Inappropriate Feeding Practices associated with Maternal Education and Growth Outcomes among Bhutanese Children <24 months

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Abstract

Background: Inappropriate infant and young child feeding (IYCF) practices are one of the major contributors to high prevalence of underweight, stunting, and wasting in children. There are limited reports on the risk factors of IYCF practice and growth status among Bhutanese children <24 months.

Objective: The study is hypothesized that maternal education would be one of the factors associated with inappropriate feeding practices, and that IYCF practices on infant and young children's growth status measured by stunting, wasting and underweight.

Method: A cross-sectional study was conducted in rural (Lhuentse and Phuentsholing) and urban (Thimphu and Phuentsholing) areas of Bhutan. We recruited 144 infants and young children aged < 24m following oral consent of their mothers and caregivers in 2011(n=49) and 2014 (n=95).

Results: Interestingly, we observed that mothers who had at least one year of schooling were 78% less likely to achieve adequate minimum meal frequency as compared to mothers who did not go to school (OR=0.22, 95% CI:0.06, 0.75). The prevalence of stunting, wasting and underweight were 27.7%, 16.9% and 13.6%, respectively, in Bhutan. Further, stunting and underweight displayed inverse association with consumption of iron-rich and iron fortifies foods (OR=0.30, 95% CI: 0.11, 0.80) and introduction of complementary foods at 6-8 months (OR=0.18, 95% CI: 0.04, 0.77).

Conclusion: This study suggests urgent need for intervention to promote improved IYCF practices in Bhutan. Bhutanese researchers need to focus more on promoting IYCF practice to uneducated mothers and also to indentify other risk factors that influence inappropriate IYCF practices.

Keywords: Core WHO feeding indicators, responsive feeding behavior, maternal education, 24-hour recall of food consumption, food consumption frequency, stunting, wasting and underweight

Introduction

From conception through the first two years of life are crucial for a child's overall growth and development, as optimal nutrition during this period lowers morbidity and mortality, reduces the risk of chronic diseases and enhances cognitive development (1)(2). Breastfeeding and complementary feeding practices are the two key factors promoting healthy growth and development for infants and young children less than two years (1). Poor infant and young child feeding (IYCF) behavior is one of the main factors causing the high rates of undernutrition among children under two. Nonetheless, it has been established that appropriate complementary feeding has the potential to prevent 6% of all under-five deaths, particularly in the developing world (3)

The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) recommend that mothers put newborns to the breast within one hour of birth, and to breastfeed infants exclusively for the first six months and continue to breastfeed for two years. With the continuation of breastmilk, the child is recommended to begin the intake of solid, semi-solid and soft foods starting in the sixth month (1)(3)(4). The complementary feeding should be timely, meaning that all infants should start receiving foods in addition to breastmilk from 6 months onwards; adequate, meaning that the nutritional value of complementary foods should fulfill the needs of a rapidly growing child; and appropriate, meaning that foods should be diverse, of appropriate texture and given in sufficient quantities (5).

Despite global efforts to improve infant and young child feeding, malnutrition among children remains a significant public health issue in developing countries. Only about 39% of infants in developing countries, and only 25% in Africa, are exclusively breastfed for the first six months. In fact, 6% of infants in developing countries are never breastfed (2). As a result, child

growth retardation and undernutrition, morbidity and mortality in developing countries has not been declining (6).

According to some previous studies, maternal age, maternal education, unemployment, inadequate antenatal clinic visits, post-natal care visits and geographical differences are the main risk factors associated with inappropriate complementary feeding practices among children aged 6–23 months in developing countries (6). Mothers and caregivers of the infants play a vital role in shaping the health of the children under two years because infants and young children are most of the time under their mother's care. Thus, the health of the infants depends on whether or not the mother or the caregiver uses the appropriate strategies to feed them. Some studies reported that lack of maternal education is the most consistent determinant of inappropriate complementary feeding practices in Bangladesh, India, Nepal, Pakistan and Sri Lanka (7). If a mother has at least completed a secondary level education, she is more likely to have better feeding practice and healthier infants. In contrast, underweight and stunting were significantly higher among children whose mothers are illiterate (2)(5)(6)(7).

In Bhutan, the National Survey 2008 reported that 80% mothers provided exclusive breastfeeding to their infants in the first month, but only 10.4% continued to exclusively breastfeed for the first six months (8). Furthermore, the prevalence of stunting was 34%, wasting 4%, and underweight 10% among the children less than five years (8). Inappropriate infant and young child feeding has also been observed as one of the determinants for the poor health of the children in Bhutan (8). Recently, it was reported in a national study that in Bhutan children who were not fed complementary food at 6-8 months were three times more likely to be severely stunted than children who were fed complementary foods (9). Additionally, the prevalence of stunting was higher among children whose mothers did not have any formal education (9).

However, limited research has been done in Bhutan regarding the determinants and nature of inappropriate feeding practice of infants and young children, including maternal education. Therefore, the present cross-sectional study was the first study which hypothesized that maternal education would be associated with inappropriate infant and young child feeding practices in Bhutan. Also, it was hypothesized that inappropriate feeding practices would have a negative association with children's growth status measured by stunting, wasting and underweight in Bhutan.

Methodology

Study Area and Study Design

This community-based cross-sectional study was carried out in two urban areas and one rural area of Bhutan in the summers of 2011 and 2014. The two urban locations were Phuentsholing in southern Bhutan and Thimphu in western Bhutan, while the rural location from which data was collected was Lhuentse in eastern Bhutan. These three locations were chosen not only based on maternal education expected but also their differential accessibility to health facilities and residential settings. For example, Phuentsholing is considered to be a heavily industrialized city as compared to Thimphu which is the urbanized capital but not dominated by industry. On the other hand, Lhuentse is more rural than Thimphu and Phuentsholing. The former two provinces have access to better health facilities and education, while the latter province is lacks facilities.

Ethical Clearance and Access to Participants

The study was first approved by the Institutional of Review Board of the Asian University for Women for research among human participants. Further consent was received to conduct the surveys in the different locations from the Ministry of Health and relevant Community Health Offices in Bhutan. To respect the rights of the respondents, oral consent was obtained after explaining the aims and procedures of the study.

Format of the Questionnaire and Development

The questionnaire was designed based on the WHO indicators for the assessment of infant and young child feeding practice in 2011 (10). It comprised seven sections aiming to capture demographic information, pregnancy and lactation maternal dietary behaviors, infant and young child's birth and breastfeeding, infant and young child's one day 24-hour recall of food consumption, the frequency of food consumption of 20 foods and food groups by the infants and young children, and the caregiver's responsive feeding behaviors. All sections in the questionnaire were used to understand the nature of infant and young child feeding and any associations between maternal education and infant and young child feeding practices and their growth.

IYCF Practice Indicators

In order to capture the IYCF practices, the eight core *indicators for assessing infant and young child feeding practices from the WHO* were used in the analysis (11). The indicators were 1) initiation of breastfeeding within one hour of birth, 2) exclusive breastfeeding for 6 months, 3) continuation of breastfeeding at 1 year, 4) introduction of complementary foods at 6-8 months, 5) minimum dietary diversity, 6) minimum meal frequency, 7) minimum acceptable diet, and 8) consumption of iron-rich and iron fortified foods. In order to capture breastfeeding initiation within one hour of birth, the mothers or the caregivers were asked "*Was (infant name) ever breastfed? If yes, how soon after did (infant name) start breastfeeding?* On the other hand, participants were also asked "*Did you ever exclusively breastfeed (infant name) with no other foods or water or other liquids? If yes, for how long?"* to evaluate exclusive breastfeeding duration.

Continuation of breastfeeding at 1 year is the proportion of children 12–15 months of age who were fed breast milk. It was assessed by asking the mothers, *"Is (infant name) still breastfeeding?"* Complementary feeding is the transition from providing only breastmilk to infants

and young children through gradually introducing solid, semi-solid and soft foods along with the continuation of breastmilk from 6 months of age (11). This was assessed through questions: *Does/did (infant name) receive foods or drinks other than breastmilk? If yes, at what age did you start giving foods or drinks other than breastmilk*?

Other IYCF practice Indicators recommended by WHO

Minimum Dietary Diversity

This is defined as the proportion of children 6–23 months of age who received foods from four or more food groups. The seven food groups used for tabulation of this indicator included: grains, roots and tubers; legumes and nuts; dairy products (milk, yogurt, cheese); flesh foods (meat, fish, poultry and liver/organ meats); eggs; vitamin A-rich fruits and vegetables; and other fruits and vegetables (11).

Minimum meal frequency

This indicator is defined as the proportion of breastfed and non-breastfed children 6–23 months of age, who received solid, semi-solid or soft food (including milk feeds for non-breastfed children) the minimum number of recommended times or more per day. The minimum was defined as: two times for breastfed infants aged 6–8 months, three times for breastfed children aged 9–23 months, and, four times for non-breastfed children aged 6–23 months in the previous day (11).

Minimum Acceptable Diet

The indicator is defined as the proportion of children 6–23 months of age who receive a minimum acceptable diet in a day. It was measured from the 24 hours food recall record which includes those who had at least the minimum dietary diversity and minimum meal frequency (11).

Iron-rich and iron fortified foods

This is defined as the proportion of children 6–23 months of age who receive an iron-rich food or iron-fortified food that is specially designed for infants and young children, or that is fortified in the home measured from the 24 hours food recall record of the infants and young children (11).

Responsive Feeding Behaviors

Responsive feeding behavior was targeted to infants and young children whose mothers or caregivers had started introducing complementary food. This indicator was obtained from four open-ended questions, which queried caregivers' verbal encouragement to their infants and young children to eat more, actions taken encouraging eating more, and the actions taken when the infants and young children wanted more or refused to eat.

Maternal Education

Maternal education was queried as the number of years of education received by the mothers or the caregivers. For this study, however, the maternal education variable was further categorized into two: (i) uneducated and (ii) educated to observe if there is significant difference between IYCF practices and mother's having and not having any education. Uneducated, in the study, referred to mothers of infants and young children who had zero years of school attendance, while educated referred to mothers having been to school at least one year.

Data Collection

The data collection was performed by interviewing mothers, and in some cases other caregivers, who had infants and young children less than 24 months of age. Participants were recruited using convenience sampling. This sampling process was used because we wanted to capture as many women with IYCs as permitted by our time and budgetary resources residing in the various interview locations. The interviews were conducted in the summers of 2011 (n=49) and

2014 (n=95) by three interviewers. In 2011, 49 respondents were interviewed by a Public Health student of Asian University for Women (AUW) from two areas, one in the southern city of Phuentsholing, and other in the larger urban capital city of Bhutan. In 2014, two other students of Public Health interviewed 95 more respondents, again in the capital city and also in an eastern rural area in Lhuentse province.

The questionnaire was in English, but the interviews were conducted orally in Dzongkha, Sharchop, Nepali and Kurtoep languages. Although the questionnaires were translated to Dzongkha, none of the mothers agreed to read and answer it themselves. Therefore, interviewers conducted the interviews by asking and explaining every question to the participants. Prior to the interview, interviewers made sure that the participants understood the procedures, objectives and potential uses of the information from the study, and obtained their oral consent.

Anthropometry

The weights of the infants and young children were measured using Salter infant spring scales measuring up to 25 kg. The recumbent length of the infants and young children were measured using an infantometer, a portable plastic infant measure mat made in the US. This was done on a firm surface with assistance, usually of the mother. The child's knees were held down and together and the head held facing upward firmly against the headboard in alignment with the rest of the child's body.

The growth status of the infants and young children was calculated from the measurements using the WHO Anthro program to find the stunting (height-for-age), underweight (weight-for-age) and wasting (weight-for-height) degrees in z-scores according to the World Health Organization international growth reference guidelines and cutoff points (11). In this study, a child was categorized as underweight, wasted or stunted if the Weight-for-Age (WAZ), Weight-for-Height

(WHZ) or Height-for-Age (HAZ) z-scores, respectively, were below minus two standard deviations (-2 SD) from the median of each international reference standard.

Dietary measurement

The single day 24-hour recall food intake data was analyzed to: (1) estimate the minimum dietary diversity, (2) minimum acceptable diet, and (3) consumption of iron-rich and iron fortified foods. Further, it was also used to analyze the quality and quantity of complementary foods by investigating if the consumption amounts met WHO kilocalorie and micronutrient requirements for IYCs using Nutritionist Pro dietary analysis software. Additionally, food frequency questionnaires were designed to assess habitual diet by asking about the frequency with which twenty food items were provided to the infant and young children. The frequencies of different food consumption were assessed by a multiple response grid in which respondents were asked to estimate how often each particular food or beverage was consumed. Participants were asked to choose one category ranging from '0' (never eaten) to '5' (> once a day) for each food item.

Statistical Analysis

All data were entered into and analyzed using SPSS for Windows software (version 14). The means and standard deviations (SD) were calculated for all continuous variables, while ratios and proportions were calculated for all categorical variables. Additionally, bivariate, chi-square tests and cross tabulations were used to understand the unadjusted associations between all the core indicators of IYCF practices and maternal education and the associations between three indicators of growth status and IYCF practices. Further, potential confounding variables were tested with the maternal education, IYCF indicators and growth status. All continuous data were checked for normality using the Kolmogorov-Smirnov test, while Non parametric Mann-Whitney U-tests were used to check for the statistically significant differences in medians of kilocalorie intakes of

complementary food between infant and young children of mothers in two categories of maternal education: (i) uneducated and (ii) educated. Multivariate logistic regression was used to identify the effects of potential confounders on the exposure factor of interest, maternal education, IYCF indicators, and growth status. A significance level of $p<0.05$ was used for all statistical analysis.

Result

Data Collection in two different years

The data for the present study was collected in two different years. Of the total 144 participants, 49 (34%) of them were interviewed in 2011, while the remaining 95 (66%) were collected in 2014. No statistical significance was found by the year of the data collection regarding the maternal education and residence variables. However, maternal occupation differences approached statistical significance ($p=0.08$) between two years of data collection (Table 2). Not finding major demographic differences by year of data collection, the two groups were combined for the purposes of this analysis.

Table 1: Demographic characteristics of respondents by different year of data collection, 2011(N=49) and 2014 (N=95

	Year of Data Collection	
Demographic Characteristics	2011, N (%)	2014, N (%)
Maternal education		
Uneducated	11(22.4)	33(34.7)
Educated	38(77.6)	62(65.3)
Residence		
Rural	13(26.5)	18(18.9)
Urban	36(73.5)	77(81.1)
Maternal occupation		
Housewife	30(61.3)	53(55.8)
Farmer	1(2.0)	13(13.7)
Non-farmer	18(36.7)	29(30.5)

Characteristics of the participants

A total of 144 mothers and caregivers of infants and young children less than two years were interviewed in 2011 (N=49) and 2014 (N=95). Of the total sample of 144, 78.5% were from two urban areas, while the remainder was from the rural areas. Table 1 presents the demographic information of the participants by residence. In both rural and urban areas, there were even distributions of sex of infants and young children. Further, more than half of the urban respondents were in the age group of 0-5m. On the other hand, 45.5% each of rural respondents were in the age groups of 0-5m and 12-23m. The average maternal age showed no significance difference by residence. However, average paternal age, maternal education and paternal education showed significance difference by rural and urban areas, $p=0.01$, $p=0.02$ and $p<0.01$, respectively. The average paternal age decreases moving from rural to urban whereas average maternal education and paternal education increases moving from rural to urban (Table 2).

Most (64.5%) of the mothers from the rural area and 21.2 % from urban Bhutan did not have any formal education. In contrast to the rural mothers' educational status, 61.5% of fathers in rural Bhutan were educated. Additionally, most of the mothers (80.7%) from the rural areas seemed to be either housewives or farmers whereas a lower proportion (60.2%) of the urban mothers reported being housewives, 36.5% were employed outside of their home, while the remaining 3.5% reported being farmers. Fathers of infants and young children, however, in rural Bhutan were mostly involved in farming (54.8%) or non-farming sectors (41.9%) such as teachers and other government sectors, while more than 90% of urban fathers were in non-farming occupations such as business, NGOs, government or other organizations. As expected, maternal education and paternal education showed positive association by rural and urban areas. On the other hand, the proportion of mothers and fathers being at home and non-farmers increases as moving from rural to urban, while the proportion decreases for the farmers (Table 2).

Table 2: Demographic information of the respondents of both the infants and young children and mothers in the study by residence (N=144)

Characteristics and categories	Residence n (%)		
	Rural (n=31)	Urban (n=113)	P-value
IYC sex			
Male	15(48.4)	56(49.6)	1.00
Female	16(51.6)	57(50.4)	
IYC age groups			
0-5m	14(45.2)	58(51.3)	
6-8m	1(3.2)	16(14.2)	0.11
9-11m	2(6.5)	10(8.8)	
12-23m	14(45.2)	29(25.7)	
Maternal age, mean(±sd)	28.3(±4.3)y	26.5(±4.4)y	0.81
Paternal age, mean(±sd)	30.0(±7.7)y	29.9(±4.9)y	0.01*
Maternal education, mean(±sd)	2.3(±4.0)y	8.5(±5.5) y	0.02*
Paternal education, mean(±sd)	5.4(±7.4)y	9.7(±5.7)y	<0.01**
Maternal education			
Uneducated	20(64.5)	24(21.2)	<0.01**
Educated	11(35.5)	89(78.8)	
Paternal education			
Uneducated	10(38.5)	21(18.9)	0.04*
Educated	16(61.5)	90 (81.1)	
Maternal occupation			
Housewife	15(48.4)	68(60.2)	<0.01**
Farmer	10(32.3)	4(3.5)	
Non-farmer	6(19.4)	41(36.3)	
Paternal occupation			
At home	1.0(3.2)	4.0 (3.5)	<0.01**
Farmer	17(54.8)	6(5.3)	
Non-farmer	13(41.9)	103(91.2)	

IYC: Infant and young child
******p<0.01: *p<0.05

Maternal Education and the Eight Core Indicators of IYCF Practices

Table 3 presents eight of the WHO recommended indicators to measure infant and young child feeding practices by maternal education. Unexpectedly, seven IYCF core indicators showed no association with maternal education. However, minimum meal frequency showed a negative association with maternal education (p=0.04). Of 16 infants and young children who met the recommended minimum meal frequency by WHO, 39.1% (n=9) of them whose mothers were uneducated met the recommended meal frequency from the 24-hour of recall food consumption,

while only 14.3% (n=7) of infants and young children of educated mothers did so. Although the other seven indicators did not reach statistical significance with maternal education, the data showed that mothers of infants and young children who had at least one year of education were doing quite better as compared to uneducated mothers in meeting the recommended breastfeeding and complementary feeding practices by WHO.

However, overall the finding implied poor breastfeeding and complementary feeding practices in Bhutan among both educated and uneducated mothers. For example, only 21.7% uneducated and 28.6% educated mothers exclusively breasfed their infants for six months. Further, the findings from 24-hour recall food consumption showed that very few proportions of infants and young children were able to get adequate and quality foods from their daily intake.

Table 3: Infants and young children who met the eight core indicators of IYCF practices by maternal education

Core Indicators for IYCF	Maternal education		
	Uneducated, n (%)	Educated, n (%)	P-value[¥]
Initiation of breastfeeding within 1h (n_1=43, n_2=98)	25(58.1)	71(72.4)	0.11
Exclusive breastfeeding for 6m (n_1=23, n_2=49)	5(21.7)	14(28.6)	0.79
Continuation of breastfeeding until 2 years (n_1=13, n_2=30)	7(53.8)	22(73.3)	0.50
Introduction of complementary Food at 6-8m (n_1=23, n_2=49)	14(60.9)	32(65.3)	1.00
Minimum dietary diversity (n_1=23, n_2=49)	6(26.1)	9(18.4)	0.39
Minimum meal frequency (n_1=23, n_2=49)	9(39.1)	7(14.3)	0.04**
Minimum acceptable diet (n_1=23, n_2=49)	2(8.7)	2(4.1)	0.59
Iron-rich and iron fortified foods (n_1=23, n_2=49)	15(65.2)	24(49)	0.23

[¥]When n <5 in the cells, Fisher's Exact Test was used; otherwise Pearson Chi-Square was used
n_1=# of uneducated mothers; n_2=# of educated mothers

Maternal education and responsive feeding behaviors

Overall, both the maternal education groups were performing poor in responsive feeding behaviors. However, no statistically significant difference was observed between the four questions querying mothers' responsive feeding behaviors by mother's education status (see Table 4). Surprisingly, the proportion of educated mothers responding negative feeding behaviors was higher as compared to the uneducated mothers although no statistical significance was observed.

Table 4: Maternal education and responsive feeding behavior among infant and young children aged more than 6 months (N=72)

		Maternal Education		
What do you:	Response	Uneducated, n (%) (n=23)	Educated, n (%) (n=49)	p-value[¥]
Say to encourage IYC to eat more?	Positive	9(39.1)	18(36.7)	0.81
	Negative	14(60.8)	31(63.3)	1.00
Do to encourage IYC to eat more?	Positive	13(56.5)	29(59.2)	1.00
	Negative	10(43.5)	20(40.8)	0.82
Do if IYC refuses to eat	Positive	6(26.1)	26(53.1)	0.13
	Negative	17(73.9)	23(46.9)*	0.06
Do if IYC to asks for more food?	Positive	16(69.6)	28(57.1)	0.33
	Negative	7(30.4)	21(42.8)	0.64

[¥]When n <5 in the cells, Fisher's Exact Test was used; otherwise Pearson Chi-Square was used

Maternal education and kilocalorie and micronutrient intakes and intake adequacy from complementary food from 24-hour recall of food consumption

The 24-hour recall of food consumption was based on mothers' recall of what kinds of food their infants and young children had eaten from the morning on the day before the interview until the morning of the interview, and the results are presented in Tables 5 and 6. The bivariate result showed very few proportion of infants and young children >6 months were given adequate kilocalories from complementary food (Table 5), irrespective of maternal education. However, no association was observed between calorie intake and mother's education. Moreover, very few of the infants and young children met the required micronutrient intake levels from complementary foods for vitamin C, calcium, iron and zinc (Table 6). Overall, both educated and uneducated mothers performed poor in feeding adequate energy (kilocalorie) and nutrients intake to their infants and young children in Bhutan

Table 5: Maternal education and N (%) of infant and young children achieving kilocalorie adequacy from complementary food by the age groups

Age Group, m	Amount of Kcal/day‡	Maternal Education		
		Uneducated, N (%)	Educated, N (%)	p-value¥
6-8m ($n_{1=}6$, $n_{2=}11$)	≥356	2(33.3)	1(9.1)	0.22
9-11m (($n_{1=}4$, $n_{2=}8$)	≥479	1(25)	3(37.5)	1.00
12-23m ($n_{1=}13$, $n_{2=}30$)	≥772	2(15.4)	5(16.7)	1.00

¥When n <5 in the cells, Fisher's Exact Test was used; otherwise Pearson Chi-Square was used
‡WHO, 2003
n_1=# of uneducated mothers; n_2=# of educated mothers

Table 6: Maternal education and recommended micronutrient intakes: vitamin A, calcium, iron and zinc by age group

Micronutrient intakes	Maternal Education	Age group, m (n_1,n_2)		
		6-8m (6, 11) N (%)	9-11m (4,8) N (%)	12-23m (13, 30) N (%)
Iron, mg				
	Uneducated	1(16.7)	0	3(23.1)
	Educated	1(9.1)	1(12.5)	10(33.3)
Zinc, mg				
	Uneducated	1(16.7)	2(50)	6(46.1)*
	Educated	1(9.1)	0	10(33.3)
Calcium, mg				
	Uneducated	1(16.7)	0	0
	Educated	2(18.2)	0	5(16.7)
Vitamin C, mg				
	Uneducated	0	0	0
	Educated	2(18.2)	3(37.5)	8(61.5)**

When n <5 in the cells, Fisher's Exact Test was used; otherwise Pearson Chi-Square was used
n_1=# of uneducated mothers; n_2=# of educated mothers
*p=0.07; **p=0.05

Logistic regression between minimum meal frequency and maternal education

Table 7 presents the adjusted and unadjusted odd ratios and 95% confidence intervals for the associations between minimum meal frequency and maternal education adjusting for the potential confounders. Among the eight indicators to assess IYCF practices in the bivariate regression, only

minimum meal frequency from the 24-hour food consumption showed statistical significance (p=0.04) with maternal education. Interesting and unexpectedly, after adjusting with potential confounders, minimum meal frequency showed a negative association with maternal education. Educated mothers of infants and young children were 78% less likely to have met the WHO recommended minimum meal frequency a day as compared to mothers who were uneducated (OR=0.22, 95% CI:0.06, 0.75). Also, low birthweight was found to be a confounder for both maternal education and minimum meal frequency, but no significance was observed after adjusting in the final model (see Table 7).

Table 7: Association between IYCF practice and maternal education according to multivariate logistic regression adjusting for the confounders (n=144)

Characteristics	**Minimum Meal Frequency**			
	Unadjusted OR(95% CI)	Unadjusted P-value	Adjusted OR (95%CI)	Adjusted P-value
Maternal education	0.29(0.10,0.85)	0.04	0.22(0.06,0.75)	0.01**
Sex	0.54(0.19,1.59)	0.29	0.70(0.23,2.14)	0.54
Age group	1.39(1.26,1.59)	<0.01	1.41(1.21,1.65)	<0.01**
Low birthweight	4.9(1.06,22.20)	0.06	3.38(0.41,28.0)	0.25

**p<0.05

Prevalence of stunting, wasting and underweight among the participants

The overall prevalence of stunting, wasting and underweight from the present finding were 27.7%, 16.9% and 13.6%, respectively. The prevalence of underweight, stunting and wasting were more common among the age group of 0-5m and 12-23m. Interestingly, maternal occupation was statistically significantly associated (p=0.008) with underweight which shows that 21.3% of infants and young children were underweight whose mothers were housewives as compared to 4.3% of mothers who were not housewives. On the other hand, paternal occupation showed an association

approaching significance (p=0.07) with stunting. The data showed that stunting was mostly prevalent (70.5%) among the fathers who were not employed but stayed at home.

Table 8: Prevalence of stunting, wasting and underweight according to socio-demographic variables (N=144)

Characteristics	Stunting (HAZ <-2 sd) N (%)	Wasting (WHZ <-2 sd) N (%)	Underweight (WAZ <-2 sd) N (%)
IYC sex			
Male (n=71)	21(30.9)	9(13.6)	11(15.9)
Female (n=73)	16(24.2)	13(20.3)	8(11.3)
IYC age group			
0-5m (n=72)	20(30.3)	11(17.5)	11(15.9)
6-8m (n=17)	4(23.5)	3(17.6)	0
9-11m (n=12)	0	0	0
12-23m (n=43)	13(31.7)	8(20)	8(18.6)
Residence			
Rural (n=31)	5(17.2)	4(13.2)	5(16.1)
Urban (n=113)	32(30.5)	18(17.8)	14(12.8)
Maternal education			
Uneducated (n=44)	9(22.2)	5(12.2)	3(7)
Educated (n=100)	28(30.1)	17(19.1)	16(16.5)
Maternal occupation			
Housewife (n=83)	19(24.7)	17(22.1)	17(21.3)**
Farmer (n=14)	4(28.6)	1(7.7)	0
Non-farmer (n=47)	14(32.6)	4(10)	2(4.3)
Paternal education			
Uneducated (n=31)	7(23.3)	3(10.3)	2(6.5)
Educated (n=106)	29(29.9)	19(20.2)	16(15.7)
Paternal occupation			
At home (n=5)	3(75.0)*	2(50)	2(40)
Farmer (n=23)	7(33.3)	2(10)	4(13.6)
Non-farmer (n=116)	27(24.8)	18(17)	14(12.4)

**p=0.008
*****approaching significant with stunting (p-value=0.07

Association between IYCF Practices and Growth Status (Stunting, Wasting and Underweight)

Table 9 presents the bivariate associations between infant and young children's growth status and the eight core IYCF practice indicators. Among the eight indicators, initiation of breastfeeding within one hour of birth was significantly associated ($p=0.01$) with stunting. Therefore, among the mothers and caregivers who did not initiate breastfeeding within one hour to their infants and young children, 41% of them were stunted, while among those who initiated breastfeeding within one hour of birth 20.4% were reported being stunted.

Table 9: Prevalence of stunting, wasting and underweight among children 0-23m by IYCF core indicators (N=144)

Core Indicators for IYCF	Growth Status		
	Stunting (HAZ <-2 sd) N (%)	Wasting (WHZ <-2 sd) N (%)	Underweight (WAZ <-2 sd) N (%)
Initiation of breastfeeding within 1h of birth (n=144)			
Yes	19(20.4)	19(20.7)	14(14.6)
No	16(41)**	3(8.1)	5(11.9)
Exclusive breastfeeding for 6m (n=72)			
Yes	4(23.5)	3(17.6)	2(11.1)
No	33(28.2)	19(16.8)	17(13.9)
Continuation of breastfeeding until 2 years (n=43)			
Yes	9(33.3)	6(22.2)	6(20.7)
No	28(26.2)	16(15.5)	13(11.7)
Introduction of complementary food at 6-8m (n=72)			
Yes	8(19.5)	5(12.8)	4 (9.3)
No	29(31.2)	17(18.7)	15(15.5)
Minimum dietary diversity (n=72)			
Yes	3(23.2)	3(23.1)	1(7.1)
No	34(28.1)	19(16.2)	18(14.3)
Minimum meal frequency (n=72)			
Yes	4(28.6)	1(7.1)	3(18.8)
No	33(27.5)	21(18.1)	16(12.9)
Minimum acceptable diet (n=72)			
Yes	1(33.3)	0	0
No	36(27.5)	22(17.3)	19(14)
Consumption of iron-rich and iron fortified foods (n=72)			
Yes	6(16.7)	5(13.9)	5(13.5)
No	31(31.6)	17(18.1)	14(13.5)

When n <5 in the cells, Fisher's Exact Test was used; otherwise Pearson Chi-Square was used
**p=0.01

Multivariate logistic regression between IYCF indicators and growth status

From the bivariate analysis between IYCF indicators and growth status, we found that initiation of breastfeeding within one hour of birth was negatively associated with stunting

(p=0.01). However, after adjusting with age and sex of infants and young children in the final model, initiation of breastfeeding did not show any significance difference with the growth status. Interestingly, consumption of iron-rich and iron fortified foods showed a negative association with stunting (p=0.01) after controlling for the confounders. Tables 10 present the unadjusted and adjusted odds ratios and 95% confidence intervals of associations between consumption of iron-rich or iron fortified foods and stunting after controlling for all the potential confounders .Therefore, those infants and young children who met the recommended consumption of iron-rich and iron fortified food a day were 70% more likely to be stunted as compared to those infants and young children who did not meet consumption of the iron-rich foods (OR=0.30, 95% CI: 0.11, 0.80).

Further, introduction to complementary food at 6-8 months also showed negative association (p=0.02) with underweight after adjusting for age and sex of infants and young children (OR=0.18, 95% CI: 0.04, 0.77). The odd ratio explains that those infants and young children who were initiated with complementary foods at 6-8 months were 82% more likely to be underweight as compared to those who were not initiated with complementary foods at 6-8 months (Table 11).

Table 10: Association between consumption of iron-rich and iron fortified foods and stunting according to the multivariate logistic regression adjusting for the confounders (N=144)

	Stunting (HAZ<-2 sd) (N=144)			
IYCF indicators	Unadjusted OR(95% CI)	Unadjusted p-value	Adjusted OR (95%CI)	Adjusted *P*-value
Consumption of iron-rich and iron fortified foods	0.43(0.16,1.14)	0.13	0.30(0.11,0.80)	0.01**
Sex	0.71(0.33,1.53)	0.44	0.62(0.28,1.37)	0.24
Age Group	1.55(0.85,1.70)	0.21	1.04(0.96,1.14)	0.30

Table 11: Association between introduction to complementary food at 6-8 months and underweight according to the multivariate logistic regression adjusting for the confounders (N=144)

IYCF indicators	Underweight (N=144) (WAZ<-2sd)			
	Unadjusted OR(95% CI)	Unadjusted p-value	Adjusted OR (95%CI)	Adjusted *P*-value
Introduction to Complementary Foods at 6-8m	0.56(0.17,1.80)	0.43	0.18(0.04,0.77)	0.02**
Sex	0.67(0.25,1.78)	0.47	0.67(0.24,1.83)	0.44
Age group	1.11(0.85,1.22)	0.13	1.07(0.96,1.19)	0.17

Discussion

This study aimed to understand the association of any maternal education with IYCF practices in Bhutan, where infant and young growth faltering is common. It also assessed the impact of IYCF practices on the growth status as measured by stunting, wasting and underweight among children less than 24 months in Bhutan.

To test the associations between maternal education and IYCF practices, eight core WHO feeding indicators, a-single 24-hour intake, and responsive feeding behaviors were analyzed with respect to maternal education status. Assessing the core WHO feeding indicators of breastfeeding and complementary feeding with potential confounders, minimum meal frequency was inversely associated with maternal education (OR=0.22, 95% CI: 0.06, 0.75). However, it should not be concluded that maternal education did not matter in improving feeding practice. First reason for the inverse relationship could be due to small sample size. Another reason perhaps could be educated mothers employed in jobs and businesses outside the house that they did not get time to be with their children and fed them properly. Also, irrespective of mother's education status, it is routine habitual that children were fed according to the family's meal time. However, several precious studies had reported positive association between feeding practice and maternal education. Poor or

no formal maternal education has already been reported as a predictor of inadequate meal frequency (12)(13)(14) . Also, in Ghana, poor maternal educational attainment was shown to be the primary factor associated with poorer child feeding practices (15) (16). Therefore, the present study need to be further emphasized and reassessed with sufficient participants.

Overall, the present findings implied poor infants and young children feeding practices in Bhutan. For example, less than one-third of infants and young children received quality and adequate of complementary foods. Further, only 21.7% of uneducated and 28.6% of educated mothers had given exclusive breastfeeding for six months to their infants and young children. Also, less than10% of infants and young children met the recommended minimum acceptable diet. This had also been documented in a study done in Ethiopia on dietary diversity and meal frequency among the infants and young children (17). Although present study did not show significant association between some of the feeding indicators with maternal education, a study done in Sri Lanka reported some of the risk factors determining poor minimum acceptable diet and minimum dietary diversity where poor and no maternal education is one it (18)(17) (19). However, more than 50% of infants and young children met the recommendations for initiation of breastfeeding within one hour of birth, introduction of complementary food at 6-8 months, consumption of iron-rich or iron fortified foods and continuation of breastfeeding until two years for both educated and uneducated mothers. However, no significance differences were shown among the two groups of maternal education.

The prevalence of stunting, wasting and underweight were 27.7%, 16.9% and 13.6%, respectively, in Bhutan. The present findings were similar to the findings of previous studies on preschool children and less than 24 months in Bhutan where they reported that prevalence of stunting were severe as compared to wasting and underweight. For example, Zangmo et al reported,

34.9% Bhutanese preschool children being stunted , 10.4% of underweight and 4.7% of wasted (8). Also, Aguayo et al reported, 27.5% of Bhutanese children being stunted and almost half (42.6%) of the stunted children being severely stunted.(9). Also, similar findings were reported on other developing countries of Africa and South Asia (15). Previous studies had shown statistical differences between growth outcomes and demographic characteristics the respondents maternal education, sex, paternal education, residence, etc (15)(20) . However, the present study did not observe any significance differences. This might be because of the small sample size. Interestingly, stunting and underweight showed inverse association with non-iron-rich and iron fortified foods (OR=0.30, 95% CI: 0.11, 0.80) and introduction of complementary food at 6-8 months, respectively, which is contradicting to the aim of the present study (OR=0.18, 95% CI: 0.04, 0.77). Thus, the present findings deserve further investigation. The present findings of inverse relationship between growth outcomes and feeding indicators should not be interpreted that early consumption of iron-rich and iron fortified foods and introduction of complementary food at 6-8 months are not important for children's development, because several previous studies from developing and low-income countries had proven the positive associations (20). For example, According to Marriott (15), meeting the complementary feeding guidance of solid foods at 6–8 months and consumption of iron-rich and iron fortified food were highly associated with lowered risk of underweight and stunting in 14 low-income countries.

The limitations of the present study include smaller sample size. Due to inadequate number of participants, the result showed no statistical significance between maternal education, eight core IYCF indicators and growth outcomes. Also, the present study could not compare the differences between rural and urban Bhutan due to insufficient participants from rural Bhutan. Moreover, the distribution of participant s was not even among the four age groups. Another limitation of the

study could be that the present findings of the study cannot be generalized to whole country since the participants were from selected few areas of Bhutan. It would not be reliable to represent the data for the country although we could use it for similar settings. Because Bhutan is a country of unique geographic structure, it would not be rationale to compare the study done in one setting to other settings.

One shortcomings of the present study could also be categorizing of the maternal education. Due to inadequate number of participants, the present study could sub-divide two categories of maternal education. The two categories for the maternal education for the present study could be too crude and non-specific for higher educated mothers. Moreover, collapse of lower and higher maternal education into one category of education may not give specific findings.

Despite having some limitations, the study showed some interesting findings which could be compared with other previous studies that makes the study valid and reliable. Further, the present cross-sectional study is the only study done in Bhutan on the topic of IYCF practice, growth outcome and maternal education. Even though there are few articles which showed nutritional status of Bhutanese children, no study was specifically conducted to analyze the relationship between maternal education and IYCF practices with respect to food, energy and nutrient intake and growth outcomes. The present study gave some ideas on how maternal education is associated with inappropriate feeding practice. Likewise it showed some specific associations of poor feeding practice on growth outcomes among the Bhutanese children less than 24 months.

From the present findings of the study, our results showed that feeding practices were associated with growth outcomes and development of children. Therefore, it could be assumed that to reduce the growth outcomes such as stunting, underweight and wasting, promoting appropriate feeding practice is recommended. It is interesting to note in this study that mother's education was

associated with both appropriate and inappropriate feeding practices. This supports the importance of women's education. Thus, the result of this study highlights the fact that ideal feeding practices are very comprehensive and complex processes influenced by social, economic, cultural and educational factors.

Conclusion

This study showed that there is a major problem in IYCF practices in Bhutan and that educated mothers did not practice IYCF behavior any better than uneducated mothers in most of the measures studied. Also, it showed inappropriate feeding practice as one of the risk factors for stunting and underweight among the infants and young children in Bhutan. Therefore, few suggestions are provided. Firstly, in order to improve current feeding behaviors to enhance infants and young children's growth and health in Bhutan, any interventions need to incorporate exclusive breastfeeding, the quality and quantity of complementary foods and responsive feeding behaviors. Secondly, the interventions should also consider both educated and uneducated mothers. Overall, we suggest that more programs to increase caregivers' feeding knowledge and practices be conducted, to improve the health of children. Therefore, national leaders and program managers with important insights for the effective allocation of human and financial resources need to set immediate interventions on IYCF practice policies and programs aiming to improve children's healthy development. It important to develop a better understanding of the prevailing infant and young child feeding practices in the country and how these relate to children's growth and development in the first 2 years of life.

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