Original Article

Magnitude and Factors Associated with Infant Formula Feeding Among Mothers Attending Public Health Institutions in Dire Dawa, Eastern Ethiopia

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Abstract

Background: Even though Breastfeeding for infants and young children provides the ideal food for healthy growth and development, use of infant formula feeding increased worldwide. Using direct and indirect campaigns promoting infant formula feeding reaches mothers. Ethiopia is no exception for this practice. Objective: To Determine the Magnitude and Associated factors for initiation of infant formula feeding among mothers attending public health institutions of Dire Dawa town, 2018. **Subjects and Methods:** A health facility based, cross-sectional study design was used. Simple random sampling technique was used to collect data from 186 study participant's using interviewer administered questionnaire. Data was entered using EPI Enfo Version 7, data was cleaned and analyzed using STATA version 14. Multivariable logistic regression analysis was used to identify factors associated with infant formula feeding. **Results:** The prevalence of infant formula feeding was 21.4 percent. The main factor for initiation of infant formula feeding was mothers had no adequate breast milk. The associated that increase initiation of infant formula feeding include lack of counseling during ANC follow up (AOR: 3.29, 95%CI: [1.27 - 8.54], p=0.014), delivery through caesarean section (AOR: 3.38, 95%CI: [1.18-9.63], P=0.022), increasing family income (AOR: 2.42,95%CI: [1.27-4.63], p=0.007) and advice from friends, neighbors and family heavily influenced initiation infant formula feeding(AOR: 3.47[1.16-10.38] P=0.026).**Conclusion:** There is increased magnitude of infant formula feeding among mothers attending public health institutions in Dire Dawa city. Lack of counselling regarding breast feeding during antenatal care follow up, delivery through caesarean section, increasing family income and advice from friends, neighbours and family heavily influenced initiation infant formula feeding. Considering targeted awareness creation focusing on women in reproductive age group will help resolve the current increasing infant-feeding prevalence and encouraging the role of health professionals in supporting infant-feeding counselling will also be a considerable intervention.

Keywords: Initiation, Infant formula feeding, Formula Milk.

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Introduction

The WHO report showed that under nutrition is estimated to be associated with 2.7millionchild deaths annually or 45% of all child deaths. Infant and young child feeding is a key area to improve child survival and promote healthy growth and development.[1]Although evidence shows that breastfeeding is undoubtedly the healthiest way to feed an infant, there are many mothers who for a variety of physical, social or psychological reasons choose to feed their infant with infant formula. Most women are physically able to produce enough breast milk for their infant, as long as they receive appropriate advice and care.[2] Infant formula is manufactured using modified cows' milk and does not contain any of the protective antimicrobial or bioactive substances.

Powdered Infant Formula (PIF) is not a sterile product and can therefore be a growth medium for harmful bacteria,[3] like contamination of Enterobactersakazakii,[4] and to reduce the risk of infection, there constitution of powdered formula should be undertaken by caregivers using good hygienic measures and in accordance with the product manufacturer's food safety guidelines.[5] According to Ethiopian Demographic and Health Survey (EDHS 2011), only2% of Ethiopian children under-age two were formula fed.[6]But recent studies have revealed that there is a variation (from 12.4% in Ethiopia to 70% in china) in the prevalenceof formula feeding.[7-9]Formula marketing in hospitals is still widespread, especially in the form of commercial discharge bags containing free samples of infant formula. New mothers who receive these samples are more likely to stop breastfeeding sooner than those who don't receive these samples. Different study found that the hospital staff and routines exerted a stronger influence on mothers' infant-feeding practices by nonverbal teaching(the hospital "modeling" of infant formula products) than by verbal teaching (counseling supporting breast-feeding).[10,11] There has been limited research that focuses on gaining a better understanding of why so many mothers choose to formula-feed their infants. However, a number of studies

suggest socio-demographic factors are associated with the choice to formula-feed. These include younger age, lower education and income, being a single parent and a current smoker.[12,13] Although many of these same women seem to be knowledgeable about the benefits of breastfeeding, young low-income women tend to be greatly influenced by the attitudes held by their social environment as well as the attitudes and support, or lack of support, from their own mothers.[13-15]

Many of these factors are difficult to modify and what is needed is a better understanding of why mothers with these characteristics make their decision to formula-feed in order to develop targeted interventions. In addition, given the well-known risks of formula feeding for mother and baby from a public health perspective,[10,13] it is critical to better understand the factors that influence these decisions with the overall goal of promoting a behavior that will improve the health of both the baby and mother.[16]

Subjects and Methods

This study was done in Dire Dawa town from June-August, 2018. Dire Dawa City Administration is one of city administration of the Federal democratic Republic of Ethiopia. According to the 2007 National -Census Dire Dawa city administration has population of 341,834 inhabitants which includes both urban and rural. But Dire Dawa town has total population of 233,224 with a balanced gender compositionof 116,232 males and 116,992 females, an increase of 30 percent over 1995. Dire Dawa city is 515 kilometers east of Addis Ababa with an economy less dependent on the Addis Djibouti railway line than in the past. It is the hometown for diverse people from different ethnic and cultural backgrounds.[17]According to the 2014 Health and Health Related report of Dire Dawa Health Bureau; the city Administration has 2 governmental Hospitals and 15 Health Centers 'providing maternal health services. According to the report Antenatal care coverage (ANC), delivery attended by skilled birth attendants and post-natal care coverage(PNC) was reported to be 57.2%, 39.7% and18.7% respectively.[18] This study employed health facility based cross sectional study design to collect data from mothers who have an infant and attending public health institutions during the study period as the source population.

The study population was randomly selected mothers who have an infant and attending public health institutions at Delivery, PNC and EPI service delivery departments during the study period. Mothers who attended health facilities at Delivery, PNC and EPI service during the study period, and gave informed consent, and lived in Dire Dawa citywere considered as inclusion criteria. Four health facilities were randomly selected and study population was proportionally allocated.The sample size was determined using a single population proportion formula:n=($\llbracket Za/2 \rrbracket$^2 p(1-p))/d^2 and sample size was calculated after considering the prevalence of initiation of infant formula feeding (12.4%) from study conducted in Gonder,[10] and10%was taken for none

response rateto get the finale sample size of 186.The two governmental hospitals (Sabian Primary and Dilchora Hospital) were included in the study purposefully. While for the selection of Health centers the lottery method was used. From the total eight urban Health centers two of the health facilities (Legehare and Gende Kore Health centers) were selected to insure representativeness. Systematic random sampling technique was used to select the study participants. The sample was allocated to each health facility proportional to size of mothers. In order to prepare the sampling frame; the data of total number of women who were attended ANC, Skilled delivery and PNC departments of theselected health facilities in the previous one year were taken from service log book of each departments. The sampling interval (Kth value) was calculated by dividing the number of units in the population by desired sample size and then a number between one and K value was taken as random starting point; and finally, k value was found to be 8. Then after considering random numbers between 1 and 8, 4 was selected. In order to select the study mothers who, have infant and attending public health institutions at delivery, PNC and EPI service systematic random sampling technique was used. A questionnaire adapted from previous studies were used to collect the data and has three parts.[19,20] The respondents were informed about the objective of the study and they were also asked to give their written consent after they had been told that they had the right to refuse to participate and be informed that the data would only be used for the purposes that had been explained to them. To maintain the quality of data, training was provided for four data collectors (nurses) and the tool was also pre-tested using 5% of the sample. Two trained supervisors were also deployed during data collection period and checked for completeness, consistencies and made corrections on daily basis before leaving each facility. Data was entered using Epi Info version 7 and after selecting important predictors, data cleaning, coding and recoding of all variables, categorization of continuous variables was done before any analysis was commenced. Data analysis was done using STATA Version 14. Descriptive statistics was conducted for categorical variables. Accordingly, frequencies and percentages were reported and whenever reporting the measure of central tendency and dispersion; normality test was conducted. This was done depicting histogram and if the data is normally distributed mean and standard deviation were reported and otherwise median and interquartile range were used. The associations between Infant formula feeding and predictors were examined using chi square test of association and the variables significant at 25% levels were considered as a candidate for Multivariable logistic regression analysis.[21]Bivariate logistic regression was done for each predictor against the outcome variable (infant formula feeding) to estimate the crude odds ratio. Multivariable logistic regression model was used to estimate adjusted odds of infant formula feeding while adjusting for potential confounders. At the model selection level P value of less than 0.05 were used as a level of statistical significance. The stepwise model building strategy was applied and post

model estimation diagnostics; like goodness of fit (gof) of the model was also conducted using Hosmer and Lameshow test.

Results

The mean age of the respondents was 25.95(SD= ±4.808) and 97.8% were married.

Table 1: Summarizes socio demographic characteristics of mother attending public health institutions in Dire Dawa City, Eastern Ethiopia, 2018.

Socio demographic characteristics		Frequency	Percent
Age of mothers	<=20	31	16.7
	21-30	129	69.4
	31-40	26	14.0
	Total	186	100.0
Marital Status	Married	182	97.8
	Divorced	3	1.6
	Widowed	1	.5
	Total	186	100.0
Ethnicity	Oromo	77	41.4
	Amhara	46	24.7
	Somali	33	17.7
	Tigre	8	4.3
	Gurage	17	9.1
	Others *	5	2.7
	Total	186	100.0
Religion	Muslim	106	57.0
	Orthodox Christian	66	35.5
	Protestant	12	6.5
	Others**	2	1.1
	Total	186	100.0
Occupation of mothers	House wife	99	53.2
	Government employee	24	12.9
	Merchant	37	19.9
	Others ***	26	14.0
	Total	186	100.0
Educational Level of Mothers	Not attended school	18	9.7
	primary school	60	32.3
	secondary school	64	34.4
	more than secondary	44	23.7
	Total	186	100.0
Family monthly income	<=2500	64	34.4
	2500-5000	88	47.3
	>5000	34	18.3
	Total	186	100.0

* Hadiya, Adere, **Catholic, ***student, daily labourer, cleaners

Majority (48.8%) of the infants were between 1 and 6 months of age. [Table 2] shows theAge and Sex distribution of infants who attend public health institutions in Dire Dawa.

Table 2: shows the Age and Sex distribution of infants who attend public health institutions in Dire Dawa City, Eastern Ethiopia, 2018.

		Sex of Baby			
		Male	Female	Total	percent
Age of infant(months)	<=1 month	39	33	72	38.7
	1-6 month	49	41	90	48.3
	6-12 month	13	11	24	6
Total		101	85	186	100

Obstetric and Delivery History of respondents

Among 186 respondents, 183(98.4%) of them had history of ANC follow up and during the follow up 50.8% of them did not receive counseling on breast feeding. Majority of them 111(59.7 %) were multiparous and spontaneous vaginal delivery was reported by 140 (75.3%) as main mode of delivery. Though 97.3% of delivery was attended at health institutions; only 76.9% of mothers had received counseling regarding breast feeding after delivery. [Table 3] summarizes the obstetric and delivery characteristics of mother attending public health institutions in Dire Dawa city.

Table 3: Obstetric and Delivery characteristics of mother attending public health institutions in Dire Dawa City, Eastern Ethiopia, 2018.

Obstetric and Delivery characteristics		Frequency	Percent
ANC follow up	Yes	183	98.4
	No	3	1.6
	Total	186	100.0
Place of ANC follow up	Hospital	89	48.6
	Health center	92	50.3
	Family Guidance Association (FGA)	2	1.1
	Total	183	100.0
Counselling on breast feeding during ANC	Yes	90	49.2
	No	93	50.8
	Total	183	100.0
Place of delivery	Health centers	47	25.3
	Hospital	134	72.0
	Home	5	2.7
	Total	186	100.0
Mode of delivery	Spontaneous vaginal delivery	140	75.3
	Caesarean delivery	46	24.7
	Total	186	100.0
Counselling on breast feeding after delivery	Yes	143	76.9
	No	43	23.1
	Total	186	100.0
Number of babies delivered in last pregnancy	One	183	98.4
	Two(twins)	3	1.6
	Total	186	100.0

Infant formula feeding practice

Majority of the infants had started infant formula feeding within one month after delivery and 32.5% started within the first day of life. (Fig 1)The main reason mentioned by mothers for the initiation of infant formula feeding was their breast has no adequate milk 154 (85%). During the study period 27 (67.5%) of them were continually giving infant formula milk and 13(32.5%) said they didn't stop giving the formula milk. Different reasons were reported for discontinuing the formula milk and the main reason was their breast has adequate milk(61.5%). Of186respondents, 101(60.5%) said that they did not know risk factors of infant formula feeding while 28(16.8%) said it causes diarrhoea, 18(16.2%) vomiting,14(8.4%) infection and

13(7.8%) dry stool. Table 4 summarizes the infant formula feeding practice of mother attending public health institutions in Dire Dawa city.

Table 4: Infant formula feeding practice of mother attending public health institutions in Dire Dawa City, Eastern Ethiopia, 2018.

	Response	Frequency	Percent
Ever heard of Infant formula milk	Yes	165	88.7
	No	21	11.3
	Total	186	100.0
Have you ever given Infant formula milk for the index baby	Yes	40	21.5
	No	146	78.5
	Total	186	100.0
Reason to start infant formula feeding	My breast has no adequate milk	34	85
	My neonate was unable to breastfeed or has disease	6	15
	caesarean Delivery	5	12.5
	I am out of home for work	4	10
	Other reasons *	4	10
Have you stopped to give infant formula feeding for your baby	Yes	13	32.5
	No	27	67.5
	Total	40	100.0
Reason for stopping infant formula feeding	My child was sick	3	23.1
	Advice from health professionals	1	7.7
	I had adequate breast milk	8	61.5
	Others **	1	7.7
	Total	13	100.0
Risk of infant formula feeding	Don't know	101	60.5
	Diarrhoea	28	16.8
	Infection	14	8.4
	Vomiting	27	16.2
	Dry Stool	13	7.8
	Others ***	5	3

*low birth weight infant, nipple infection **cost of formula milk, *** Poor growth, increase weight, allergic than infant formula milk.

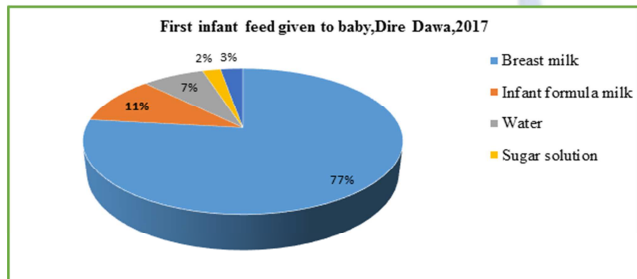**Figure 1: Source of Infant formula feeding among mother attending publichealth institutions in Dire Dawa city, Eastern Ethiopia, 2017**

Knowledge score			
	Good	180	96.8
	Poor	6	3.2
	Total	186	100.0

Knowledge scores
o Good: respondents who were answer above mean knowledge score.
o poor: respondents who were answer bellow mean knowledge score

Table 5: Knowledge statements and knowledge score on breast feeding by mother attending public health institutions in Dire Dawa city, Eastern Ethiopia, 2018.

	Knowledge statements	Yes		No		I don't know	
		N	%	N	%	N	%
1	Breast feeding is nutritious	171	91.9	7	3.8	8	4.3
2	Breast feeding is healthy	180	96.8	1	0.5	5	2.7
3	Breast feeding is protective	178	95.7	3	1.6	5	2.7
4	Breast feeding encourages bonding	180	96.8	3	1.6	3	1.6
5	Breast feeding has contraceptive benefit	85	45.7	80	43	21	11.3
6	Breast milk is cheap	179	96.2	6	3.2	1	0.5
7	Breast milk is better advantage	182	97.8	1	0.5	3	1.6

Factors affecting initiation of infant formula feeding

The multivariable logistic regression analysis showed that family income, counseling on breast feeding during ANC follow up, mode of delivery and source of information about infant formula milk (health professionals and family, peers and neighbors) were statistically associated with infant formula feeding. Mothers with family income more than 5000.00 birr per month (AOR: 2.42, 95%CI: [1.27, 4.63], p=0.007) were more likely to initiate infant formula feeding than income less than 5000.00 birr. Mothers who had no counselling on breast feeding during ANC follow up were 3.29 times (AOR: 3.29, 95%CI: [1.27 - 8.54], p=0.014) more likely to initiate infant formula feeding than those counselled on breast feeding during ANC follow up. Women who delivered with caesarean section were 3.38 times(AOR: 3.38, 95%CI: [1.18-9.63], P=0.022) more likely to initiate infant formula feeding as compared with those gave birth spontaneously.

Mothers were3.47 times (3.47[1.16-10.38] P=0.026) more likely to initiate infant formula when their source of information is family, peers and neighbours than other sources. When health professionals were source of information for women, they are65.3% (AOR: 0.347,

95%CI: [0.126-0.955], P=0.04) more likely to initiate infant formula feeding than those non-health professionals. [Table 6] summarizes factors associated with infant formula

feeding among mother who attend public health institutions in DireDawa city.

Table 6: Logistic regression model showing the determinants of Infant formula feeding among mother who attends public health institutions in Dire Dawa city, Eastern Ethiopia, 2018.

	Infant formula feeding		logistic regression		
Monthly family income	Yes	No	COR[95%CI]	AOR[95%CI]	P value
<=2500.00	6(9.4%)	58(90.6%)	1		
2500.00-5000.00	17(19.3%)	71(80.7%)	9.66 [3.29-28.36]*	0.99(0.78-7.44)	0.06
>5000.00	17(50.0%)	17(50.0%)	4.17[1.77-9.82]*	2.42[1.27-4.63]	0.007**
Employment status					
unemployed	14(14.1%)	85(85.9%)	1		
employed	26(29.9%)	61(70.1%)	2.58[1.24-5.36]*	1.41[0.56-3.52]	0.12
Counselling on breast feeding during ANC follow up					
Yes	13(14.4%)	77(85.6%)	1		
No	27(29.0%)	66(71.0%)	2.42[1.15-5.07]*	3.29[1.27-8.54]	0.014**
Mode of delivery					
Spontaneous vaginal delivery	17(12.1%)	123(87.9%)	1		
Caesarean delivery	23(50.0%)	23(50.0%)	7.23[3.35-15.61]*	3.38 [1.18-9.63]	0.022**
Time of initiation of infant feeding					
<=1 hour	18(15.1%)	101(84.9%)	1		
> 1 hour	22(32.8%)	45(67.2%)	2.74[1.34-5.60]*	1.12 [0.39-3.14]	0.08
Health professionals					
Yes	29(41.4%)	41(58.6%)	0.18[0.084-0.40]*	0.34 [0.12-0.95]	0.04**
No	11(11.6%)	84(88.4%)	1		
Peers, families and neighborhoods					
Yes	23(17.6%)	108(82.4%)	4.69(2.09-10.54)*	3.47[1.16-10.38]	0.026**
No	17(50.0%)	17(50.0%)	1		

* p value <0.2   **statistically significant variables

Discussion

The economy of DireDawa city has grown rapidly in recent years. The rise in living standards accompanying the economic growth has led to a demand for improved health care and in particular, the application of advanced medical technologies. Infant feeding practices are another part of the culture which has been influenced by economic development. There is now widespread promotion of infant formula and mothers are fascinated by the prospect of a high-technology product which promises much for their infants. On the other hand, cultural beliefs are still strong and most mothers commence breastfeeding, but they tend to combine this with infant formula in the early months of their infants' lives. The study finding revealed that the prevalence of infant formula feeding among women who attend public health institutions in DireDawa city was 21.5 %.

The prevalence was found to be higher than study done in North Ethiopia Gonder City,[10] which reported 12.4% prevalence but lower than studies done in Scotland (57%),[22] and china (88%).[23] The difference may be explained in terms of place of residence, cultural and socioeconomic status of the women. This study also showed that 10.8%of mothers had first introduced infant formula into the irinfant's diet at birth. The finding was found to be lower than what was reported by global study survey done by UNICEF(30%),[24]study done in China (70%),[23]Scotland(38%),[2] and South Africa(23.6%),[25]but still higher than study done in Gonder City. The difference may be due the cultural variation between the women in both towns and access to information.

The principal reasons for initiation of infant formula feeding were my breast has no adequate milk(85%), followed by my neonate was unable to breastfeed or has disease (15%), caesarean delivery(12.5), I am out of home for work(10%). A similar study conducted in Durham Region in 2009-2011 shows the Top Five Reasons for Formula Introduction before Six Months, include "Milk supply concerns/hungry baby"(39%) was the most common reason for introducing formula before six months, followed by baby/mother's medical issues(16%) and latching difficulties(9%).[19] But a study done in china the belief that 'the more or the quicker the baby gained weight, the healthier the baby is' was the main reason. This study shows that patients have a range of reasons for initiation of infant formula feeding. On the other hand, among those who started infant formula feeding 67.5% (27) of them continue to give infant formula milk while 32.5%(13) stopped to give formula feeding. The reason for stopping infant formula feeding includes I had adequate breast milk (61.5), my child was sick (23.1%) advice from health professionals (7.7%) but a study done in South Africa showed that the most common reasons why the mothers reported discontinuing the infant formula included that the infant did not like the taste (n = 8; 34.8%), it caused constipation in the infant (n = 3; 13.0%) or it was too expensive (n = 3; 13.0%)[26].Family income, counseling on breast feeding during ANC follow up, mode of delivery and source of information about infant formula milk had significant association with initiation of infant formula feeding. Based on the multivariable analysis mothers with family income

more than 5000.00 birr per month were more likely to initiate infant formula feeding than family income less than 5000.00 birr.

This study is supported by a research done in Canada on 2013.[27] Another factor identified by current study was the presence of ANC follow up does not affect infant feeding practice rather counselling regarding breast feeding is very important which is evidenced with mothers who had no Counselling on breastfeeding during ANC follow up 3.29 times more likely to initiate infant formula feeding than those mothers who had Counselling on breast feeding during ANC follow up. A study conducted in England on 2012 showed that those intending to formula feed were more likely to discuss feeding at an antenatal check-up than those intending to breastfeed (81% and 75% respectively).[5]Mode of delivery is another important factor identified by this study which has significantly associated with initiation of infant formula feeding. Women who delivered with caesarean section had 3.38 times (p=0.022) more likely to initiate infant formula feeding as compared with women delivered through spontaneous vaginal delivery. The study conducted in Vietnam (OR: 2.94, 95% CI: 2.39-3.61),[28] and Brazil showed one of the factors that influence infant formula feeding was mode of delivery (vaginal delivery(8.1%) caesarean delivery (15.4%)).[29]The other interesting finding in this study was that mother who hear information from family peers and neighbours regarding infant formula milk had 3.47 times more likely to initiate infant formula than other source of information, however; when source of information about infant formula milk was health profession it was found to be 0.347 times (P=0.04) less likely to initiate infant formula feeding than those women whose source of information were not health professionals. The reason could be information from health professionals include both risk of infant formula milk and importance of exclusive breast feeding. But information from peer's family and neighbours mainly didn't focus on risks of infant formula milk which facilitate the initiation of infant formula feeding. This is evidenced by 60.5% of study population didn't know any risk associated with infant formula feeding. But in contra-distinction to the western countries particularly, the South Africa, Iowa, and Oregon, where for instance, information from health professionals is related to higher rates of initiation of infant formula feeding, this is may be due to the nature of advertisement which is associated with provision of free formula milk sample to mothers which strongly affect decision of mother on initiation of infant formula feeding.[30-33]Even though associations between maternal age, education, residence (urban or rural), age of infant, higher maternal education level and formula milk introduction before six months were statistically significant in the following studies the variables didn't show significant association after multivariable logistic regression analysis but residence is not included in this study since all of study population live in urban areas.[29,34,35]

Conclusion

In this study it was found that the prevalence of infant formula feeding was found to be high and introduction of infant formula occurred very early. There are lots of women who need to give their babies formula because they can't make enough milk. Evident factors that increase infant formula feeding include lack of counselling during ANC follow up, delivery through caesarean section, increasing family income and advice from friends, neighbours and family heavily influenced initiation infant formula feeding. Considering adopting of strict regulations and enforcement for the marketing of infant formula, which will help resolve the current increasing infant-feeding prevalence and encouraging the role of health professionals in supporting infant-feeding counselling will also be a considerable intervention.

Acronyms/Abbreviation
AFASS   Affordable, Feasible, Acceptable, Sustainable and Safe
BMS   Breast milk substitutes
CSA   Central Statistical Authority
EBF   Exclusive breastfeeding
EDHS   Ethiopian Demographic and Health Survey
ENA   Essential Nutrition Actions
EPI   Expanded Program for Immunization
FADUA   Frequency, Amount, Density, Utilization and Active feeding
GDP   Gross Domestic Product
HEW   Health Extension Worker
IBFAN   International Baby Food Action Network
ILO   International Labor Organization
IMCI   Integrated Management of Childhood Illness
IYCF   Infant and Young Child Feeding
MOE   Ministry of Education
MOHMinistry of Health
PNCPost Natal Care
PMTCT   Prevention of Mother to Child Transmission (of HIV/AIDS)
SBCC   Social and Behavior Change Communication
SFP   Supplementary feeding programs
SNNPR   Southern Nations, Nationalities, and Peoples' Region
TFP   Therapeutic feeding programs
USAID   United States Agency for International Development

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