at 5, 6, and 7 months of age. Formula feeding was 1-3% whereas PBF increased from 2-14% during this period.

Longitudinal analysis showed similar results with EBF 96% till 2 months, 91% at 3 months and 87% at 4 months of age. EBF decreased by 4%, 11% and 64% respectively to 80%, 63% and 20% with increasing SSSF (without FM) at 5, 6, and 7 months of age. PBF increased from 2%-10% and FM from 2%-16% from 1-7 months as per longitudinal analysis. The duration of FM feeds was less than one

month in all babies who either converted to EBF or SSSF. None of the babies received unmodified animal milk during this period.

SSSF was initiated at 4, 5, 6 and 7 months in 4%, 14%, 66% and 16% respectively where 82% initiated SSSF between 6-8 months of age and 18% initiated SSSF earlier at 4-6 months of age as per advice of investigator. Early initiation of SSSF at 4-6 months was due to flattening or faltering in the weight for age growth curve on the CHDR (82%) whereas pregnancy, return to work, new onset crying and breast refusal were the other reasons. CF indicators according to UNICEF/WHO 2021 IYCF guidelines are given in Figure 2.

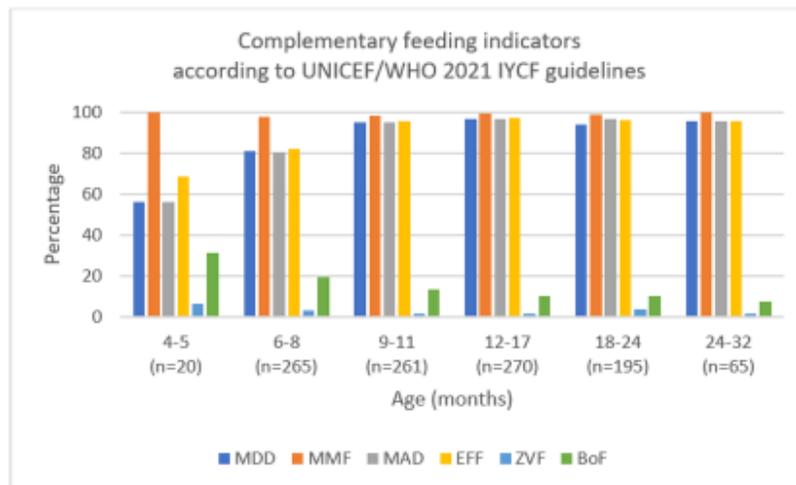


Figure 2: Complementary feeding indicators according to UNICEF/WHO 2021 IYCF guidelines
 MDD: minimal dietary diversity, MMF: minimal meal frequency, MAD: minimal acceptable diet, EFF: eggs and /or flesh food consumption, ZVF: zero vegetable and fruit consumption, BoF: bottle fed

MDD and MAD increased from 56% (4-5 months) to 81% (6-8 months) and to 95% thereafter. MMF was 98-100% at all ages. Egg and/or flesh food consumption (EFFC) increased from 70% (4-5 months) to 95% from 9 months onwards. None of the children consumed sweetened beverages at any

age. Zero vegetable and fruit consumption (6.3% - 1.5%) as well as bottle feeding (BoF) (31.3%-7.6%) decreased with age where BoF was seen only at 3 months (1.5%) and not at birth, 1, 2 or 4 months of age. CF indicators according to Sri Lankan IYCF guidelines are given in Figure 3.

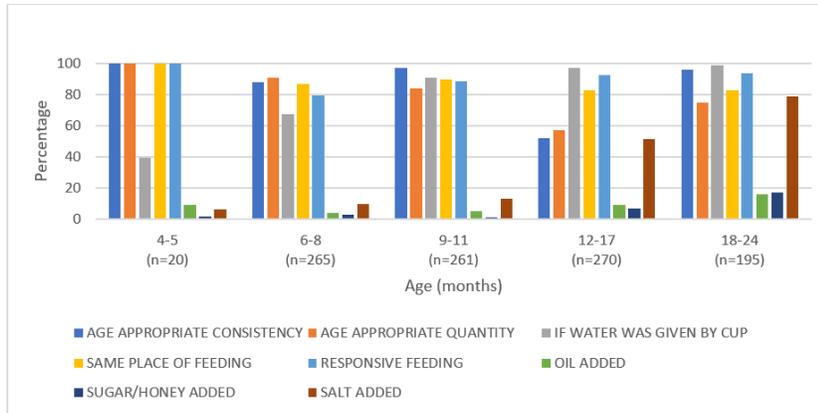


Figure 3: Complementary feeding indicators at different ages according to local IYCF guidelines 2008

Age-appropriate consistency of CF decreased from the time of initiation to the lowest (51.8%) at 12-17 months and improved again to >95% by 18-24 months. This was mainly due to delayed transition from mashed food to family food. Similarly, the quantity which was age appropriate at initiation was at its lowest (57.4%) at 12-17 months and improved to 74.6% by 18-24 months, as a significant number of children remained at ½ - 1 cup quantity even at 12 months and beyond. All babies were offered boiled cooled water at the initiation of CF as per local IYCF guideline. Water was given by cup in only 39% at 4-5 months but improved to 99% by 18-24 months. Water was given via feeding bottle in 33% and via cup and spoon in 28% at initiation and gradually decreased over time. All (100%) children were fed in an identified dining area, where he/she was seated

in one place, away from the television at the initiation of CF, but this decreased to 83% at 18-24 months. This was mainly due to increasing mobility of the child with age, where caregivers either followed the child around as child continued to walk around the house while eating or tried to keep the child in one place by using the television. Responsive feeding was also seen in all children at initiation but reached the lowest at 6-8 months (79%) and gradually increased to its maximum (93%) at 18-24 months. There was an increase in the number of children who had oil, sugar and salt added to their food along with increasing consumption of family food. Composition pattern of complementary food from 5 months to 24 months according to the 8 food groups used to assess dietary diversity as per WHO IYCF 2021 guideline⁸ is given in Figure 4.

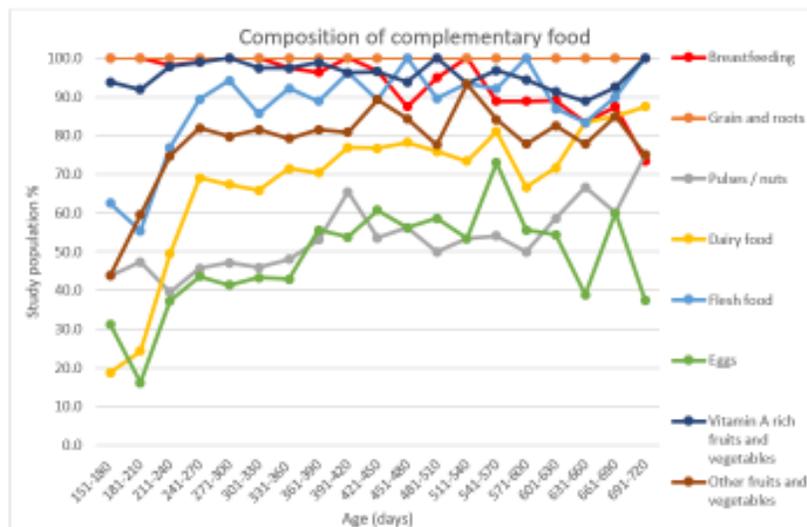


Figure 4: Composition of complementary food. Vertical line at 241-270 days show that most infants have achieved minimum diet diversity (MDD) by this age

Breastmilk was consumed by most babies (96%) until completion of first year of life after which it reduced to 75% at the end of the second year, with an average of 2 breastmilk feeds per day. Grains (100%) were consumed at all ages. Vegetables and fruits especially those rich in vitamin A were consumed by 90-100% at all ages. Flesh food consumption (FFC) increased with age from about 55% at 6 months to 90% at 8 months. The most common type of flesh food was fish followed by poultry. None of the infants consumed red meat. Pulses were consumed by 40-60% and egg consumption increased from a minimum of 15% at 6 months of age to 50-60% at 12 months after establishment of CF. The delay in rise in consumption of eggs was mainly due to parental concerns of giving eggs before 9 months, as per older guidelines at a time when eggs were recommended only after the measles vaccine at 9 months, due to possible cross allergy with its components. Dairy food, other than breastmilk, mainly consisting of yoghurt and cheese was increased from 19% at 5 months to 70-80% by one year.

Challenges faced by the study participants were identified during the one-to-one interviews between the investigator and the parent. While all study participants knew that SSSF should be commenced at the completion of six months, they were unaware that it could be started at the end of four months when faced with challenges like growth faltering, return to work or onset of a growth spurt causing crying after feeds and feeling of inadequate milk after months of successful breastfeeding, instead of starting formula milk. This led to parents assuming that formula feeding was their only option in case of any challenges faced with breastmilk.

FFC was discouraged till nine months or sometimes one year by grandparents due to religious or cultural beliefs. Storage of flesh food became a challenge due to the lack of a refrigerator. This was overcome by using eggs for breakfast and using FFC for lunch and dinner. Blending and sieving food from the time of initiation of complementary food led to refusal of particles by the infant, resulting in delays in increasing the particle size which in turn led to delays in consuming solid family foods by the first year.

Crowding 3 meals and 2-3 snacks between a few hours like 9am to 5pm, led to refusal of food by the child, due to inadequate time to feel hunger, as many mothers breastfed through the night until early morning. This challenge was overcome by increasing spacing between meals including breastfeeds. Continuing to breastfeed on demand after the period of EBF also interfered with spacing. This challenge was overcome by counselling

mothers to use breastfeeding only for nutrition and not as a pacifier nor to put the child to sleep.

Information gathered during the interviews revealed that feeding behaviour focused on 'feeding the child' rather than 'supporting the child to eat' where the mother was 'blamed' or 'held responsible' if the child did not eat according to the family's expectations. Focus on the quantity of food that should be fed to the child as instructed by the CHDR / public health midwife, led to the mother being stressed resulting in force feeding or using distraction to feed the child to try and feed the recommended quantity of food. None of the parents realized that the 'eating experience of the child' is that which resulted in either enjoying or refusing food, until this was pointed out and reiterated at every visit. Most parents were reluctant to let the child touch the food and get actively involved. Parents were not aware of the importance of an authoritative parenting style, regular feeding routine or setting limits until they were counselled by the investigator. Most parents were used to feeding the infant in isolation before the rest of the family where they had to be repeatedly counselled to allow the infant to eat with other family members so that the infant could imitate the others' feeding behaviour. The change in the child's feeding behaviour after acting on the above information worked as a positive reinforcement to continue responsive feeding.

Discussion

Our study population demonstrated better IYCF indices than DHS 2016/2017¹⁰ and achieved the proposed national targets for 2020¹¹ except for continued breastfeeding (CBF) for 2 years. Initiation of breastfeeding (100% vs 90.3% vs 95%), EBF at 0-1 month (96% vs 93.4% vs >90%), EBF at 2-3 months (96% vs 87.2% vs >90%), EBF at 4-5 months (92% vs 63.8% vs >75%), PBF from 0-5 months (3% vs 6%), formula feeding from 0-5 months (2% vs 5%), CBF at 1 year (96% vs 94.3% vs 95%) and CBF at 2 years (75% vs 88% vs 90%) were seen in our study population, DHS 2016/2017¹⁰ and the proposed national targets for 2020¹¹ respectively. Similarly, initiation of CF (100% vs 85% vs 100%), MDD (94% vs 73% vs 90%), MMF (93.5% vs 80% vs 86%), MAD (94% vs 62% vs 80%) and EFFC (94% vs 59% vs 90%), were seen in our study population, DHS 2016/2017¹⁰ and the proposed national targets for 2020¹¹ respectively. Both DHS 2016/2017¹⁰ and our data were markedly better than that reported for the South Asian region IYCF indices¹²; SSSF 57.4%, MMF 47.7%, MDD 33% and MAD 20.5%. Composition of CF in our study population had better diversity and higher EFFC compared to DHS 2016/2017¹⁰ data as well as South Asian region data¹¹: grains (100% vs 88% vs 77%), vitamin A rich fruits and vegetables in (96% vs 86% vs 33%), other vegetables and fruits (78%

vs 47% vs 18%), legumes (53% vs 66% vs 14%), EFFC (95% vs 58% vs 17%), diary (68% vs 42% vs 11%) in our data, DHS 2016/17¹⁰ and the South Asian¹² data respectively. Oil (4.8% vs 40%) and sugar (4% vs 34%) consumption were lower in our data compared to the DHS 2016/17 data.

Our study found that 86% of infants between 6-24 months were fed in a specific place similar to Jeyakumaran's study in Jaffna (80%). Responsive feeding, including feeding in a specific place, in seated position, with a non-distractive environment, according to hunger cues, at a regular time, while responding to the child in an emotionally supportive manner without forcing, scolding or physical restraint were seen in all infants at the initiation of CF, with a lowest of 79% at 6-8 months which improved to 93% by 2 years in contrast to the previous reported studies where authoritarian feeding style was used in 82% care givers of children aged 3-5 years in Colombo¹³, knowledge regarding responsive feeding was seen in only 25-49% caregivers of infants aged 4-12 months in Bibile¹⁴, responsive feeding was not effectively practised at 9 months of age according to a qualitative study in Anuradhapura¹⁵, 64% of preschool teachers agreed that force feeding was necessary in Nuwara Eliya¹⁶ and where only 22.7% used responsive feeding in children between 4-23 months in Jaffna¹⁷.

Individualized counselling, which was the key difference between our study population and the DHS 2016/2017 group as well as the other reported studies, is the most likely reason for the high adherence to IYCF guidelines in our study population, which also enabled our study population to achieve the 2020 IYCF national targets. Individualized counselling was done monthly during the first year and 2-monthly during the second year. It included informing caregivers about the IYCF guidelines, individualized diet planning, helping them to understand and interpret the growth chart and showing them how the infant's growth, development and behaviour changed according to their adherence to the IYCF guidelines. The positive effects of adherence to IYCF guidelines were acknowledged, appreciated, and encouraged and their beneficial effects on growth and development were discussed at each visit while pointing out the negative effects of non-adherence. Reasons for non-adherence were explored together in a "no-blame" environment and a mutually agreed action plan according to individualized socioeconomic status, cultural and religious beliefs and social norms was formulated and documented in the caregiver's language of choice in the clinic book. They were given a 24-hour hotline to contact the investigators in case of any urgent concerns where additional appointments were scheduled as necessary. Participants were encouraged to share their

achievements as well as challenges with the other participants to encourage peer learning.

Individualized counselling considering the personal circumstances and the CHDR growth pattern of each infant, emphasizing on diversity and responsive feeding, instead of quantity, is likely to improve IYCF practices. It should be checked if the caregivers are following the recommendations and if not, resolve problems and re-try until counsellor and caregiver agree on common ground. Importance of starting EFFC early and how it can be used even without a refrigerator should be explained. Blending and sieving of CF should be avoided but mashing the food, and the importance of stepping up on particle size, with advance of age and child gets competency in munching and swallowing, should be emphasized. Breastfeeding should be spaced with age so that they can be replaced by meals when CF is initiated. Caution is advised in using the word 'breastfeed on demand' beyond the time of birth. Meals should be spaced with at least a 3-hour gap before snacks and a 6-hour gap between main meals, starting breakfast as early as possible when the infant wakes up and ending with dinner as late as possible before the infant goes to sleep. Also bottle feeding should be actively discouraged at all stages especially when starting to give water with initiation of SSSF. Awareness should be raised regarding initiation of CF after 4 months in case of challenges faced by infant in the form of growth faltering or the onset of a growth spurt causing poor satisfaction and crying after breastfeeding in a child who previous breastfed well or mother returning to work. Caregivers should be empowered to interpret the growth chart and enjoy the growth of their child when adhering to IYCF practices, which would serve as the best positive reinforcement to continue the same behaviour.

Conclusions

Our study population demonstrated better adherence to the IYCF guidelines in comparison to the DHS 2016/2017 data while achieving the proposed national targets for 2020. This is most probably due to the individualized dietary planning and counselling at each visit.

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