

Determinants of Micronutrient Fortified Blended Food (Balbhog) Consumption among Children 6–35 Months of Age Provided through the Integrated Child Development Services Program in Gujarat, India

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Abstract

Context: The state of Gujarat had introduced Extruded Fortified Blended Food, Balbhog, as take-home ration for children 6–35 months of age. The study aimed to understand awareness, availability, and consumption pattern of Balbhog and gain insights on factors influencing its regular use. **Aims:** This study aims to understand coverage and feeding practices of micronutrient fortified blended food (Balbhog) and determine factors for its regular use. **Subjects and Methods:** A cross-sectional survey of 1623 households with children of 6–35 months of age registered in Anganwadi centers was conducted in the four districts of Gujarat. Household and dietary survey were conducted to understand child care and feeding practices at household level. **Results:** The results showed high awareness about Balbhog (88.6%) among caregivers, with majority reporting using it (81.7%) before. Regular Balbhog consumption (42.2%), however, declined considerably across all population characteristics. Monthly distribution of adequate Balbhog packets, taste of Balbhog preparations, meal frequency of children, and caregivers' participation in the monthly Integrated Child Development Services (ICDS) event emerged as strong predictors of regular Balbhog consumption. No disparity in consumption was observed across socioeconomic characteristics of the population. **Conclusion:** Household feeding practices and ICDS program factors mediated regular use of Balbhog among children. Improving availability of entitled Balbhog packets, raising awareness about Balbhog preparations, and improving child feeding practices could help in increasing Balbhog consumption in the community.

Keywords: Anganwadi worker, determinants, fortified food, Integrated Child Development Services, take-home ration

INTRODUCTION

India accounts for almost 40% of the undernourished children in the world^[1] and responds to this challenge through Integrated Child Development Services (ICDS) program. ICDS program is delivered from Anganwadi centers (AWCs) by Anganwadi Worker – appointed on every 1000 population. The ICDS program in Gujarat which was launched in 1975, currently covers 5.2 million beneficiaries (children under 6 years, pregnant women, lactating mothers, and adolescent girls) through 52,649 operational AWCs.^[2] Although the program coverage has increased over the years, implementation challenges regarding targeting of services to eligible households and promotion of appropriate complementary feeding practices still exists.^[3] While broad program guidelines are provided by the central government,

the Government of Gujarat has introduced many initiatives to improve nutritional status of its population.^[2] Under supplementary nutrition programme (SNP), government had introduced micronutrients fortified take-home ration (THR) premixes – Balbhog for children and Sheera, Upma, and Sukhadi for pregnant women, lactating mothers, and adolescent girls.^[4]

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Fortification of staple foods has limited impact on young children due to its inadequate consumption.^[5,6] Extruded Fortified Blended Food products (EFBF) are now being viewed as an important intervention to address child malnutrition and their impact on children's growth and development exists in many countries.^[7-10]

Balbhog is a micronutrient-rich EFBF product and is made out of wheat (40%), bengal gram (12%), defatted soyabean (12.5%), edible oil (12%), and sugar (28%) with addition of selected micronutrients.^[2] Daily intake of Balbhog provides 33% of the Recommended Dietary Allowances (RDA) of calories and proteins and 50% RDA of micronutrients. All 6–35-month age children registered in AWC are entitled for seven Balbhog packets (500 g each) every month, and about 1.8 million children receive Balbhog as part of SNP in the state.^[2] The objective of our study was to determine awareness, accessibility, and usage of Balbhog in ICDS program areas of Gujarat and gain insights on factors influencing its regular use.

SUBJECTS AND METHODS

Study design and setting

A multistage cluster sampling was conducted to select 1623 children aged 6–35 months registered in the ICDS program. In the first stage, one district each (Surat, Jamnagar, Patan, and Dahod) was randomly selected from the four geographical regions of the state; in the second-stage ICDS, project sectors from each district were selected based on probability proportional to size; in the next stage, one AWC was randomly selected from each ICDS sector; and finally, children were randomly selected from the enlisted 6–35-month age children in the AWCs. A total of 1760 children were selected, and after nonresponse from 137 caregivers, we interviewed primary caregivers (mother) of 1623 children after obtaining their consent. The study protocol was approved by Institutional Ethics Committee of Public Health Foundation of India (TRC-IEC-78/10).

Survey instruments

A bilingual questionnaire (Gujarati and English) was designed and translated into the local language and backtranslated for validation. Female investigators – graduates from home science and food and nutrition department – collected data on: (a) socioeconomic and demographic characteristics; (b) infant young child feeding practices; (c) access and consumption of Balbhog; (d) access and utilization of ICDS and health services; (e) dietary intake in the past 24 h; and (f) food frequency pattern.

Statistical analysis

Before data entry, supervisors checked questionnaires for its completeness and correctness. Double data entry was made using Microsoft Access. For analysis, all Balbhog preparations were clubbed under Balbhog, and its consumption of at least five times a week was considered as regular use for the study. Multivariate analysis using logistic regression was conducted

to identify determinants of regular Balbhog use. $P < 0.05$ was considered as statistically significant. SPSS (IBM SPSS, Version 19.0. Armonk, NY: IBM Corp) was used for data analysis.

RESULTS

Awareness and consumption of Balbhog

Out of the total 1623 children, 43% of children were in 12–23 months' age group, 78% children were from rural areas, 39% belonged to other backward class, and 90.4% were Hindus. Majority of the caregivers were in the 15–24-year age group and had received no formal schooling. Table 1 shows conditional analysis for Balbhog use by children among those caregivers who (a) had heard of Balbhog and (b) have both heard and reported to have previously given it to children. High awareness about Balbhog (88.6%) existed across all population groups. However, when having heard of Balbhog was controlled for in the analysis, the percentage of caregivers who have previously used Balbhog before (81.7%) declined marginally for each of the population characteristics. The decline was much more substantial across all population characteristics among regular Balbhog users (42.2%) when awareness and prior use were controlled for in the analysis. For example, 81.6% scheduled caste caregivers had previously used Balbhog, but 49% were its regular users. Likewise, among lowest wealth quintile caregivers who had used Balbhog before (85%), about 46% used it regularly.

Age of introduction to Balbhog

Mean age for introducing Balbhog to children was 8.9 months; 62% children were introduced to Balbhog between 6 and 9 months' age. Proportionally, more children from scheduled caste (65%), residing in rural areas (64%), and from district Patan (66%) were introduced to Balbhog between 6 and 9 months' age than children from other caste groups, districts, and urban areas.

Distribution of Balbhog packets

All registered children in 6–35 months' age group are entitled for monthly seven Balbhog packets of 500 g each from AWC. Our result showed that households received average 5.0 ± 3.0 packets (range: 0–10 packets) in the last month preceding the survey. Among the regular Balbhog users ($n = 1175$), 43% received recommended 7 or more Balbhog packets; 28% received between 4 and 6 packets; 29% received 1–3 packets; and 8.7% received no packets in the month preceding the survey (detailed results not shown). The analysis indicated that distribution of entitled 7 packets was more likely to be in rural (44.6%) versus urban (35%) areas, in lowest wealth quintile (51%) versus highest wealth quintile group (37.2%) and in Patan district (59%) compared to other districts ($P < 0.05$).

Additional ingredients during Balbhog preparation

Balbhog is positioned as a precooked food requiring no additional ingredients during preparation. Our 24-h dietary

Table 1: Balbhog awareness and use, conditional analysis by population characteristics

Background characteristics	Number of children (n)	Heard of Balbhog (%)	Previously used Balbhog (among those who have heard of Balbhog) (%)	Regular Balbhog use (among those who have heard and previously used Balbhog) (%)
Residence				
Rural	1263	89.5 (1130)	82.0 (927)	42.6 (395)
Urban	360	85.6 (308)	80.5 (248)	40.7 (101)
District				
Dahod	410	94.9 (389)	84.1 (327)	50.5 (165)
Jamnagar	403	82.9 (334)	79.6 (266)	23.3 (62)
Patan	401	94.0 (377)	78.5 (296)	42.2 (125)
Surat	409	82.6 (338)	84.6 (286)	50.3 (144)
Religion				
Hindu	1468	89.6 (1316)	81.9 (1078)	41.6 (448)
Non-Hindu	155	78.7 (122)	79.5 (97)	49.5 (48)
Caste				
SC	158	86.1 (136)	81.6 (111)	45.0 (50)
ST	493	89.0 (439)	81.3 (357)	49.0 (175)
OBC	629	90.8 (571)	81.8 (467)	36.8 (172)
Others	286	84.6 (242)	80.2 (194)	40.7 (79)
Mothers' education				
No schooling	730	91.0 (664)	82.8 (550)	44.9 (247)
1-5	247	85.8 (212)	83.5 (177)	39.5 (70)
6-8	329	84.5 (278)	81.3 (226)	38.1 (86)
9-10	209	90.9 (190)	80.5 (153)	41.8 (64)
10+	108	87.0 (94)	73.4 (69)	42.0 (29)
Wealth index				
Lowest	323	92.9 (300)	85.0 (255)	45.9 (117)
Second	326	90.8 (296)	79.7 (236)	43.2 (102)
Middle	325	87.4 (284)	84.5 (240)	40.8 (98)
Fourth	326	86.5 (282)	78.4 (221)	40.7 (90)
Highest	323	85.4 (276)	80.8 (223)	39.9 (89)
Mothers' age (year)				
15-24	674	86.4 (582)	80.1 (466)	42.3 (197)
25-29	621	88.6 (550)	85.1 (468)	40.8 (191)
30-34	236	93.2 (220)	78.6 (173)	43.4 (75)
35+	92	93.5 (86)	79.1 (68)	48.5 (33)
Sex				
Male	866	89.1 (772)	80.3 (620)	41.5 (257)
Female	757	88.0 (666)	83.3 (555)	43.1 (239)
Age of child (months)				
6-11	376	81.9 (308)	64.0 (197)	43.1 (85)
12-23	696	90.7 (631)	84.8 (535)	39.6 (212)
24-6	551	90.6 (499)	88.8 (443)	44.9 (199)
Total children	1623	88.6 (1438)	81.7 (1175)	42.2 (496)

SC: Scheduled Caste, ST: Scheduled Tribes, OBC: Other backward class

survey results showed that caregivers put additional ingredients during Balbhog preparation to improve its palatability – 58% caregivers added sugar or Jaggery and 77% added additional oil or ghee (clarified butter) while cooking Balbhog.

Determinants of regular Balbhog consumption

Multivariate analysis using logistic regression was used to identify potential factors influencing regular Balbhog

consumption [Table 2]. Among ICDS and community health events, participation of caregivers in Annaprashan Diwas was significantly associated with regular use of Balbhog (adjOR = 1.65; 95% confidence interval [CI]: 1.24–2.19). Among feeding practice variables, frequency of meals had a significant effect on regular Balbhog consumption, likelihood of regular use increased with increase in the number of meals in a day (4+ meals adjOR = 2.92 95% CI: 1.53–5.59; 3 meals

Table 2: Determinants of regular Balbhog use among 6-35-month age children

	Adjusted OR	CI	P
Balbhog packets received last month			
≤3 (RC)	1.00		0.02
4-6	1.81*	1.26-2.61	
7+	2.04*	1.45-2.89	
Participated in Annaprashan Diwas			
No (RC)	1.00		0.04
Yes	1.65*	1.24-2.19	
Meal frequency of children in a day			
≤1 (RC)	1.00		0.01
2	2.30*	1.13-4.67	
3	2.72*	1.38-5.34	
4+	2.92*	1.53-5.59	
Taste of Balbhog			
Dislike (RC)			0.02
Like	1.99*	1.36-2.91	

*Significant at $P < 0.05$ Adjusted for age, sex, caste, mother's education, residence, wealth status, household size, media exposure, participation in Mamta Diwas and growth monitoring events and perceived Balbhog quality. RC: Reference category, CI: Confidence interval, OR: Odds ratio

adjOR = 2.72, 95% CI: 1.38–5.34; 2 meals adjOR = 2.3, 95% CI: 1.13–4.67). The result showed that children consuming 4 or more meals in a day were about 3 times more likely to be regular user of Balbhog than children consuming one meal.

Adequate distribution of Balbhog packets and Balbhog's taste also emerged as important factors influencing its regular use. Caregivers who received the entitled seven or more Balbhog packets were two times more likely to be regularly feeding Balbhog to their children than caregivers receiving <3 packets (adjOR = 2.04; 95% CI: 1.45–2.89). Likewise, the odds of regular Balbhog consumption was two times more among children who liked the taste of Balbhog preparation than those who disliked its taste (adjOR = 1.99; 95% CI: 1.36–2.91). No social, economic, and demographic factors emerged as a predictor for regular Balbhog use.

DISCUSSION

Awareness of fortified food supplements is an important factor for its use.^[11,12] The results show high awareness and coverage of Balbhog in the AWC areas. The awareness and prior use of Balbhog were proportionally more in disadvantaged groups – rural areas, tribal district, and the lowest wealth quintile – than in advantaged groups, indicating proper targeting of the product to the vulnerable population. We found regular consumption of Balbhog was not influenced by socioeconomic and demographic factors but was mediated by the child feeding practices, preparation methods, participation in Annaprashan Diwas, and adequate distribution of packets in households.

A key factor for acceptability of a food product by children is its taste.^[9,13] The result shows that liking for Balbhog's taste by children significantly influenced its consumption. The perception about taste and quality of Balbhog was varied among caregivers – many caregivers appreciated the sweetness and texture, while some complained about its foul odor, lumps, and poor taste. To make Balbhog palatable to children, caregivers added additional ingredients or made small variations during preparation. This finding is consistent with another study where Balbhog prepared in plain boiling water did not come out well, and caregivers used additional ingredients (sugar or Jaggery, oil, ghee, and milk) to improve preparation consistency and sweetness.^[14] Although Balbhog is positioned as ready to eat product, additional ingredients were perceived as extra cost by many families and were not used by many families. Caregiver's knowledge of additionalities and their affordability seemed critical for improving Balbhog's taste and increasing its acceptability among children.

Adequate distribution of Balbhog packets emerged as a strong predictor for its regular consumption. Usage of Balbhog depended on its availability at home, and households that received entitled packets were more likely to be its regular user than households which received less number of packets. The audit of AWCs done during the same survey found almost all AWCs had received stipulated supply of Balbhog packets in the last 3 months preceding the survey, but its distribution to eligible households was average 4.8 packets per month. Inadequate distribution of packets to households, despite their availability in AWCs, was due to diversion of packets to noneligible households, as well as low demand for the product by children due to its inferior taste. Further analysis of Balbhog distribution system at AWCs can help ICDS staff identify and resolve bottlenecks in the distribution chain.

The likelihood of regular Balbhog use increased with number of meals given to children in a day. In our study, caregivers who fed meals to their children at regular intervals also consciously included Balbhog in their children's diet leading to its increased consumption. Intrahousehold sharing of food provided through supplementary feeding program remains a major concern for the program. Various targeted feeding programs have highlighted that 50%–75% of the ration does not reach the intended recipient due to sharing with family members.^[15] Similar findings were also reported from our study with Balbhog being shared with other children and household members.

Among the monthly health and ICDS events in community – Mamta Diwas, Annaprashan Diwas, and growth monitoring visits to AWC – participation in Annaprashan Diwas was significantly associated with regular Balbhog consumption. The Annaprashan Diwas strategy to demonstrate Balbhog preparations in mother's groups on a fixed day of the month influenced its regular use than promoting it in open village event like Mamta Diwas where focus remains on immunization services and distribution of THR premixes to beneficiaries.

CONCLUSION

The results highlight that regular Balbhog consumption is mediated by individual, household, and programmatic level factors and is not influenced by socioeconomic and demographic factors. Adequate counseling of caregivers on Balbhog is therefore important for its promotion, use, and compliance. To improve consumption, caregivers need to be made aware about Balbhog preparations that are tastier and acceptable to children. Balbhog's contribution of providing essential micronutrients to attain adequate physical and mental growth in children needs to be stressed to improve its targeting and demand. Estimation of actual beneficiaries in AWC catchment areas and reaching out to them will be crucial for improving Balbhog availability in households. Future inquiry in the state should focus on examining frontline worker's capacity to counsel caregivers on IYCF practices and Balbhog. Once implementation issues have been adequately addressed, further research will be useful to assess impact of Balbhog on nutritional status of children.

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Conflicts of interest

There are no conflicts of interest.

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