

Food supplements to reduce stunting in Pakistan: a process evaluation of community dynamics shaping uptake

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Abstract

Background

There is an increasing interest in use of food supplements to prevent stunting, however evidence from trials remains inconclusive meriting qualitative examination of barriers and synergies for supplement use by targeted groups. We contribute evidence on factors influencing community uptake of food supplements to feed into the design of future food supplementation programs for countering stunting.

Methods

A process evaluation was undertaken of a stunting prevention food supplementation pilot in rural Pakistan that distributed wheat soy blend (WSB) to pregnant & lactating women, and lipid-based nutrient supplement (LNS) and micronutrient powder (MNP) to <5 years children. We investigated community uptake applying five parameters: value, acceptability, receipt of supplement, usage by target group, correct dosage used. Mixed methods were used: survey of 800 households, 18 FGDs with male and female caregivers, 4 FGDs with community health workers (CHWs), 22 key informant interviews with district stakeholders.

Results

Survey findings showed that proportionately few beneficiaries consumed the full dose of supplements – , despite reasonable knowledge levels amongst caregivers. Sharing of supplements with other household member was common, and full monthly stock was not received by several beneficiaries. Qualitative findings revealed caregivers did not associate food supplements with stunting reduction. WSB was well accepted as an extra ration, LNS was popular due its chocolaty taste and texture, whereas MNP sprinkles were perceived to be of little value and also mistrusted. Cultural food practices led to common sharing, whereas interaction with CHWs was minimal for nutrition counselling. Qualitative findings also indicated CHW related programmatic constraints of low motivation, multi-tasking, inadequate counselling skills and weak supervision.

Conclusion

We conclude that community acceptability of food supplements does not translate into optimal consumption. Instead a greater emphasis is needed on demand creation amongst caregivers and moving from sole reliance on CHWs to a broadening of food delivery and behavioural change options.

Introduction

Globally, 22% of children under five are stunted as a consequence of chronic nutrition deprivation, with South Asia bearing 40% of the global burden of stunting. Providing packaged specialised food supplements are argued to be a low cost, rapid way to prevent under-nutrition in vulnerable groups such as pregnant-lactating women (PLW) and young children 6–59 months of age (1, 2). The premise of use lies in providing a quick window of action during the critical 1000 day period from conception to two years of age to prevent stunting (3, 4) as opposed to sustainable food based approaches that require longer term efforts. Specialized packaged foods comprise of different products carefully manufactured for needs of specific vulnerable groups. Fortified Blended Foods (FBFs) are designed for use of PLW and consist of a blend of partially precooked cereals in either wheat or corn base fortified with vitamins and minerals to be mixed with water and cooked (5). Ready to Use Foods (RUF) are designed for children 6–59 months of age to be eaten in small quantities as a supplement to regular diet and are prepared in a lipid base

providing proteins, fats and micronutrients (6, 7). Micronutrient powders (MNP) are single dose packets of vitamins and minerals in tasteless powder form to be sprinkled on cooked meals of children 3 < years and serve mainly to enhance the micronutrient intake rather than stunting prevention (8). High energy biscuits are designed for use by children and adults especially in emergency settings when food cooking facilities scarce and provide a mix of densely packed protein and minerals. To prevent stunting, the food supplements are usually provided through community-based food delivery programs to ensure timely access, individualized counselling and support with more frequent interaction and follow-up by CHWs, increased demand for guidance and support among supplement users, increased hands-on learning opportunities for caregiver and continued use for PLW and under five children (9).

There is an increasing interest in use of food supplements to control stunting and wide ranging food supplementation programs have been implemented as part of food security measures in countries such as India, Malawi, Bangladesh, Madagascar and Ghana (10–13). Existing evidence from trials remains inconclusive in terms of use of FBS and RUFs for stunting prevention (1, 8, 11, 14, 15). Moreover, available evidence is from trials whereby tight vigilance is given to food distribution, food messaging and support to mothers for food usage (11, 12, 15, 16). However, in mainstream health systems the distribution and effective uptake of food supplements is certain to be more challenging if food is to be taken regularly over long term hence as in stunting preventive programs.

While much has been published on use of ready-to-use therapeutic foods (RUTFs) for treatment of under-nourishment and stunting reduction, there is less evidence on use of food supplements to prevent stunting. Mixed method studies have been conducted to explore adherence and acceptability of food supplements within the community to understand the factors related to consumption (17). Available evidence on the factors influencing the usage of food supplementation is presently small and emerging, chiefly requiring evidence in real life settings outside of controlled trial areas and particularly benefit from qualitative insights on how community adherence can be improved.

This paper attempts to contribute empirical insights for effective community uptake of food supplements when designing food supplementation programs to counter stunting in food insecure settings. Evidence is drawn from Pakistan where the percentage of stunting in children < 5 years is 40.2%, the highest in South Asia and nearly twice as much as the global prevalence (18). Within Pakistan, stunting is regionally concentrated in the province of Sindh where almost every second child is stunted with little change seen over the years. We present here findings from a process evaluation of a pilot study on food commodity based stunting prevention conducted in two rural underserved districts of Sindh province in Pakistan. Our study employs mixed methods to delve into community dynamics around the usage of food supplements to prevent stunting.

Method

Setting: Process evaluation was conducted over October-December 2016 of a stunting prevention project that had been in place for two years (2014-2016), whereby food supplements were provided to PLW and children 6-59 months of age in the two districts (Thatta and Sujawal) of Pakistan that had an established prevalence of childhood stunting. Supplementation was provided in the 29 union councils (lowest administrative unit) out of the total of 55 UCs of the two districts through the community-based Lady Health Workers (LHWs) between the years 2014-16. Supplementation consisted of locally produced LNS (Wawamum – chocolate drink) to children from 6 – 23 months, MNPs (powder to be sprinkled on food) to children 24-59 months and Wheat Soya Blend (WSB)

(chickpea based fortified food to be mixed with flour) to PLWs during pregnancy and for six months after giving birth (table 1). Besides the provision of food/nutrient supplements, education was also provided on supplement use and benefits and counselling on infant and young child feeding (IYCF) (early initiation and exclusive breastfeeding, sustained breastfeeding, complementary feeding and hygiene practices). The details of the program and methodology are provided elsewhere (19).

Table 1: Food Supplements and targeted beneficiaries

Supplement	Target group	Dosage/ Frequency	Consumption
LNS (Wawa Mum)	Children aged 6-23 months	1 sachet (50g) Once a day	Directly from the sachet
MNP	Children aged 24-59 months	1 sachet Every other day	Sprinkled over semi-solid or solid food
WSB	Pregnant and/or lactating women	5kg (2 bags) Spread throughout the month	Making bread or desserts

The LHW program has been running for several years in Pakistan and operates through salaried village based female health workers who provide frontline maternal and childcare preventive services, growth monitoring and identify severe disease and ensure timely referrals. Each LHW has a health house in her village as the centre point for health awareness sessions, and also conducts home visits on monthly basis. The LHW are supervised by Lady Health Supervisors (LHS) based at a health facility where she also collects commodities and submits monthly report.

Food Intervention: All PLW and children < 5 years of age residing in the 29 LHW covered UCs were the beneficiaries of the food supplementation program irrespective of their nutritional status. Food stocks (LNS, MNP and WSB) were collected by LHWs during their monthly visit to the health centre and mothers then visited the LHW health house in respective villages to receive the monthly supplements. Mothers were provided information on food administration during collection, and further follow-up on food usage was done by LHW during routine household visits. Through this program, the LHWs were given additional responsibilities of distribution of food supplements and counselling mothers on usage.

We investigated community dynamics related to uptake of ready to use food supplements by the intended recipients through a cross-sectional mixed methods assessment. Our review of existing literature helped identify five key parameters as being critical to the success of a food supplementation program.

- Value: recognising the value or importance of food supplements for health and disease can influence usage.
- Acceptability: Acceptability by beneficiaries is important, typically expressed in terms of likes or dislikes of packaging, texture, taste and smell (20).
- Receipt of supplements: Delivery actions for supply and distribution of food supplements require attention to effectively integrate food supplementation into infant and young child feeding practices (9)
- Targeting compliance: Supplements are created for specific target populations, and it is important for only those populations to consume those supplements in adequate amounts (7).

Dosage compliance: Compliance with adequate dosage and frequency is required over long stretches of time, requiring effective filtration of information to beneficiaries (21).

We used a range of mixed methods to explore the above parameters:

1. Household quantitative survey of PLWs and mothers of children under 5 years of age- to examine receipt of food supplies, food consumption by targeted beneficiaries, knowledge of dosage and consumption of correct dosage
2. Focused group discussions (FGDs) with female and male caregivers probing value, acceptability, receipt of supplies, consumption by targeted beneficiaries
3. FGDs with Lady Health Workers probing community uptake and delivery factors affecting usage
4. Key informant interviews (KIIs) with district stakeholders probing community uptake and delivery factors affecting usage

Table 2 summaries data collection tools and parameters.

Table 2: Data Collection Parameters and Tools

Study area	Parameters	Tools (N)	Study Participants	Themes Explored
Community level dynamics affecting uptake of food supplements by targeted beneficiaries	-Are food supplements being received by households?	HH Survey (n=806)	Mothers	-Receipt of food supplements
	-Does the community understand the value and purpose of supplements?			-Usage of food supplements by target groups
	-Is there acceptability of food supplements amongst target groups and particular likes and dislikes associated with different supplements?			-Knowledge of food supplement usage
	Is there consumption by required beneficiaries and in sufficient quantities	Community perceptions FGDs (n=18)	PLW: 2 FGD Fathers & male HH members of <5 children: 6 FGDs	-Value of food supplements and willingness to pay - Acceptability of food supplements - Receipt of food supplements -Usage of food supplements
		Health provider feedback FGDs (n=4) KIIs (n=22)	FGDs: LHWs KIs: district and union council stakeholders	Enablers & Barriers related to: -Uptake of food supplements by community -Delivery of food supplements

Food Intervention: All PLW and children < 5 years of age residing in the 29 LHW covered UCs were the beneficiaries of the food supplementation program irrespective of their nutritional status. Food stocks (LNS, MNP and WSB) were collected by LHWs during their monthly visit to the health centre and mothers then visited the LHW health house in respective villages to receive the monthly supplements. Mothers were provided information on food administration during collection, and further follow-up on food usage was done by LHW during routine household visits. Through this program, the LHWs were given additional responsibilities of distribution of food supplements and counselling mothers on usage.

Data Collection

Household Survey: A structured paper-based questionnaire was used to collect data from randomly identified households (HH). Sample size was calculated using the comparison of sequential surveys approach to detect a

15% difference in ever receiving food supplements by eligible population. Sample size calculations considered the percentage of food supplement received during the previous process assessment i.e. 69% and design effect of two and the total sample size calculated was 806 to detect a 15% difference with 80% power and 5% level of significance. The HH survey was conducted in 12 UCs randomly selected from both districts and the probability proportional to size (PPS) sampling method was used to randomly select houses from the lists of HH already available with the LHWs.

FGDs with caregivers: 12 UCs were randomly selected from the targeted 29 UCs, and from each UC, 2 villages were randomly selected to conduct FGDs with targeted participants. A total of 18 FGDs were conducted with community members: twelve FGDs were conducted with mothers and mothers-in-law, six with male members of households. Each FGD had 8-10 participants, lasted around two hours. A topic guide with probes was used to gather information on value, distribution, acceptability, and usage of food supplements during these discussions.

FGDs with LHWs: A total of 4 FGDs were conducted with Lady Healthcare workers (LHWs). These included LHWs from 12 UCs randomly selected from the targeted 29 for intervention. Each FGD had 8-10 participants and lasted between around two hours. A topic guide with probes was used to probe LHW perceptions on community uptake of supplements, underlying factors and LHW experiences on delivery of food supplements.

KIs with district stakeholders: A total of 22 KIs were carried out with district stakeholders, including the district health office staff, union council representatives, community-based organizations, and Lady Health Supervisors (LHS) overseeing LHWs. A topic guide was used to probe perceptions on community uptake of supplements, factors underlying community uptake and perceptions of programmatic delivery of food supplements.

Quality assurance: Two field based teams were formed one for household survey and the other for qualitative investigation each headed by a field supervisor and 5 data collectors. The study lead and research specialist trained both the team on study tools, oversaw data collection and real time analysis. Household questionnaire was pre-tested before starting data collection, validation checks were done on 5% of the forms within the same day and errors corrected. Data forms after being checked for completeness by field supervisor were entered into SPSS using double entry to minimise errors.

Focus group discussions with community members were conducted in an accessible location, usually in a village home or school chosen by the participants. Space at local government health facilities was used for FGDs with LHWs as it is a common convening point. Each FGD was conducted by a pair of facilitators and note taker, held in local Sindhi language, and principles of free flow of conversation were established at the outset. Tape recorders were used with permission of the participants. FGDs and key informant interviews were conducted in local language, transcription was carried out during field data collection, and after checking with the audio recordings were then then translated to English.

Data Analysis: Quantitative data was analyzed in Stata version 14. Descriptive analysis was carried out and frequencies generated for all of the categorical variables. Transcripts were manually analyzed using inductive thematic analysis and content coded a priori in line with the identified five parameters. Coding was reviewed by the study team, discrepancies were discussed, relationship between themes was discussed and new codes created where felt necessary. Triangulation of emerging findings was done across HH survey, community FGDs, LHW FGDs and KIs to identify commonalities and differences.

Ethical Considerations: The project obtained ethical approval from the Ethics Review Committee (ERC) of Aga Khan University (GN: 2919-Ped-ERC-14) and the National Bioethics Committee (NBC) (4-87/14/NBC-147/RDC/624) of the Pakistan Medical and Research Council. Written informed consent was obtained from survey participants prior to collection of data. The FGDs and KIs began with introduction of the study, re-confirmation of interest to participate in the discussion, and maintained confidentiality of respondents' information. Identifying information of respondents was removed in transcription, analysis and reporting, substituting with numeric codes. All computerised data was encrypted, and hard copies were stored in locked filing cabinets to ensure confidentiality of data.

Results

Household Survey: Out of the 806 households surveyed, there were 203 HHs with children aged 6-23 months, 200 HHs had children aged 24-59 months and 403 HHS had PLW. All the mothers (99.6%) in the catchment area were aware of the collection points for the food supplements, most (78%) received food supplements during the previous month, whereas a fifth of HHs (22%) did not food supplements in the previous month. The major reasons for not receiving the food supplement were that the mothers either forgot to collect (10%) or were busy in household work (5%), in very few cases the mothers visited the health house but the food supplements were not available (5%) (Table 3).

Table 3: Receipt of food supplements

Total	N (%)
	806 (100)
Proportion of mothers aware of delivery points	803 (99.6)
Any food supplements received in the previous month	626 (77.7)
Not receiving food supplements	180 (22.3)
<i>Forgot to receive/visit LHW's health house</i>	83 (10.3)
<i>Busy in household work</i>	44 (5.4)
<i>Visited but supplements not available</i>	39 (4.8)
<i>Visited but LHW was absent</i>	6 (0.7)
<i>Other</i>	8 (1.0)

However of those who received supplies, not all received the full stock of supplements – only 50% of households had received the full stock for LNS, 61% for MNP, 63% for WSB at the time of survey (Table 4). The supplements were often shared with other members of the household. LNS supplies were shared with other household members in 45% of eligible households, WSB in 34% of households and MNPs in 13% of households. However eligible individuals did not always consume food supplements in required dose. Amongst eligible beneficiaries who consumed the supplement only 20% used the full dose of LNS, 30% took the full does of WSB and 32% took the full dose of MNP. At the same time knowledge of correct use and dose was fairly high. Most mothers (80%) were aware of the correct dose of LNS and WSB, and all (100%) were aware of the correct method of LNS and WSB consumption. Comparatively fewer mothers (64%) knew the correct dosage of MNP although most (80%) knew how to correctly use MNP.

Table 4: Knowledge and compliance with food supplement dosage

Variable	LNS (children aged 6-23 months) <i>N (%) - 203 (100)</i>	MNP (children aged 24-59 months) <i>N (%) - 200 (100)</i>	WSB (PLW) <i>N (%) - 403 (100)</i>
Knowledge of correct dose	165 (81.2)	127 (63.5)	334 (82.8)
Knowledge of correct method of preparation	203 (100)	159 (79.5)	403 (100)
Full monthly quota of supplement received	101 (49.7)	122 (61.0)	253 (62.7)
Partial or no supplement received	102 (50.3)	78 (39.0)	150 (37.3)
Sharing of supplement with other HH members	88 (45.0)	25 (13.0)	129 (33.6)
Use of supplement by eligible individual	108 (55.0)	174 (87.0)	255 (66.4)
<i>Full dose of supplement used</i>	42 (20.7)	63 (31.5)	121 (30.0)
<i>Partial or no dose of supplement used</i>	161 (79.3)	137 (68.5)	282 (70.0)

FGDs with Community:

Value of Food Supplements: Most caregivers did not perceive stunting as a health concern. They commonly believed that stunting occurs because the parents of an individual are of short height or that God had ordained a person's height. LNS supplements were believed to be associated with greater 'physical strength' and 'energy' for people of all age groups. WSB was regarded by some caregivers to positively impact the child's health at birth, while others regarded this as an extra bag of ration. Caregivers were willing to use supplements only if provided free of cost. Only a few reported that they are ready to pay a token amount for these food supplements with higher willingness to pay for WSB and lowest for MNP. Willingness to pay (WTP) reported by participants was up to forty rupees for WSB; ten rupees for LNS; and maximum three rupees for MNP for a single pack of the supplement. Caregivers reported that they would not be interested in purchasing food supplements and believed it would be more beneficial to spend their money on other rations such as cooking oil and wheat, which could feed the entire family instead of selected groups. Participants stated that they would not mind using WSB and LNS if provided free of cost.

It's [Stunting] natural for children because it depends on parents' heights. If parents are smaller, their children will also be small" (LM)

"It [WSB] is good thing and gives physical strength [energy] to the pregnant and lactating women" (PW).

Receipt of Food Supplements: Most mothers knew that the LHWs health houses were the collection point for the food supplements and where these were located. However, mothers reported that they do not always get the full stock of supplies when approaching LHWs. Sometimes they were unable to pick up the supplements due to household chores, instead sending their children or spouse to pick up the supplies. However husbands and children often do not interact with LHWs, at other times stop to listen to the LHWs instructions on its use and benefits. Mothers expressed stated that LHWs distributes supplies in a hurry and there is less chance to understand why the supplements should be used. They also mentioned that although LHWs do make household visits, growth monitoring of child is rarely carried out and there is little discussion on food supplement use.

" ..., I don't get the food supplement every time, as she [LHW] says stock has finished and asks us to wait for a few days." (LM)

"We should sit together with her [LHW] to discuss about the use and benefits of the supplements and other issues." (PW)

"Sometimes I send my son or daughter to receive food supplements from LHW house" (LM)

Acceptability of Food Supplements: Information about the acceptability of the food supplements was probed based on their colour, texture, odour, and packaging. Participants expressed strong like for the taste and texture of WSB although they were indifferent about its colour, odour and packaging. Participants believed that all family members were entitled to consume WSB. The preferred use was through mixing with wheat flour to make chappatis served at meals. Participants enthused over the taste of LNS considering it to have a "chocolate" flavour and syrupy liquid texture. Caregivers were largely hesitant of MNP usage and also reported that children did not adequately take to it. It was believed that the powder changed the colour and taste of the food that it was sprinkled over hence turning off children from consuming their meals. Some caregivers also expressed that children experienced bouts of diarrhoea after consuming MNPs.

"WSB tastes good when prepared and mixed with anything; people like it." (LM)

"Wawa Mum (LNS) is good for children's health. It gives them energy." (LM)

"The taste of [MNP] is not liked by children. It changes color of certain food products." (Grand-mother)

"I think Wawamum is little chocolate so ten rupees is fine price for it and even then many people will not buy; people will say it was given for free and must remain free of cost" (Spouse)

"...yes because its taste is good, so all children have it and they are happy to have Wawa Mum" (PW)

"All members have it [WSB when it is prepared and mixed in flour [aata] and meal [mani] is made of it." (LM)

Usage of Food Supplements: Sharing of WSB and LNS was commonly reported among the household members. WSB was usually served to all household members mixed in chappatis (bread) for daily meals. Caregivers felt that it was culturally unacceptable for mothers to consume separate chappatis made of WSB flour. Caregivers also considered that there was extra work involved to make two different sets of dough and chappatis (bread). LNS was reported to be popular amongst children and adults due to its taste and this led to consumption by older siblings and sometimes even by adults. Most caregivers felt that they it would be unfair to restrain older children from having a chocolaty treat. MNP was not shared due to perceived unpleasant taste and issue of food changing colour when sprinkled with MNP.

FGDs with LHWs:

Community uptake: LHWs reported that households were always willing to receive extra food parcels, however expressed concern that food sharing was common and hence the target groups did not always receive the adequate amount of the food supplements. LHWs believed that village-level committees comprised of influential and educated people from the community would be helpful in ensuring that the right beneficiaries consume food supplements.

Food supplement delivery: LHWs were concerned that substantial time was required in maintaining records of supplements and counselling of households on supplement use. LHWs complained that they did not get sufficient time from usual chores to attend to these tasks. They also felt demoralised that there tasks kept on increasing and

there was little support available from their supervisors. LHWs also mentioned delays in re-stocking of supplements which they attributed to be a major reason for households not being able to obtain full stock of supplements. According to LHWs their transport allowance was meagre to regularly fetch supplies while on the other hand there was rising demand from the community for WSB and LNS.

"We don't get salary and food distribution incentive on time." (LHW)

"At village level there should be committees of influential people who can look after the proper usage and also help us in distribution, otherwise people will continue to demand food supplements for the ineligible ones" (LHW)

KIs with district stakeholders:

Community uptake of food supplements: KIs expressed concerns that community is poorly aware of the importance of food supplements and that the critical step prior to food distribution should have been to sufficiently sensitize the community on why to use and who should use. KIs reported that certain segments of the community believed that these supplements are supplied by foreign agencies with malicious intent, hence awareness is all the more required to dispel suspicions. KIs largely felt that community does not get sufficient interaction with LHWs, with interaction being mostly confined to Polio days, and this was reported as another hindrance to adequate uptake of food supplements. They believed that LHWs should be re-established as primary care givers with community, particularly with women, this would then also help with supplement use for children and mothers.

Delivery of food supplements: There was also concern amongst key informants on record keeping of distribution and usage of food supplements, and many expressed their desire for regular review of such record. LHS blamed low literacy of LHWs for weak record keeping, yet others believed that record keeping has less to do with competency and more with insufficient emphasis given so far to monitoring. While all key informants recognised that monetary support is required for regular delivery of supplements to health worker houses in the villages, there was less consensus on why monetary support is not delivering results so far. LHS supervisors were wont to blame slow release of transport allowance to LHWs, whereas the district health office distributing food supplements stated that transport allowance were often withheld until monitoring reports were submitted by health workers. Stakeholders doubted that LHW are adequately trained to deliver awareness to the community and stated that community awareness requires considerable support.

"There should be trust of people on her [LHW] but it is only possible when she performs her duties honestly, she only comes for polio drops, and doesn't come otherwise."

"There are some religious leaders who misguide people and say that it is western world tactics to provide these supplements to us which are mixed up with some [haraam] prohibited food/things."

"There is also issue that a large number of beneficiaries don't realize that this program is for their good, there is a need of educating the people more on that."

"Although there are some issue of capacity of LHWs. The LHW has the vital role in this program. She better knows about the situation in the community, she even knows about the number of pregnant women as well as the new born babies."

"There are some LHWs who are weak at maintaining records; we need to solve this issue on priority basis."

“Many LHWs don’t submit monthly reports on time but still demand timely provision of incentives and this is not possible that they can get incentive without submission of timely monthly reports.”

Table 5: Summary of key findings (To be inserted at the end of the results section-line 380)

Value of Supplements	Distribution of Supplements	LHWs	Acceptability	Usage of Supplements	Value of Supplements
HH Survey					
	-Supplement not available -majority of mothers were aware of delivery points	-LHW absent at health house			-Target groups did not receive adequate amounts
Community Perceptions: FGDs with Family Members					
-Stunting not viewed as a problem- seen as genetic and God's will/natural Mothers could see improvement in child's growth post-supplements	-Information on usage not provided to family members who collected supplements	-Correct usage technique only taught to mothers by LHWs LHWs hurried the sharing of information	- WSB - taste and texture liked by PLW; seen as source of energy and provided physical strength - LNS - children liked chocolatey taste - MNP - changed the colour of food and taste, so was not liked by target population (or otherwise).	-Lack of trust regarding government intervention -Village elders volunteered to play a positive and productive role in promotion and encourage use of food supplements in their community	- LNS and WSB were shared by household members
Healthcare Provider Feedback: FGDs with LHWs					
	- Supplements not restocked due to transport allowance issues -Male members of the households that come to collect supplements do not wish to stay and learn about usage	-LHWs felt overwhelmed by multiple tasks -Expressed need for support by LHSs	-Need for village level committee to supervise education and distribution of supplements by elders and educated community members	Demotivating factors affecting usage: -lack of time, supplies, oversight, skills, trainings and support by LHSs	-Concerned regarding target groups not receiving adequate amounts due to sharing of supplements

		technique or dosage.			
District Stakeholders Feedback: KIIs					
-Benefits of supplements to alleviate stunting not understood	-Transport allowance is not regularly provided for restocking and transport of supplements	-LHSs stated that LHWs need more education and training on community awareness Poor record keeping by LHWs		-LHWs focused more on anti-polio drives and family planning Multiple commitments make it difficult to effectively run supplement program	

Discussion

There is an increasing interest in use of food supplements to control stunting, however evidence from trials remains inconclusive meriting the qualitative examination of factors that can constrain or facilitate effective use of supplements by targeted vulnerable groups. We contribute evidence on factors influencing community uptake of food supplements to feed into the design of future food supplementation programs for countering stunting in food insecure settings.

Survey findings showed consumption of full dosage of supplements by intended target groups was sub-optimal for all three supplements, despite reasonable knowledge levels amongst care-givers. Quantitative findings also showed receipt of partial supplies by several households, forgetting to pick up supplies, and sharing of supplies with other household members. Sharing was commonly seen for WSB and LNS but much less for MNP. Qualitative findings from community FGDs indicated that the community did not perceive stunting as a problem. While community members were willing to utilise food supplements if provided free of cost there was little willingness to pay (WTP) for the supplements. Qualitative findings also indicated that WSB was well accepted as an extra ration and LNS was popular due its chocolaty taste and texture, whereas MNP sprinkles were perceived to be of little value, and was mistrusted with complaints of dislike by children, perceived to damage the prepared food, and linked with diarrhea. Cultural food practices led to common sharing with household members. Interaction with health workers was minimal for nutrition counselling at food pickup points and during households visits, and encounters were usually linked to Polio campaigns.

FGDs with CHWs and KIIs with district stakeholders corroborated poor awareness in the community as well as shortfalls in the food supplementation delivery process. A common thread of identified issues related to community health workers in terms of LHWs being multi-tasked, poorly trained in BCC, less attention to reporting on supplement distribution and overall weak attention to food supplementation in supervision. Reluctance was reported from CHWs and CHW field supervisors to absorb food supplementation into their regular routine of work unless supported by extra work stipends, and even then it was felt to overstretch their capacity to deliver. Reliance on CHWs to transport heavy supplies was considered problematic as transportation expense was not disbursed or

timely availed. KIIs from district stakeholders also felt the need for more concerted community awareness as well as wider sharing of food monitoring information with public stakeholders.

Evidence on food supplementation is mostly from the controlled environment of trials. Trials conducted in Ghana, Haiti, Peru, Bangladesh and Malawi show wide acceptability of food supplements (10-12, 22, 23). However evidence from Ghana and Malawi found low willingness to pay for food supplements in households indicating continued subsidization in provision of food supplements (24). Sharing of supplements with other household members has been reported in at least two other studies that highlighting cultural imperatives to feed all family members and motherly instinct to share food among all her children that can hinder deliberative targeting of food supplements (10, 11). Other studies have also found that the distance of the collection point, delay in funds and supplement distribution affected the delivery and use of the supplements (25-27). There is less evidence body on community health workers and their role in supporting food supplement usage, with some evidence indicating inadequate capability of the community workers detrimentally impacting food supplements usage (26, 28).

The strength of our study is that firstly it is not confined to a controlled trial environment in investigation of community uptake of food supplements. Secondly it explores different parameters of uptake drawn from available literature including value, acceptability, receipt of food, usage compliance and targeting compliance. Third, it applies a diverse range of quantitative and qualitative methods to explore food uptake and also distills findings across the levels of community, health workers and district supervisors. Finally, it inductively picks up issues related to community health worker delivery as part of village based food supplement distribution, an area that has been extensively explored in existing body of literature and provides powerful compelling reasons that need to be acted on to improve food uptake. A limitation of the study is it is a cross-sectional study and hence at least the quantitative findings are limited to supplements received and used in the last month, however the qualitative investigation draws on accumulative experience over time. Our study is a descriptive study and does not attempt to test a specific hypothesis and assign quantitative scores.

We conclude that provision of food supplements to vulnerable populations must be rolled out with caution, with careful attention to village based dynamics in design of effective programs. Community acceptability of food supplements does not translate into optimal consumption, instead a greater emphasis is needed on demand creation amongst caregivers, countering food sharing practices, and moving from sole reliance on community health workers to a broadening of food delivery and behavioural change options. Our study also underscored a body of findings related to community health workers with low motivation, multi-tasking, poor behavior change skills, inadequate supervision impacting on food supplement distribution and awareness creation. We contend that the sole reliance on community health worker program delivery is clearly insufficient for effective rollout of food supplementation programs, with investment for multi-pronged behavioral interventions to create demand and alternative delivery systems.

Abbreviations

ERC: Ethical review committee

FGD: Focus group discussion

IYCF: Infant and young child feeding practices

KIIs: Key informant interviews

LHW: Lady health worker

LMICs: Low-income and middle-income countries

LNS: Lipid-based nutrient supplements

MNP: Micronutrient powder

NBC: National Bio-ethics committee

PDHS: Pakistan demographic health survey

PLW: Pregnant and lactating woman

PPS: Proportion to population size

UCs: Union councils

WHO: World Health Organization

WSB: Wheat soya blends.

WTP: Willingness to pay

Declarations

Ethics approval and consent to participate: The project obtained ethical approval from the Ethics Review Committee (ERC) of Aga Khan University (GN: 2919-Ped-ERC-14) and the National Bioethics Committee (NBC) (4-87/14/NBC-147/RDC/624) of the Pakistan Medical and Research Council. Written informed consent was obtained from survey participants prior to collection of data.

Consent for publication: Not applicable

Availability of data and materials: The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests

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