

Original Article

Micronutrient powder use and infant and young child feeding practices in an integrated program

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Integrated infant and young child feeding (IYCF)/micronutrient powder (MNP) programs are increasingly used to address poor IYCF practices and micronutrient deficiencies in low-income settings; however, little is known about how MNP use may affect IYCF practices. We describe how MNP use was associated with IYCF practices in a pilot program in select districts of Nepal where free MNP for children 6-23 months were added to an existing IYCF platform. Representative cross-sectional surveys were conducted in pilot districts with mothers of eligible children at 3 months (plains ecozone, n=1054) or 15 months (hill ecozone, rural only, n=654) after implementation of an integrated MNP/IYCF program. We used logistic regression to assess how IYCF practices varied by MNP use (none, 1-30, 30-60 sachets). At both time points, consuming 30-60 MNP sachets vs. none was associated with achieving minimum dietary diversity and minimum acceptable diet. In the 3 month survey consuming 30-60 MNP sachets vs none was also associated with achieving minimum meal frequency and continued breastfeeding at 2 years. In this setting, addition of MNP to an existing platform of IYCF messaging did not appear detrimental to IYCF practices.

Key Words: micronutrient powders, Nepal, infant and young child feeding, breastfeeding, child nutrition

INTRODUCTION

Undernutrition and anaemia are significant public health problems in Nepal, as 41% of children less than 5 years of age are stunted, 29% are underweight, and 46% are anemic.¹ Globally, undernutrition is estimated to be an underlying cause of 45% of deaths in children under 5 years of age.² Longer term consequences of child undernutrition include cognitive deficits and lower educational attainment, which translate into economic burden.³ An important contributor to undernutrition is poor infant and young child feeding (IYCF) practices.⁴ WHO recommends exclusive breastfeeding for the first 6 months of life,⁵ at which point a diverse set of complementary foods must be added to continued breastfeeding to provide adequate nutrition.^{6,7} Children 6 to 23 months of age are especially vulnerable to nutritional deficiencies because of high nutrient needs relative to caloric intake, and rapid growth.⁸

Micronutrient powders (MNPs) are sachets of vitamins and minerals that are mixed into semi-solid food immediately before consumption in order to address micronutrient deficiencies among vulnerable populations. WHO recommends home fortification of foods with micronutrient powders for children 6 to 23 months of age to improve iron status in countries with a high burden of anaemia.⁹ The Home Fortification Technical Advisory Group (HF-TAG), comprised of stakeholders from public private

academic, and non-governmental organizations, developed guidance that supports the adaptation of this WHO guideline in program settings;^{10,11} HF-TAG recommends that MNP interventions for young children be integrated with IYCF programs in order to benefit from joint delivery.¹⁰ International agencies and donors have also actively supported the program design and scale up of MNP interventions integrated into IYCF programs,¹² and integration with IYCF is now the norm in programs for young children.¹³ While it is generally assumed that integration of these programs will mutually benefit both programs, there is little programmatic evidence of this. To improve the micronutrient status of young children, an MNP program should not interfere with existing dietary practices or undermine exclusive and continued breastfeeding.¹⁴ Since MNP do not contain energy and can be added to traditional foods, it is generally assumed they will not displace breastfeeding or otherwise interfere with recommended feeding practices,¹⁵ however, there is little data supporting these assumptions.

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The purpose of this paper is to examine the association between MNP consumption and select IYCF practices at 3 and 15 months after implementation of an integrated MNP/IYCF pilot program in four districts in Nepal. We examined associations at both 3 and 15 months, which represent practices shortly after project start when project investment was high, as well as practices 15 months after program start when program activities were more routine.

MATERIALS AND METHODS

Integrated infant and young child feeding and MNP program

In 2010, the Nepal Ministry of Health and Population (MoHP) in collaboration with UNICEF launched an integrated IYCF/MNP pilot program, where 60 sachets of MNP were available for free every 6 months for all children 6 to 23 months of age. The MNP program was added to an existing IYCF program; the integrated intervention package included a behaviour change component supporting the adoption of improved IYCF practices and consumption of MNP among children 6 to 23 months of age. Female Community Health Volunteers (FCHV) and health facility staff were trained to provide behaviour change information, counselling, and support about recommended IYCF practices and MNP use. The IYCF messages focused on early breastfeeding initiation, breast milk exclusivity for the first six months, and continued breastfeeding thereafter. The IYCF program also supported timely introduction of complementary foods at six months of age, provided strategies to improve the energy density and nutritional quality of local complementary foods, supported age appropriate minimum meal frequency, improving dietary diversity, and active feeding strategies.

At the district level, two different MNP distribution models were piloted in rural areas: MNP were distributed either directly from FCHV or at the local health facility. In urban areas, MNP were initially distributed by FCHV at a campaign-like meeting, and then distribution was through urban health facilities or other convenient government agencies depending on the local context. Upon MNP receipt, caregivers were instructed on use and told their child should consume one sachet daily for 60 consecutive days and to collect another 60 sachets in six months. The pilot intervention lasted 18 months in each district and had a staggered start across districts.

Survey design and sampling

As part of program monitoring, representative cross-sectional household surveys were collected by an external organization. All data were collected September–November 2011, but because of the staggered start of the project, this was 3 months after intervention start in Rupandehi and Parsa districts, located in the plains ecozone, and 15 months after intervention start in Makwanpur and Palpa districts, located in the hills ecozone. Using population proportion to size (PPS) sampling, 30 clusters were selected from rural areas in each of the four districts, and 30 clusters were selected from urban municipalities across Rupandehi and Parsa combined; no data were collected in urban areas of Makwanpur and Palpa. A household census was conducted in each cluster to identify all

eligible children; 12 children 6 to 23 months from each cluster were then randomly selected for a household interview. The interviews were conducted with mothers/caregivers (in most instances this was the mother, so from here on is referred to as “mother”) of selected children and included questions on exposures to the intervention program, IYCF practices, and MNP intake. There was no replacement for refusals or if there were fewer than 12 eligible children in a cluster.

Participation in the interview was voluntary and verbal informed consent was obtained from each mother. Verbal consent was witnessed and formally recorded. The protocol was approved by the Nepal Ministry of Health and Population. A de-identified data set was used for this analysis.

Infant and young child feeding practices

WHO standard questions and definitions were used to calculate the prevalence of several IYCF practices:¹⁶ continued breastfeeding at 1 year (proportion of children 12–15 months of age who were breastfed the previous day) and 2 years (proportion of children 20–23 months of age who were breastfed the previous day); timely introduction of solid, semi-solid, or soft foods (proportion of children 6–8 months of age who received complementary foods the previous day); minimum dietary diversity (proportion of children 6–23 months of age who received food from 4 or more food groups the previous day); minimum food frequency (proportion of children 6–23 months of age who received complementary foods the minimum number of times the previous day, breastfed: 2 times for age 6–8 months, 3 times for age 9–23 months; non-breastfed: 4 times for age 6–23 months); and minimum acceptable diet (proportion of children 6–23 months of age who received minimum dietary diversity and minimum meal frequency the previous day). We additionally assessed current breastfeeding, defined as having consumed any breast milk in the previous day.

Micronutrient powder intake

Mothers who reported getting MNP sachets for their child were asked to recall the number of MNP sachets their child consumed from the last batch obtained. We categorized reported consumption of MNP as 1–29 sachets or 30–60 sachets; mothers who reported never having heard of MNP or never giving MNP to their child were categorized as non-users. We categorized MNP use by amount of sachets consumed, because use of only a few sachets was not likely to interfere with IYCF practices. MNP consumption was dichotomized as consumed/did not consume when assessing the association with timely introduction of solid, semi-solid or soft foods because this indicator only includes children ages 6–8 months and children aging into the program would not have had sufficient time to consume all of the sachets they received.

Statistical analysis

Initial analyses were completed for each of the five surveys separately. Similar patterns of associations were observed in the 3 month urban and rural surveys in Rupandehi and Parsa (plains ecozone) and in the 15 month rural surveys in Makwanpur and Palpa districts (hills

ecozone); therefore, data from 3-month surveys were combined, as were data from the 15-month surveys; these are described as the 3 month plains survey and 15 month hills survey, respectively. Data were analyzed using SAS 9.3 (SAS Institute Inc., Cary, NC). Estimates are weighted to account for the combining of data in different districts, and analyses account for complex survey design. Separate logistic regression models were constructed for each of the IYCF outcomes with MNP consumption as the primary predictor. Because of the high prevalence of continued breastfeeding at one year (>95%) and the small sample size due to the narrow age range used for calculating this indicator, models with this outcome would not converge; thus continued breastfeeding at one year was not used in further analyses. Models were adjusted for maternal education, household wealth quintile, and MNP distribution model.

RESULTS

Characteristics of the population

In both the 3 month plains and 15 month hill surveys, approximately half of children selected were male, and more than 90% were currently breastfeeding (Table 1). Among mothers in the 3 month plains and 15 month hill surveys, 41.5% and 25.5%, respectively, had no educa-

tion.

MNP consumption and IYCF practices

Among children 6-23 months, 43.5% in the 3 month plains survey and 36.4% in the 15 month hills survey had never consumed any MNP (Table 1). Approximately 37% of children in both surveys had reportedly consumed 30-60 sachets of MNP.

Among children 6-8 months, the prevalence of timely introduction of complementary foods was 74.8% among MNP non-consumers and 91.7% among MNP consumers in the 3 month plains survey, and 85.9% and 94.2%, respectively, in the 15 month hills survey. However, these differences were not significant in adjusted models (Table 2).

In both the 3 and 15 month surveys, children who had consumed 30-60 sachets from the last batch they received had increased odds of meeting recommendations for minimum dietary diversity (aOR: 2.56 and 2.22, respectively) and minimum acceptable diet (aOR: 2.52 and 2.27, respectively) compared to children who consumed no MNP (Table 2); the association of use of 30-60 sachets with minimum meal frequency and continued breastfeeding at two years were also significant in the 3 month plains survey (aOR: 2.04 and 2.86, respectively). Moreover, in the

Table 1. Characteristics of the survey populations, select districts of Nepal, 2011

	3 month plains [†] (n=1054)		15 month hill [†] (n=654)	
	N	% [‡]	N	% [‡]
Child's age				
6-11 mo	316	29.9	210	32.3
12-17 mo	441	42.2	253	38.4
18-23 mo	297	27.9	191	29.4
Male	521	50.3	332	50.7
Currently breastfeeding	951	90.8	622	95.0
Education of mother				
No education	425	41.5	161	25.5
Primary level (1-5 class)	200	20.3	200	30.6
Secondary level (6-10 class)	292	26.3	195	29.0
Higher Secondary and above	92	7.7	44	6.5
Adult class/informal education	45	4.2	54	8.4
Main source of income				
Agriculture/farming	460	48.5	512	78.8
Wage labour	195	17.0	28	4.3
Trade/business	174	12.9	21	3.2
Service (government/private)	176	13.7	31	4.6
Remittance/other	79	7.9	62	9.1
Wealth quintile				
Lowest	122	12.3	219	34.1
Second lowest	158	16.3	184	28.1
Middle	216	22.1	125	18.9
Second highest	250	23.4	92	13.8
Highest	308	25.8	34	5.2
Households with flush toilet	456	38.1	231	34.7
Household with mud/earth/dung floor	621	64.2	591	90.4
Households with electricity	900	83.4	503	76.5
MNP use				
None	495	43.5	231	36.4
1-29 sachets	197	19.7	171	25.8
30-60 sachets	362	36.8	252	37.8

MNP: micronutrient powder.

[†]3 month survey is representative of all municipalities in Rupandehi and Parsa districts; 15 month survey is representative of rural areas of Makwanpur and Palpa districts.

[‡]Column percentages represent weighted frequencies.

Table 2. Timely introduction of complementary foods, minimum dietary diversity, minimum meal frequency and minimum acceptable diet by micronutrient powder (MNP) consumption, Nepal 2011

	3 month plains survey [†]				15 month hills surveys [†]			
	n	% met	aOR [‡]	95% CI	n	% met	aOR [‡]	95% CI
Timely introduction of complementary foods ^{§§}								
Did not consume MNP	115	74.8	1.00	-	56	85.9	1.00	-
Consumed MNP	24	91.7	2.62	0.44-15.52	35	94.2	2.79	0.27-29.16
Total	139	77.7			91	89.0		
Achieved minimum dietary diversity [‡]								
None	495	26.6	1.00	-	231	30.1	1.00	-
1-29 sachets	197	33.7	1.55	1.06-2.27	171	43.0	1.08	0.66-1.77
30-60 sachets	362	47.0	2.56	1.80-3.64	252	58.1	2.22	1.55-3.19
Total	1054	35.5			654	44.0		
Achieved minimum meal frequency [‡]								
None	495	57.8	1.00	-	231	68.3	1.00	-
1-29 sachets	197	60.4	1.18	0.82-1.71	171	73.4	1.14	0.72-1.80
30-60 sachets	362	72.8	2.04	1.40-2.97	252	77.4	1.38	0.95-2.01
Total	1054	63.8			654	73.1		
Achieved minimum acceptable diet [‡]								
None	495	19.5	1.00	-	231	22.4	1.00	-
1-29 sachets	197	21.9	1.32	0.84-2.07	171	35.2	1.20	0.74-1.96
30-60 sachets	362	36.7	2.52	1.68-3.78	252	48.6	2.27	1.59-3.23
Total	1054	26.3			654	35.6		
Continued breastfeeding at 2 years [‡]								
None	85	66.6	1.00	-	31	77.1	1.00	-
1-29 sachets	42	68.8	1.09	0.49-2.46	35	94.3	3.83	0.83-17.74
30-60 sachets	77	85.2	2.86	1.12-7.31	67	87.9	1.68	0.65-4.37
Total	204	75.0			133	86.9		

[†]3 month survey representative of Rupandehi and Parsa districts; 15 month survey representative of rural areas of Makwanpur and Palpa districts.

[‡]WHO standard definitions were used to calculate indicators (2008). Timely introduction of complementary food includes only children 6-8 months of age. Continued breastfeeding at 2 years includes only children 20-23 months of age.

[§]Timely introduction of complementary food includes only children 6-8 months of age. Because children are not eligible to receive MNP until they are 6 months of age, many children in this age group may not have had MNP for a sufficient time period to consume 30-60 sachets; therefore MNP consumption was dichotomized as consumed or did not consume.

[‡]aOR are adjusted for maternal education, wealth quintile, and distribution model.

3 month hills surveys children who had consumed 1-29 sachets had increased odds of meeting recommendations for minimum dietary diversity (aOR: 1.55), compared to children who had not consumed any MNP. For all other indicators, IYCF practices did not differ between children consuming 1-29 sachets of MNP and children not consuming MNP.

DISCUSSION

It is recommended that MNP interventions for young children be integrated with IYCF programs because integration will support the appropriate use and sustainability of MNP interventions, and MNP interventions provide an opportunity to increase the delivery of and catalyze IYCF counselling and messages.^{10,14} Using programmatic data from an integrated IYCF/MNP pilot program in Nepal, this analysis identified associations between MNP intake and meeting recommendations for key IYCF practices. Our findings suggest that MNP use did not interfere with IYCF practices when integrated into a package that included IYCF messages.

An advantage of MNP as an intervention is that when used correctly MNP do not change the taste, colour, or smell of the food that they are mixed into, and in theory, require no changes to existing dietary or feeding practices. However, this assumes the existing feeding practices and complementary foods are appropriate for MNP use, or

that there is an existing IYCF program in place addressing these issues.¹⁷ In countries where introduction of complementary foods is typically delayed, it is possible that MNP interventions that include children starting at 6 months will support the timely introduction of complementary foods at that age. In this analysis there were no significant associations among timely introduction of complementary foods and program exposures or MNP intake, which might be related to the relatively high prevalence of timely introduction of complementary foods among our sample population and the small sample sizes of children 6 to 8 months (the sample used to calculate this indicator) in the survey. Current breastfeeding at two years was positively associated with MNP in the 3 month survey, and not associated with MNP use in the 15 month survey, suggesting MNP use did not undermine breastfeeding.

Strengths of this analysis include the use of programmatic data from multiple districts of Nepal which was collected at two time points, 3 and 15 months after program implementation. Data collected at 15 months did not include urban areas; however, approximately 80-88% of the population in these districts live in rural areas. Limitations include that all data, including MNP intake and IYCF practices, were self-reported, and may not represent actual practices. Additionally, while we did find that IYCF practices were better among high MNP users, we

were unable to assess if integration of the MNP program into an existing IYCF program contributed to this association. We controlled for maternal education and household wealth, but it is possible that other factors may be associated with both improved IYCF practices and MNP use.

Among this Nepali population, MNP use did not undermine breastfeeding or other feeding practices when integrated with other IYCF messaging.

AUTHOR DISCLOSURES

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention, UNICEF, or the Government of Nepal. The authors have no conflicts of interest to declare.

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综合方案中微量营养素粉的使用和婴幼儿喂养方法

婴幼儿综合喂养 (IYCF) /微量营养素粉 (MNP) 被越来越多地在贫穷地区婴幼儿综合喂养和低收入人群微量营养素缺乏人群中推崇。然而,很少有人知道 MNP 的使用如何影响 IYCF 的实施。我们选择尼泊尔地区 6-23 月龄幼儿为对象,将免费使用 MNP 添加到现有的 IYCF 平台中,描述试点地区 MNP 的使用与 IYCF 实施的关系。在试点地区开展有代表性的横断面调查,选择符合条件的 3 个月龄孩子的母亲 (平原生态区, n=1054) 或实施综合 MNP/IYCF 方案 15 个月龄孩子的母亲 (仅限农村山区生态区, n=654)。用 logistic 回归模型评估 IYCF 方案如何随着 MNP 的使用而变化 (未使用、1-30 袋、30-60 袋)。消耗 30-60 袋 MNP 与未使用 MNP 在这两个时间点比较,实现最低饮食多样性和最低可接受饮食有关。在 3 个月的调查中,消耗 30-60 袋 MNP 与未使用 MNP 与实现最低饮食频次和 2 年的持续母乳喂养有关。在这一背景下,添加 MNP 对现有 IYCF 平台的运行并未出现不利的影响。

关键词: 微量营养奶粉、尼泊尔、婴幼儿喂养、母乳喂养、儿童营养