Grandmothers’ knowledge positively influences maternal knowledge and infant and young child feeding practices in Nepal

ABSTRACT

Objective: To examine associations between grandmothers’ knowledge and IYCF practices and to test whether the associations are independent or operate via maternal knowledge.

Design: Cross-sectional household survey data from households with a child under 5 years (n=4080). We used multivariate regression analyses, adjusted for child, maternal, grandmother, and household characteristics, and district-level clustering to test associations between grandmothers’ knowledge and IYCF practices for children 6 to 24 months living with a grandmother. We used causal mediation to formally test the direct effect of grandmothers’ knowledge on IYCF practices versus maternal knowledge mediating these associations.

Setting: 240 rural communities, 16 districts of Nepal.

Subjects: Children 6 to 24 months of age (n=1399), including those living with grandmothers (n=748)

Results: We found that the odds of optimal breastfeeding practices were higher - early BF initiation (2.2 times; p=0.002) and colostrum feeding (4.2 times; p<0.001) - in households where grandmothers had correct knowledge versus those with incorrect knowledge. The same pattern was found for correct timing of introduction of: water (2.6), milk (2.4), semi-solids (3.2), solids (2.9), eggs (2.6) and meat (2.5) times (p<0.001). For the two pathways we were able to test, mothers’ correct knowledge mediated these associations between grandmothers’ knowledge and IYCF practices: colostrum feeding (b=10.91, p<0.001) and the introduction of complementary foods (b=5.18, p<0.001).

Conclusions: Grandmothers’ correct knowledge translated into mothers’ correct knowledge and therefore, optimal IYCF practices. Given grandmothers’ influence in childcare, engagement of grandmothers in health and nutrition interventions could improve mothers’ knowledge and facilitate better child feeding.
INTRODUCTION

Nepal has experienced some of the fastest rates of reduction in child undernutrition globally: between 1996 and 2011, the prevalence of stunting (height-for-age z-score < 2 SD) among children under two years of age fell from 48% to 27%. Improvements in health service access and utilization, sanitation, and education coupled with reductions in poverty drove this stunting reduction over time in Nepal (1, 2, 3). However, child undernutrition remains a significant public health burden, with more than one in four Nepali children under 2 years of age stunted (1, 2).

Infant and young child feeding (IYCF) practices, which did not improve between 1996 and 2011, might be a key contributor to persistent child undernutrition in Nepal (1–5). IYCF practices are important for child survival, child growth and development (6,7). The World Health Organization (WHO)-recommended IYCF practices cover both breastfeeding and complementary feeding of children under two years of age (4). According to the 2011 Demographic Health Survey (DHS), about 80 percent of mothers reported to have exclusively breastfed their children under six months of age. Complementary feeding practices continue to be suboptimal: not even one in three children aged 6 to 24 months consumed foods from at least four of seven food groups, the standard for minimum dietary diversity. Also, contrary to the WHO recommendation of introducing children to complementary foods at six months of age, nearly one in four children four to five months of age are fed solid or semisolid foods and at least 40 percent of children six to eight months still do not consume solid or semi-solid foods (8). This highlights that complementary foods are sometimes introduced too late and other times, too early.

Maternal and household demographic and socio-economic factors likely drive poor IYCF practices. Prior studies in Nepal have found maternal employment, education, age, and media exposure as determinants of IYCF practices (6,7, 3). Cultural beliefs, knowledge, and perceptions have all been shown to influence complementary feeding, including which types of foods to introduce first, the timing of their introduction, and who should feed young children (9). Behavior change interventions often target mothers with the aim of improving their IYCF-related beliefs, attitudes, and knowledge and ultimately, their IYCF practices. However, in much of South Asia, including Nepal, grandmothers are also childcare providers who influence maternal decisions regarding child feeding. Judi Aubel highlights the central role grandmothers play in child feeding in Bangladesh, Pakistan, and Nepal: grandmothers advise mothers on caregiving, including child feeding, and they are often direct caregivers for young children (10,11).

In South Asia, grandmothers are considered storehouses of knowledge and wisdom on a wide-array of household topics. Given their revered status, grandmothers often serve as advisors and
supervisors to the next generation, playing an influential role in child health and nutrition (10). In a qualitative study about the role of Tamang mothers-in-law in Mwakanpur, Masvie found that most mothers were assisted by their mothers-in-law for young child feeding in Makwanpur, Nepal (12). Another qualitative study in Nepal reported that mothers were obliged to obey their mothers-in-law and follow local practices even when the mother wanted to follow a doctor’s recommendations: although mothers were responsible for food preparation, grandmothers had primary decision-making power over which foods the child would receive and when (13). Furthermore, in Nepal, about 4 out of 5 women residing in rural areas are engaged in agricultural labor; many mothers depend on grandmothers to provide care for their young children while they work in the fields (14). Locks et al. found that 55% of mothers and 39% of grandmothers are primary child caretakers in Baitadi, Nepal (14). In rural Nepal, grandmothers provide childcare in part because of the heavy workloads of mothers and authoritative cultural space that grandmothers occupy in the Nepali households, but also because of the drastic increase in labor emigration of both men and women. The number of labor permits issued to men increased from 211,371 in 2008 to 492,724 in 2014, a 133% increase, but the number of labor permits issued to women grew even more drastically from 8,594 in 2008 to 29,154 in 2014, a steep incline of 239% (15). If this trend continues, grandmothers may play an increasingly significant role in child health and nutrition.

Studies on the role of grandmothers in IYCF practices in South Asia are limited; those conducted to date are primarily qualitative and the quantitative studies were based on small sample sizes. There are no prior quantitative studies on this topic in Nepal. In this study, we investigate the associations between grandmothers’ correct knowledge and correct practices for the following IYCF indicators: breastfeeding initiation, colostrum feeding, and timing of introduction of six types of complementary foods - water, milk (and milk products other than breast milk), semi-solid foods, solid foods, meat, and eggs - for children 6 to 24 months of age residing in rural Nepal. We also investigate whether any found association is direct or whether maternal knowledge mediates the association.

**METHODS**

*Survey design and sampling*

We use data collected for a baseline survey of a quasi-experimental impact evaluation of Suaahara, an integrated nutrition program to improve maternal and child nutrition in rural Nepal. Data was collected from mid-June to early October (rainy season) of 2012 across Nepal’s three agro-ecological zones – mountains, hills, and terai (8). Households were selected through a multi-stage cluster design. First, 16 districts were purposively selected to include 8 intervention districts and 8
comparison districts, matched based on various agro-ecological and socio-demographic characteristics. Second, 5 village development committees (VDCs) per district were selected and third, 3 wards per VDC were selected; both VDCs and wards were selected using probability proportional to size (PPS) techniques. Lastly, within each ward, 17 households with a child under 5 years of age were randomly selected from a census carried out by study enumerators. The total sample included 4,080 households across 240 wards, including 1,399 children between the ages of 6 and 24 months of age.

**Ethical approval**

Ethical approval was obtained from the Nepal Health Research Council (NHRC), Nepal’s ethical review board, and the internal review board of the International Food Policy Research Institute (IFPRI) in 2012. For the additional analysis in this publication, ethical approval was also obtained from the London School of Hygiene and Tropical Medicine (LSHTM) in 2015.

**Data collection**

The baseline household survey involved interviewing three household members: 1) the mother of a randomly selected child under 5 years of age (the index child), 2) a major adult economic decision-maker (the mother’s husband or adult male, when available) and 3) the child’s grandmother, if she resided in the same household. These household surveys included asking the primary female and male respondents a diverse set of questions regarding household socio-demographics and knowledge and practices relating to maternal and child health and nutrition; water, sanitation and hygiene (WASH); agriculture; family planning; and empowerment. The grandmothers’ questionnaire included questions regarding their knowledge and beliefs on key maternal and child health and nutrition topics, including IYCF.

**Data analysis**

All statistical analyses were performed using STATA version 13.0 (2013). For this IYCF-focused study, we restricted our analysis to households with at least 1 child 6 to 24 months of age (n=1399) and for our regression analysis, we focused on index children in this age range, residing with a grandmother (n=748).

The primary outcome variables were IYCF practices, as reported by mothers: whether or not the child was fed colostrum (yes/no); whether or not there was early initiation of breastfeeding, defined as the child receiving breast milk within the first hour of birth (yes/no); and whether or not the child was introduced to water, milk (and milk products other than breast milk), semi-solid foods, solid foods, eggs, and meat at the appropriate age, defined as mothers who reported introducing each of the 6 complementary foods between 6 to 9 months of age (yes/no). These specific IYCF
variables were selected based on both the research question and data availability from the 
grandmothers’ survey for construction of the parallel primary explanatory variables.

The primary explanatory variables were grandmothers’ knowledge and beliefs on these three IYCF 
practices. Grandmothers were asked whether or not a child should be given colostrum; when 
breastfeeding should start; and when (in months) they believed each of the six complementary 
foods should be introduced. Binary variables were created for both the breastfeeding variables to 
denote correct knowledge: 1) child should be fed colostrum (yes/no) and 2) child should receive 
breast milk within the first hour of birth (yes/no). Binary variables were also created for correct 
knowledge on the timing for introduction of complementary foods, defined as grandmothers who 
reported they would introduce each of the 6 complementary foods between 6 to 9 months (yes/no).

We used Analysis of Variance (ANOVA) and chi-squared tests to explore characteristics of 
households with (N=748) and without (N=651) a grandmother in residence. Next, multivariate 
logistic regression models were used to test the associations between grandmothers’ IYCF 
knowledge and parallel IYCF practices. Lastly, we empirically tested the direct versus indirect 
effects for grandmother’s correct knowledge and the actual practices, via mother’s correct 
knowledge as the hypothesized mediator for colostrum feeding and timely introduction of 
complementary foods. We were unable to test pathways for early initiation of breastfeeding, as the 
dataset did not include a maternal knowledge variable for this. Given the binary nature of our child 
feeding outcome variables, we used generalized structural equation modelling (GSEM) for our 
mediation analysis.

In all adjusted models, we controlled for various potential confounding factors at the child, mother, 
grandmother, and household levels, based on our knowledge of the local setting and prior studies 
regarding IYCF in Nepal (13,14,16–19). Child variables included age in months, sex (male or 
female), and decision-maker regarding child feeding (mother, grandmother or other) . Maternal 
characteristics included age in years, level of education (years of formal schooling completed), 
whether participated in wage or salary employment in the year prior to the survey (yes or no), 
number of sources from which nutrition information was ever heard (newspaper/magazine, radio, 
television, brochure/banner/poster, billboard, flipchart, counseling card, announcements in 
loudspeakers, community/village gatherings, religious gathering/meetings, mother’s group, street 
drama, health facility, female community health volunteers), and residency with her own mother 
(yes or no). Grandmother characteristics included age in years and level of education (years of 
education completed). Household characteristics included the number of children <5y residing in 
the household, the agro-ecological zone of residency (mountains, hills, or terai), caste/ethnicity
(Dalit, disadvantaged Janajatis, disadvantaged non-Dalit terai, religious minorities, relatively advantaged Janajatis, Brahmin/Chhetri/Sanyasi), level of food security (food secure, mildly food insecure, moderately mood insecure, or severely food insecure) measured by the household food insecurity access scale (HFIAS) (20), and wealth quintile (poorest, second poorest, middle income, second wealthiest, or wealthiest), calculated using principal component analysis. We also controlled for potential clustering at the district level and included a variable identifying whether the district was an intervention or comparison area, given the purposive selection of intervention areas by degree of need and how this may influence the results.

RESULTS

Table 1 presents key descriptive statistics for the child, mother, grandmother, and household; these statistics are presented for both types of households: those with (N=748) and without a grandmother (N=651) in residence. Among those living with a grandmother in the household, half were male and the mean age was 14 months. Mothers were on average 24 years old, with ages ranging from 15 to 42 years. Mean maternal education was six years of formal schooling. Among surveyed mothers, only 5% resided with their own mothers and only 13% claimed to participate in wage or salary employment in the past year. On average, women received nutrition information from only one source of a possible ten sources. Mean age of the grandmothers was 55 years, but the ages range from 35 to 85 years. On average, these grandmothers had less than half a year of formal schooling.

Around half of the households resided in hill districts, with residency for the other half split fairly evenly between mountains and terai districts. About half of the households were from most advantaged ethnic group while 17% were Dalit, the most disadvantaged caste group in Nepal. The average number of children under five years of age per household was one. More than 8 out of 10 surveyed households were food secure.

Table 1 also presents some statistically significant differences we found between characteristics of households with and without grandmothers. Households with grandmothers tend to have mothers that are younger (p<0.001) and more highly educated (p<0.001); however, these mothers are less likely to have participated in wage/salary employment in the past 12 months (p=0.01). Compared to those households without a grandmother present, higher proportion of households with grandmothers are from the Brahmin/Chettri/Thakuri/Sanyasi caste and ethnicity group and more have achieved food security, as measured by the HFIAS (p<0.001).

Table 2 summarizes both grandmothers’ and mothers’ IYCF knowledge and household IYCF practices included in the analysis. Most grandmothers had correct breastfeeding knowledge: breastfeeding should be initiated within one hour of birth (71%) and colostrum should be given to
the baby (83%). While slightly less than half of the grandmothers had correct knowledge that water and meat products should be introduced at 6 to 9 months of age, a majority of the grandmothers had correct knowledge on when semi-solid foods and solid foods should be introduced (71% and 75% respectively). Half of the grandmothers had correct knowledge regarding timing of introduction of milk and eggs. Only 17% of the grandmothers reported correctly (6 to 9 months of age) for when all six of these complementary foods should be introduced.

Mothers’ knowledge was higher than grandmothers’ knowledge for all IYCF variables analyzed. Mothers reported that six of ten children were breastfed within the first hour of birth and that about 9 of 10 children received colostrum. Thirty-seven percent of the mothers, in households with grandmothers, reported feeding water, and milk and milk products at the correct time while 64% and 70% of the mothers reported feeding semi-solid foods and solid foods at the correct time. Half of the mothers reported correct practice of introducing eggs and meat at 6 to 9 months of age. None of the differences in maternal knowledge or IYCF practices between household with and without grandmothers were statistically significant.

Table 3 shows results from the regression analysis of grandmothers’ correct knowledge and optimal household practices for breastfeeding initiation, colostrum feeding and timing of introduction of each complementary food. When adjusting only for district-level clustering, the odds of correct IYCF practices were about two to four times higher in households where grandmothers had correct knowledge compared to households where grandmothers had incorrect knowledge. In the adjusted models, the odds of appropriate breastfeeding initiation and colostrum feeding were 2.2 and 4.2 times higher (P: 0.002, P<0.001) in households where grandmothers had correct knowledge compared to households where grandmothers had incorrect knowledge. Similarly, in the adjusted models, correct household timing of introducing water, milk, semi-solid foods, solid foods, eggs and meat were all 2 to 3 times higher in households where grandmothers had appropriate knowledge compared to households where grandmothers did not have appropriate knowledge (p<0.001). Results were also robust when checked for clustering at the ward level (results available upon request).

Tables 4 and 5 present results from our GSEM, based on our hypothesized models (Figures 1 and 2), of how grandmothers’ knowledge may influence IYCF practices directly as well as indirectly via maternal knowledge. Our results show that grandmother’s correct knowledge on feeding colostrum mostly influences the actual practice via influencing maternal knowledge. The direct effect is almost zero (Figure 3), whereas there is a large, significant indirect effect: grandmothers’ correct knowledge improves the odds of mothers’ having correct knowledge by 2.1 times (P<0.001) and
mothers’ correct knowledge improves the odds by 5.3 times of colostrum being fed (P<0.001).

Similarly, grandmother’s correct knowledge on timely introduction of complementary foods has almost no direct effect (Figure 4), but the indirect effect is positive and significant: the odds of maternal correct knowledge are 2.1 times higher in households where grandmothers had correct knowledge (P<0.001) and correct maternal knowledge improves the odds of complementary foods being introduced at the right time by 2.5 times (P<0.001).

DISCUSSION

The present study explored the association between grandmothers’ knowledge and select IYCF practices of children under 2 years of age: initial breastfeeding, feeding colostrum, and the appropriate timing of introduction of water, milk, semi-solid foods, solid foods, meat, and eggs as complementary foods. The results of the cross-sectional dataset that included children 6 to 24 months of age (N=1399) of which 748 lived with grandmothers and 651 did not live with grandmothers, showed that more than half initiated breastfeeding within the first hour of birth, nearly all were given colostrum, and the percent of households with appropriate timing of introduction of complementary foods varied among the six types of food – water, milk, semi-solid foods, solid foods, meat, and eggs. Using logistic regression model, we found that, among households with grandmothers in residence, the odds of appropriate IYCF practice was at least 2 times or more likely in households where grandmothers had correct knowledge compared to households were grandmothers had incorrect knowledge and these results were statistically significant. Our mediation analyses showed that almost all of the association between grandmothers’ practice-specific IYCF knowledge and actual practice is mediated by maternal knowledge: grandmothers’ IYCF-related knowledge influences maternal IYCF knowledge and in turn household IYCF practices.

In this study, the variation across IYCF practices even among the same population was substantial. Although more than 90% of children in rural Nepal were given colostrum, initial breastfeeding in the first hour after birth only happened in about two-thirds of households. This prevalence was higher than Nepal’s most recent DHS, which showed that less than 45% of children in rural areas born in the previous two years were breastfed within one hour of birth. Similarly, the timing of introduction of complementary foods varied substantially by type of food, with water and milk given too early and eggs and meat given too late, both in this study and other studies in Nepal. A previous study noted that this is in part because of a belief that complementary foods should be soft to avoid diarrhea and stomach aches and that animal-sourced foods should only be introduced once the child develops teeth and the ability to digest appropriately (13,14). Attention to each of these IYCF practices is important given their importance for ensuring optimal child nutrition.
This study highlights the potential role of other adult household members, specifically grandmothers, in child feeding and nutrition. The positive associations between grandmothers’ knowledge and IYCF practices are consistent with earlier, albeit scant, literature in South Asia. Sharma and Kanani, in a study in Vadodara, India found that households in which a grandmother resided, in comparison to households without a grandmother, delayed initiation of complementary feeding to beyond six months of age and called for future child nutrition interventions in South Asia to include all family members who are childcare providers (21). In a mixed-methods study in rural Haryana, India, Kausal et al. found that grandmothers believed that complementary foods should only be introduced when the infant starts walking or asking for food, while the mothers believed complementary feeding should be introduced much earlier. This is consistent with our findings and underscores that IYCF-related knowledge may differ among adult childcare providers in the same household and highlights the need for ensuring that grandmothers are also aware of optimal IYCF practices, given their influential role in child feeding in South Asia (22,23). Analyzing a cross-sectional dataset from the Young Lives study in Andhra Pradesh, India, Moestue and Huttly found independent associations between maternal, paternal, and grandmother characteristics and child nutritional status, further highlighting the need for programs to target other family and community members, rather than just mothers (24). Studies from outside of South Asia have also emerged showing the important role of grandmothers for child health and nutrition and the need for targeting them with behavior change communication interventions (25–27).

As mentioned, commonly in South Asia and in Nepal, senior women are highly revered and hold the top position in the family hierarchy, often having power and authority over younger women, including relating to infant feeding (27,28). A study in Maharashtra, India shows that grandmothers take care of infants and teach first-time, inexperienced mothers about breastfeeding, prelacteal feeding, complementary feeding, and feeding during child illness. This study found that mothers often follow practices that their mothers and mothers-in-law suggests, perhaps due to their own inexperience or to avoid conflict and maintain tradition (23). Mothers generally consult grandmothers regarding infant and young child feeding and some grandmothers feel that it is their responsibility to teach mothers and pass on their knowledge, perceiving themselves as “providers of perinatal care” (12), a perception strengthened by first-time mothers relying on them for expertise and knowledge regarding IYCF practices.

The present study suffers from a few limitations. First, this study is based on a cross-sectional dataset and thus, our regression results cannot be interpreted as causal. Second, this was not a nationally representative sample; the 16 districts of Nepal included in this survey were purposively selected for an impact evaluation baseline. Third, there may be residual unaccounted for
confounders not available in the dataset or biases, which are inevitable in self-reported practices, e.g. IYCF. We asked mothers of children up to two years of age to remember child feeding practices since birth and acknowledge potential recall bias as a study limitation (29–34). Finally, in this dataset, the grandmother data are limited and certain interesting data points, such as whether the grandmothers had been exposed to nutrition-related counseling or other inputs, are unavailable.

Despite these limitations, this study is the first empirical study in Nepal, and one of few globally, to investigate associations between grandmothers’ knowledge and IYCF practices. Our study adds to prior studies, which were mostly qualitative or had very small sample sizes, failed to adjust for potential confounding and clustering, and only looked at either breastfeeding or complementary feeding. Furthermore, our study disaggregates the complementary foods rather than lumping the various food types, which is important given variation in use of these foods for child feeding. The mediation analysis also allowed us to explore how grandmothers’ knowledge may influence nutritional practices, compared to traditional regression analysis which only answers whether associations exist or not. Therefore, our study suggests additional hypotheses around how household factors influence IYCF practices in South Asia.

Future research and program and policy implications

Globally, most child nutrition policies and programs target mothers of young children, aiming to increase their awareness and motivation to engage in optimal IYCF practices. In South Asia, grandmothers’ roles as decision-makers and advisors on child health and nutrition suggests that they should be integrated into existing programs or that interventions designed specifically for grandmothers and other adult household members could prove beneficial. One way of addressing knowledge gaps may be to improve health workers’ knowledge and their counselling skills for communicating accurate IYF knowledge and ensure that health workers are reaching childcare providers at large with this information, rather than just mothers. Different child nutrition approaches and programs may be needed to target households with and without grandmothers, since we observed differences in demographics between these two types of households.

Additional studies could analyze factors that may shape grandmothers’ knowledge, pathways and mechanisms for how this influences child feeding and the nutritional status of the child, and how these differ by various demographic (e.g. caste) and socio-economic (e.g. wealth) characteristics. Detailed attention should be given to which household member undertakes which specific childcare roles and how often to inform the design of future interventions. Rigorous experimental studies are needed to investigate how grandmothers, and other adult household members, affect change in IYCF practices. While the focus on this study was infant and young child feeding, a similar analysis...
for other nutrition-related practices including diet for women during pregnancy and lactation, food hygiene, and water, sanitation, and hygiene behaviors would also be informative.

The Government of Nepal’s National Multi-sector Nutrition Plan and the various nutrition sensitive and nutrition specific interventions (35), aiming to address the high prevalence of stunting, wasting, and micronutrient deficiencies, are all important steps in the right direction. Our findings suggest these efforts may be more effective in improving IYCF practices and reducing undernutrition if other adult household members, such as grandmothers, are also explicitly targeted (24,36,37). In rural Nepal, this is now particularly important in light of increasing exit migration for women in Nepal and young children being left behind to be cared for by grandparents. Nepal’s present climate of commitment to nutrition and to addressing the burden of undernutrition, particularly among children in the first ‘1000 days’ of life, must be pushed forward. This is an ideal time to adopt innovative approaches to nutritional obstacles so that further reductions in child nutrition can be seen and to engage in rigorous research studies to assess the effectiveness of these approaches and build a stronger evidence base for how to address persistent under nutrition.
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