Dealing with Child Undernutrition Using Local Foods: Experience from Bangladesh

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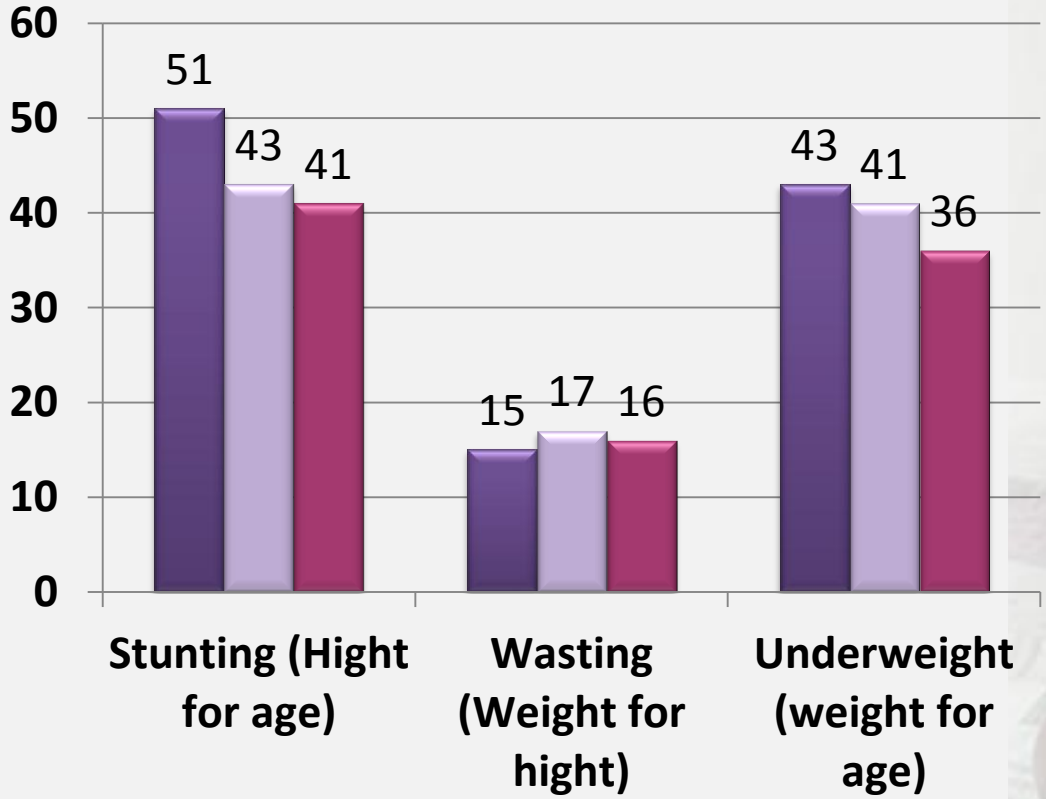
Child Malnutrition Situation in Bangladesh

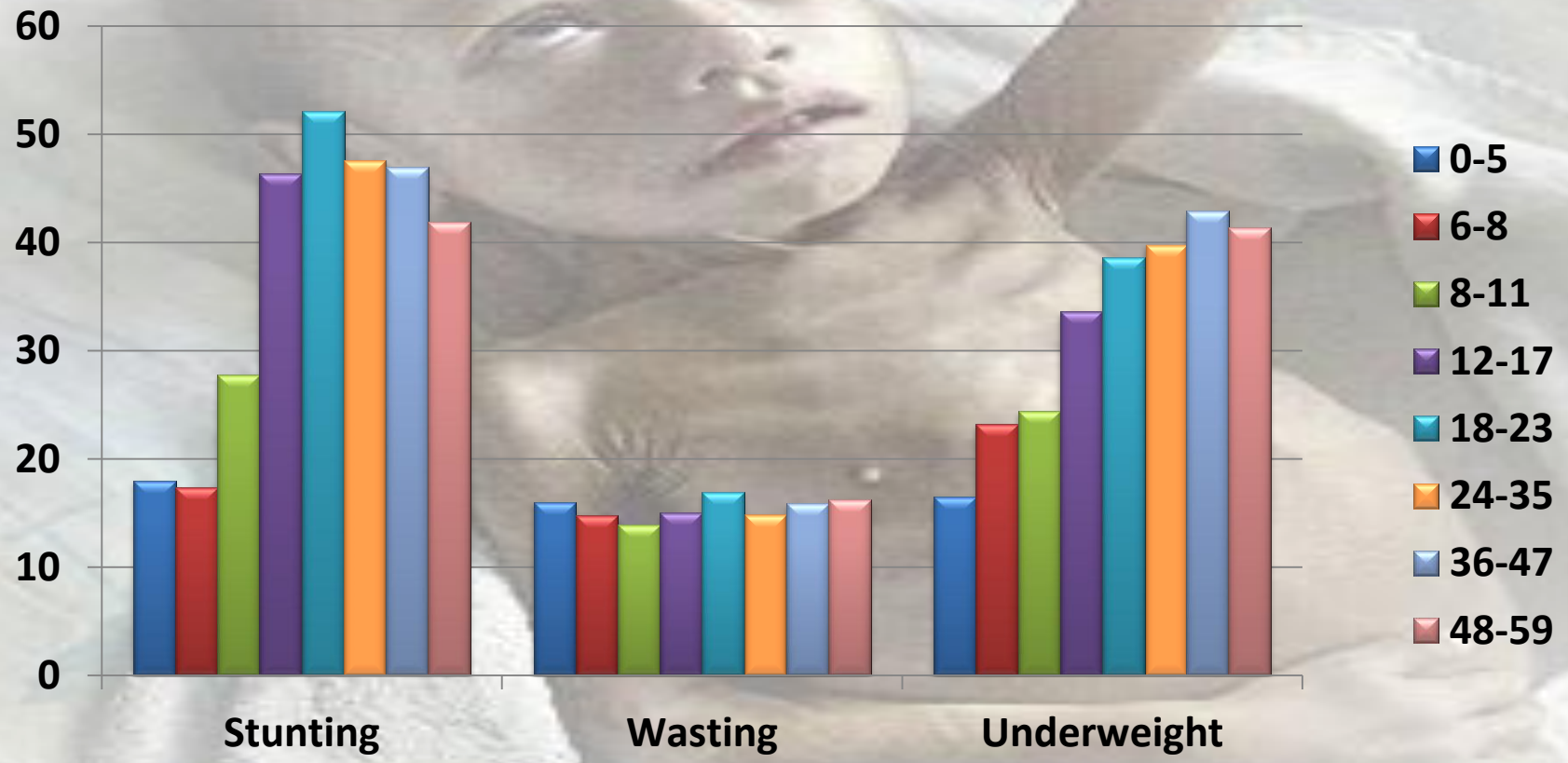
Bangladesh Breastfeeding Foundation

Child Malnutrition in Bangladesh



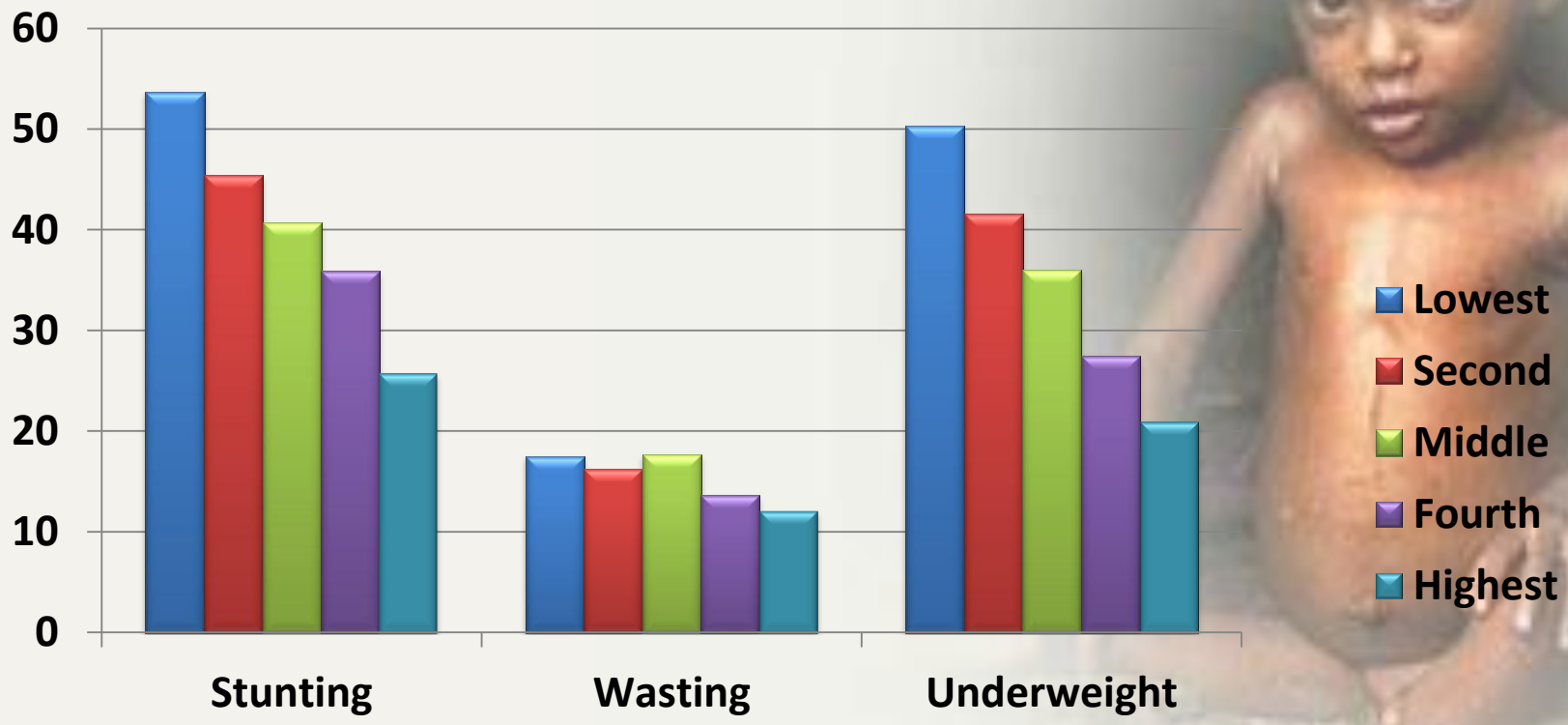
Source: BDHS 2011

Prevalence of malnutrition among under-five children according to age (mo)



Source: BDHS 2011

Prevalence of malnutrition among under five children according to socioeconomic quintiles



Source: BDHS 2011

Risk factors for Malnutrition of Under-nutrition Children in Bangladesh

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Risk Factors (OR) for Malnutrition in Under five Children

Factors	Stunting	Wasting	Under-weight
Previous Birth Interval			
0-23 months	1.545	---	1.409
24-47 months	1.355	---	1.204
48+ months	1.000	---	1.000
Size at Birth			
Very small	2.083	1.885	3.933
Smaller than Average	1.790	1.690	2.226
Average/Larger	1.000	1.000	1.000
Mother's Body Mass Index			
Acute malnourished mother	---	1.000	1.000
Nourished mother	---	0.594	0.620

Source: Rayhan et al.;2006

Cont.....

Factors	Stunting	Wasting	Under-weight
Father's education			
No education	---	---	1.000
Primary level attendant	---	---	0.988
No education	---	---	0.702
Mother's education			
No education	1.000	---	---
Primary level attendant	0.894	---	---
Secondary or higher level	0.629	---	---

Source: Rayhan et al.;2006

Dealing with child under nutrition using local food

Bangladesh Breastfeeding Foundation

Controlled trial of three approaches to the treatment of severe malnutrition

- **Treatment group:**
- **Inpatients:** **Children were admitted with their mothers and were resident until they reached 80% wt/ht.**

- **Daycare:** **Children came with their mothers from 800 to 1700 h every day except Friday, until 80% wt/ht was reached.**

- **Care at home:** **Children were treated in the day-care facility for 7 days**

Thereafter they were visited at home weekly for one month, then twice monthly until they reached 80% wt/ht.

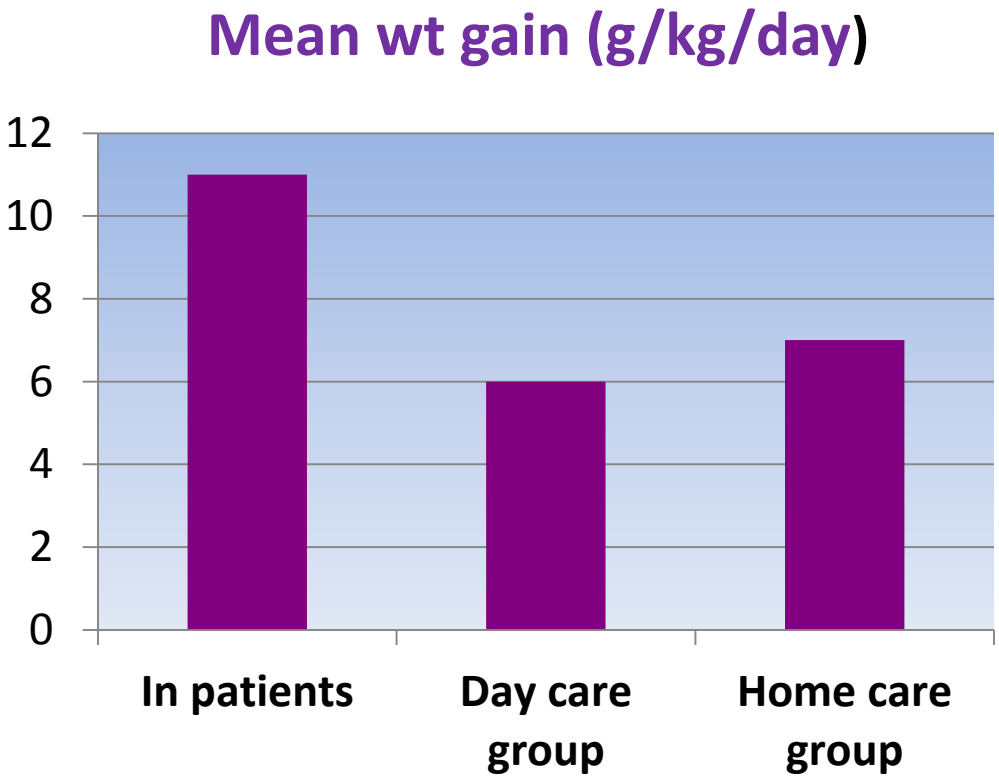
Source: Sultana Khanum et al; 1994

Diet

	Inpatients	Daycare patients	At-home patients
1st week	• 80-100 mL/kg per day of modified milk (75 kcal and 1-5 g protein/100 mL) 2-hourly, • 4 rice-based salt-free meals.	• 2-hourly milk feeds • 3 rice-based salt-free meals	parents were advised to give • 2 further milk feeds • 1 meal at home.
Weekend	4 cups of milk and 4 rice-based meals	4 cups of milk and 4 rice-based meals	4 cups of milk and 4 rice-based meals
2nd week	• 4 milk feeds (120-150 mL/kg per day) of high-energy milk (100 kcal and 3 g protein/100 mL) • 3 rice-based salt-free meals • 2 snacks.	• 3 milk feeds • 3 rice-based salt-free meals • 2 snacks	Mothers were advised to give •1 further milk feed • 2 meals at home
2nd week onward	Mothers were asked to feed 3-4 milk feeds, 3 rice-based meals, and 2 snacks. The meals recommended for daily consumption were • rice pudding, • rice with dhal, • rice with pumpkin, dhal or potato, oil, • meat or fish(if affordable).		
In all groups: breast-fed patients continued to receive breast milk. For children aged >24 months, milk feeds were omitted and 4 rice-based meals and 2 snacks were fed			

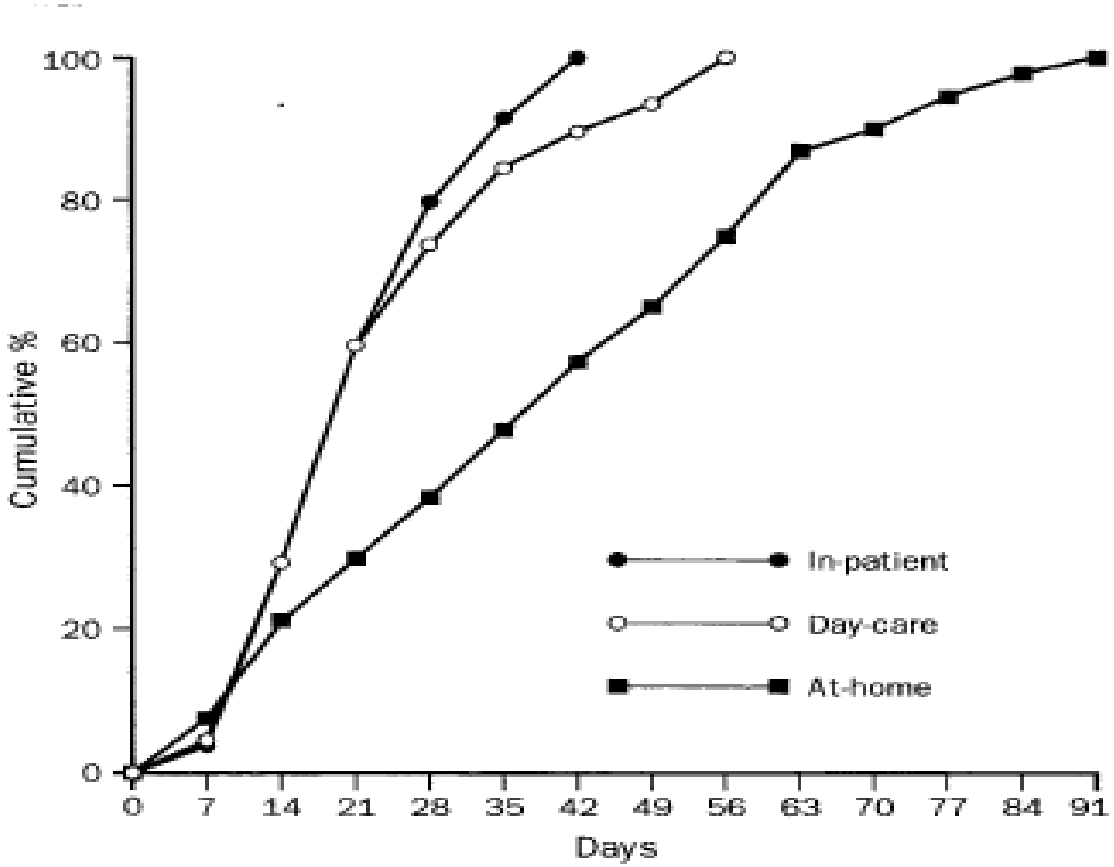
Source: Sultana Khanum et al; 1994

Mean weight gain of the children



Source: Sultana Khanum et al; 1994

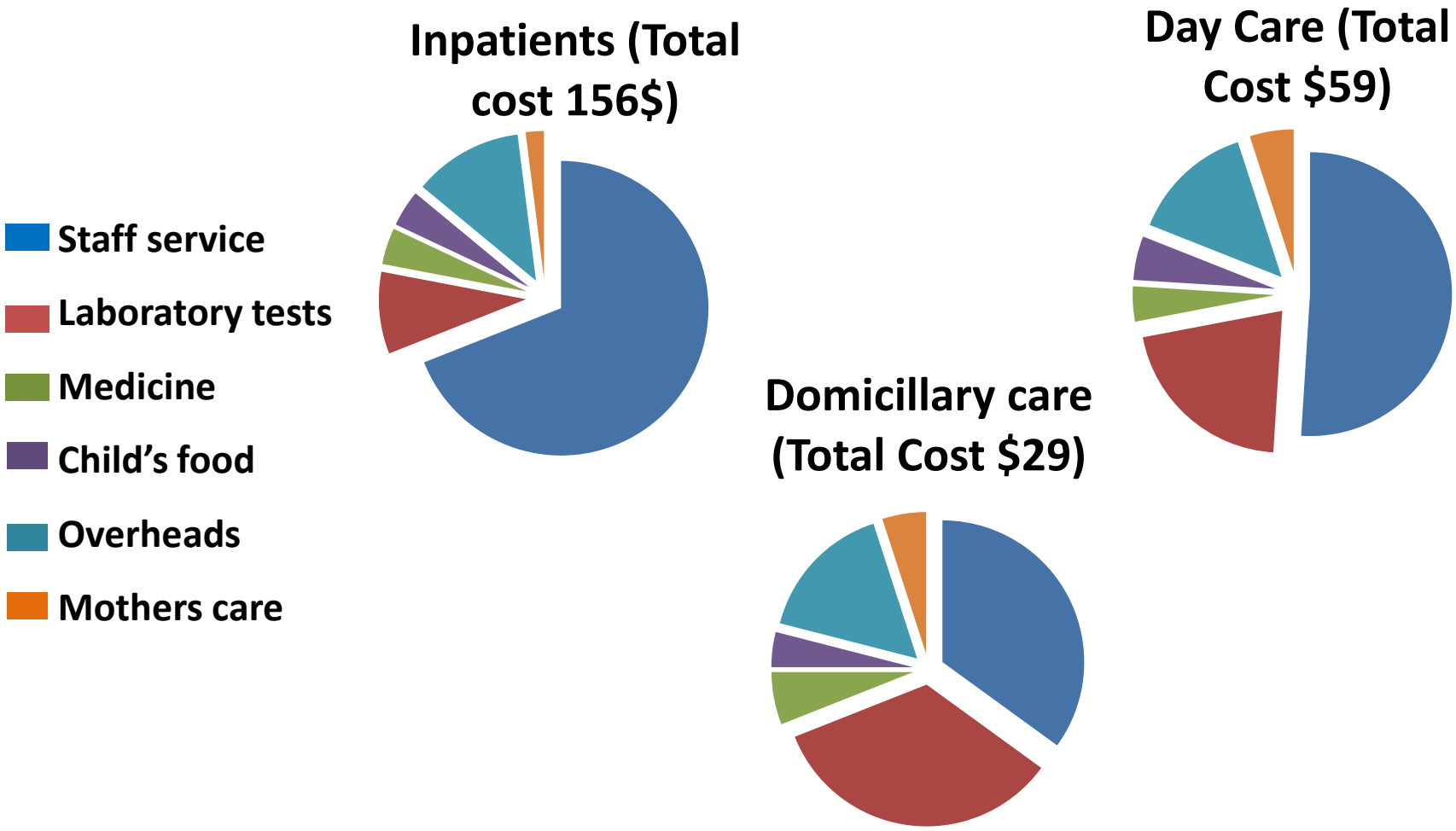
Days to achieve 80% weight-for-height interpolated for days 42, 56, 70, and 84 for at-home group



Footnote: interpolated for days 42, 56, 70 and 84 for at-home group

Source: Sultana Khanum et al; 1994

Cost effectiveness of treatment of severely Malnourished children



Source: Ann Ashworth and S. Khanum; 1997

Growth, morbidity, and mortality of children in Dhaka after treatment for severe malnutrition

Component of intervention	inpatients	Day Care Group	domiciliary group
Health and nutrition education and practical guidance for 20 min	Everyday	Everyday	During their initial week of daycare
Additional instructions on feeding children at home (How to feed, How much and how often)	Didn't received	Received	Received
Practical Session preparation of meal	Didn't received	Received	Received
Visited at home	Didn't visited	Didn't visited	• Weekly for 1 month • Then twice a month (until they reached 80% of weight-for-height)
Ad hoc advice	Didn't received Ad hoc advice	Didn't received Ad hoc advice	if any deleterious practices were observed

Source: Sultana Khanum et al.; 1998

Mean weight and height gain during the follow-up period according to treatment group

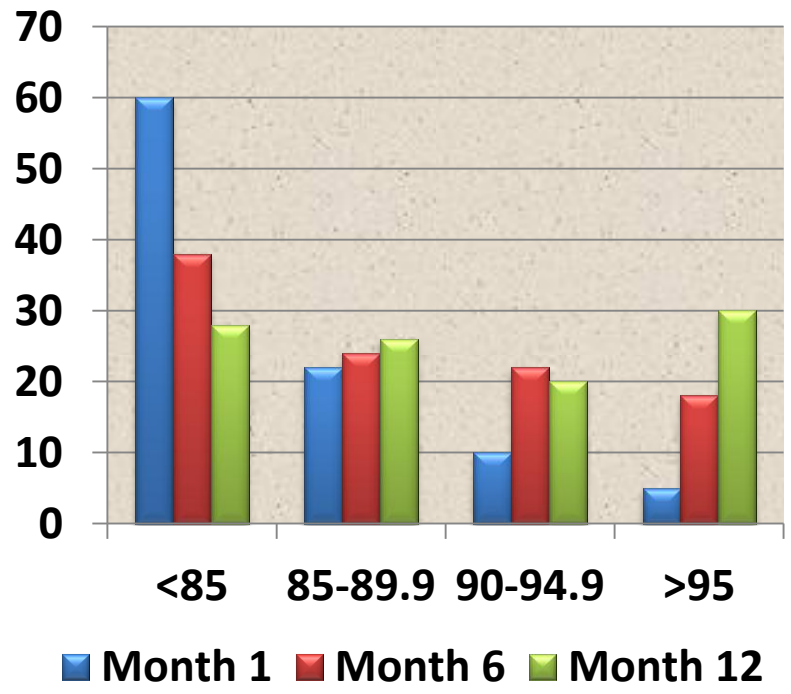
	Inpatient care (n = 118)	Daycare (n = 111)	Domiciliary care (n = 106)
Weight (kg)			
At start of follow-up	7.73 ± 1.81	7.46 ± 1.89	7.83 ± 2.00
Gain in 1 y	2.15 ± 1.12	2.39 ± 0.98	2.47 ± 1.13
Height (cm)			
At start of follow-up	73.3 ± 8.1	72.4 ± 8.4	74.4 ± 9.7
Gain in 1 y	6.4 ± 2.6	7.2 ± 2.3	7.3 ± 2.3

[1] $\bar{x}$ ± SD. There were no significant differences among groups (ANOVA).

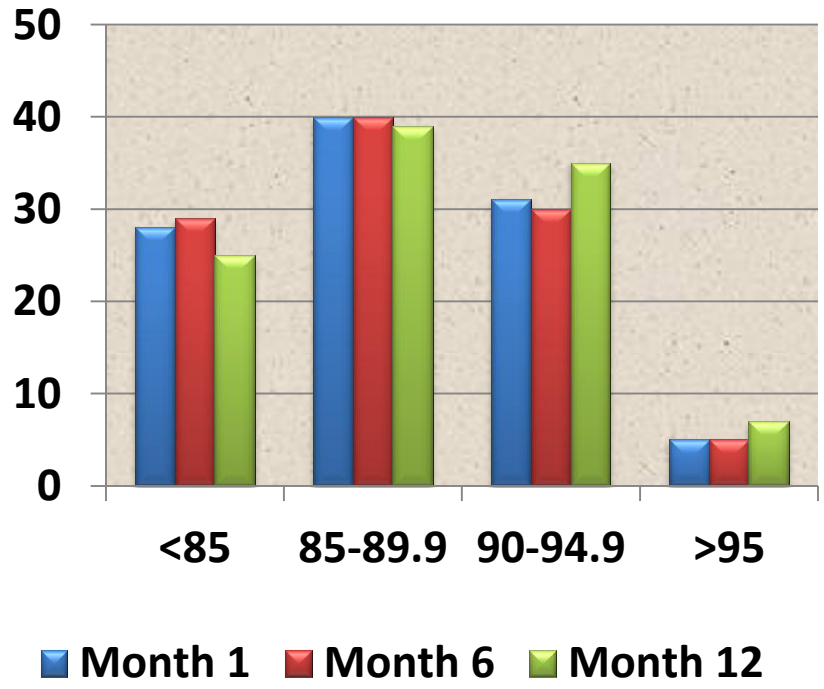
Source: Sultana Khanum et al.; 1998

Percentage distribution of weight-for-height and height-for-age after 1, 6, and 12mo of follow-up (n = 335).

Weight for height (%NCHS median)



Height for age (%NCHS median)



Source: Sultana Khanum et al.; 1998

Management of Severely Malnourished Children with Diarrhoea and use of a Standardized Management Protocol

Standard Protocol:

- **Dehydration was assessed by WHO criteria.**
- **Some dehydration was managed with rice-based oral rehydration solution (sodium 90 mmol/L, potassium 20, chloride 80, citrate 10; rice powder 50 g/L)**
- **In severe dehydration, initial hydration was done by intravenous.**
- **Oral rehydration solution 10 mL per kg per h was started after 1 h and continued as with less-severe dehydration.**

Source: T. Ahmed et al; 1999,

Standardize Feeding protocol

Feeding was begun immediately on admission	milk suji, given every 2 hours
Children with marasmus and marasmic kwashiorkor	
Day 1	10 mL/kg per feed (80 kcal/kg/day)
Day 2 and 3	12 mL/kg per feed (96 kcal/kg/day) on days
Day 4 onwards (if no diarrhoea)	12 mL/kg concentrated feed (milk suji 100, 144 kcal/kg/day)
Children with kwashiorkor	
Days 1 to 3	9 mL/kg per feed (72 kcal/kg/day)
Day 4 onwards. (if no diarrhoea)	9 mL/kg per feed special milk (108 kcal/kg/day)
Non-breast-fed infants younger than 4 months received a noncommercial, cow-milk-based infant formula. Mothers were advised to breast-feed every 30 min if necessary. Anorexic children were fed by nasogastric tube.	

Source: T. Ahmed et al; 1999,

Composition of diets (cooked volume 1 L)

Ingredients	Infant formula	*Milk suji*	*Milk suji* 100	Special milk
Whole milk powder (g)	60	40	80	100
Rice powder (g)	—	40	50	—
Sugar (g)	50	25	50	70
Soya oil (g)	20	25	25	30
Egg albumin (g)	—	—	—	25
Magnesium chloride (g)	0·5	0·5	0·5	0·5
Potassium chloride (g)	1	1	1	1
Calcium lactate (g)	2	2	—	—
Energy (kcal/100 mL)	68	67	100	100
Protein (g/100 mL)	1·5	1·4	2·6	3
Protein-energy ratio (%)	9	8	10	12
Fat-energy ratio (%)	47	47	40	58

Source: T. Ahmed et al; 1999,

Outcome by the treatment regimen

	Standardized protocol (n=334)	Non protocol (n=293)	P
Hospital stay (days)	4.5 (3-7)	4.5 (3-6.5)	0.7
Discharged [Number (%)]	245	186	0.006
Daily weight gain (g/kg)	4.4 (0-14)	3.5 (0-13.2)	0.1
Hypoglycemia developed during hospital day [Number (%)]	9(2-7)	17 (5-8)	0.05
No intravenous rehydration [Number (%)]	199 (59.5)	85 (29)	<0.001
Total intravenous infusion (ml)	0 (0-350)	385 (0-770)	<0.001
Died[Number (%)]	30 (9)	49 (17)	0.003

Source: T. Ahmed et al; 1999,

Nutrition Education with or without Supplementary Feeding Improves the Nutritional Status of Moderately-Malnourished Children in Bangladesh

Components of Intervention	Intensive nutrition education (INE) group	Supplementary feeding (SF) group	Comparison group
Intensive nutrition education	Twice a week.	Twice a week	fortnightly from the nutrition promoters of BINP
Supplementary feeding (Khichuri)	None	Six days in week. (300 kcal)	None

Source: S.K. Roy et al.; 2005

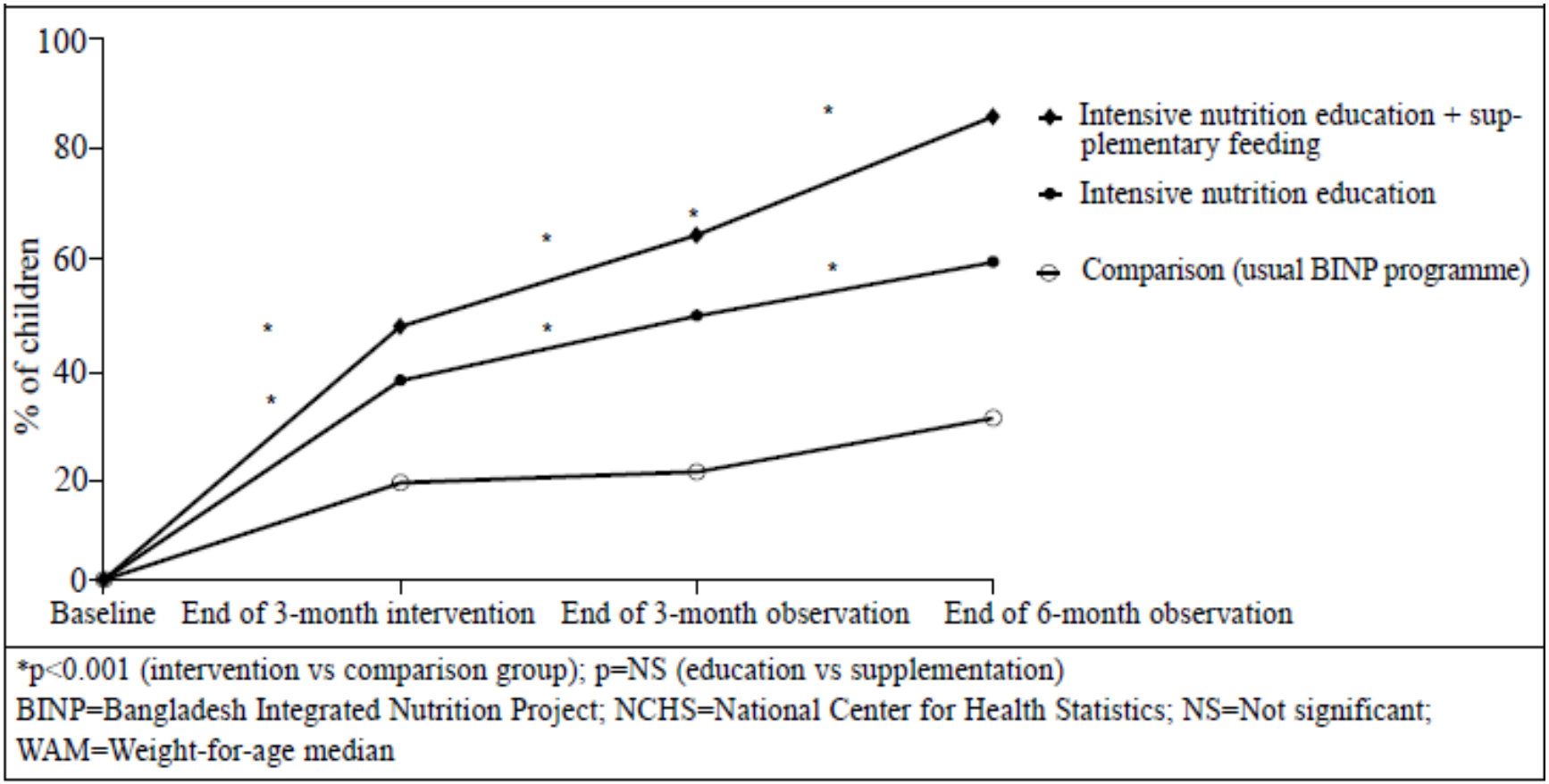
Ingredients of Khichuri

Ingredient	Quantity	Cost (Tk*)
Rice	2 fistful (65 g)	0.90
Lentil	1 fistful (25 g)	1.00
Oil	5 teaspoonfuls (18.8 g)	1.00
Potato	1 medium size (50.0 g)	0.60
Egg/meat/fish	1 piece (55 g)	3.00
Onion	1 medium (17.6 g)	0.40
Pumpkin/vegetables	1 piece (26.0 g)	0.20
Garlic/ginger	½ teaspoonful (4 g)	0.10
Salt	¾ teaspoonful (3 g)	0.04
Water	4 glasses	
Total cooked volume	650 g	
Calorie	678 kcal	
Protein calorie (%)	10.6	
Total cost	7.24	

*US$ 1.00=66.00 taka

Source: S.K. Roy et al.; 2005

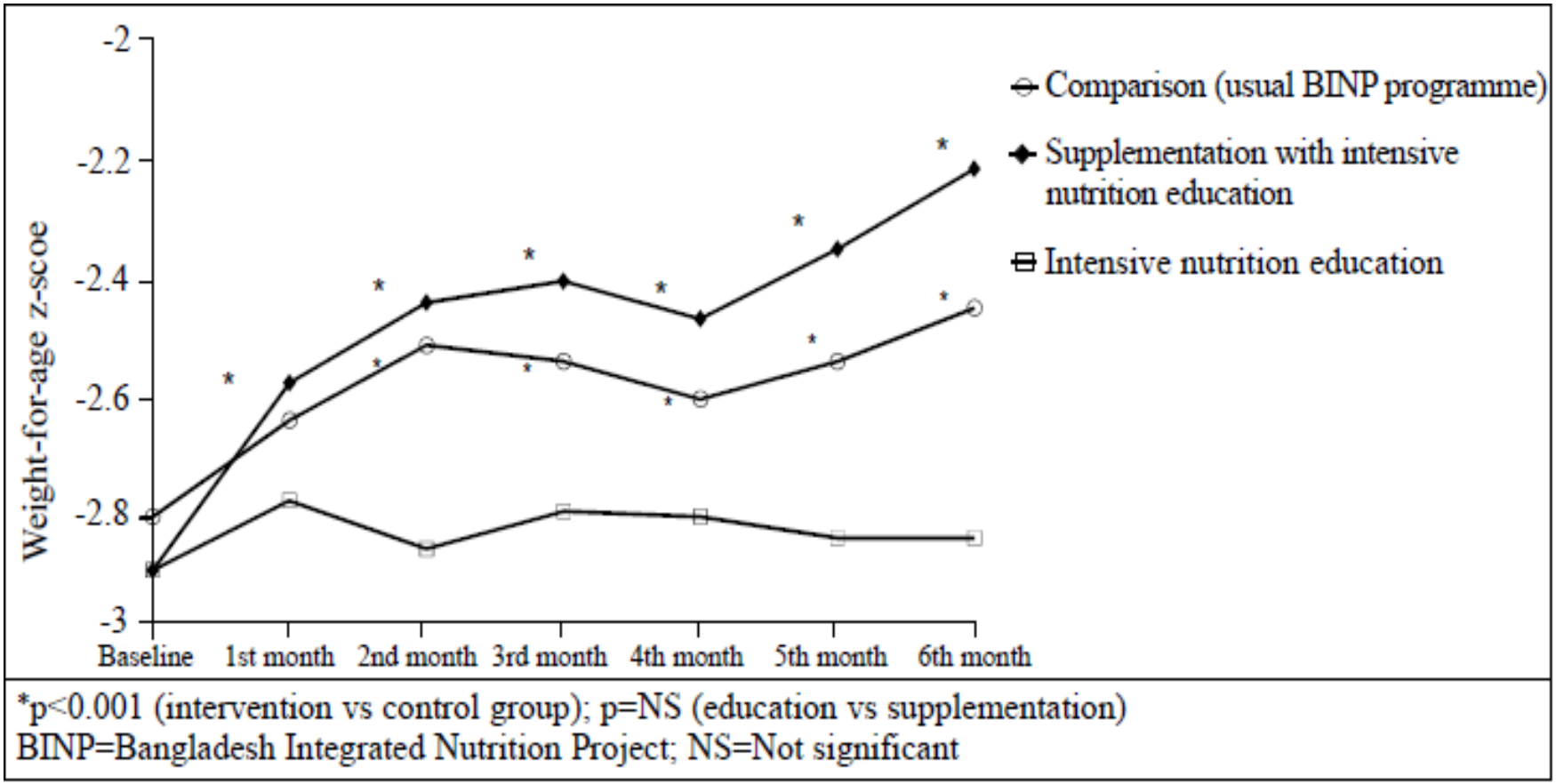
Proportion of children improved above 75% from baseline up to end of 6-month observation



*p<0.001 (intervention vs comparison group); p=NS (education vs supplementation)
BINP=Bangladesh Integrated Nutrition Project; NCHS=National Center for Health Statistics; NS=Not significant; WAM=Weight-for-age median

Source: S.K. Roy et al.; 2005

Growth (weight-for-age) of children during three-month interventions and six months observation

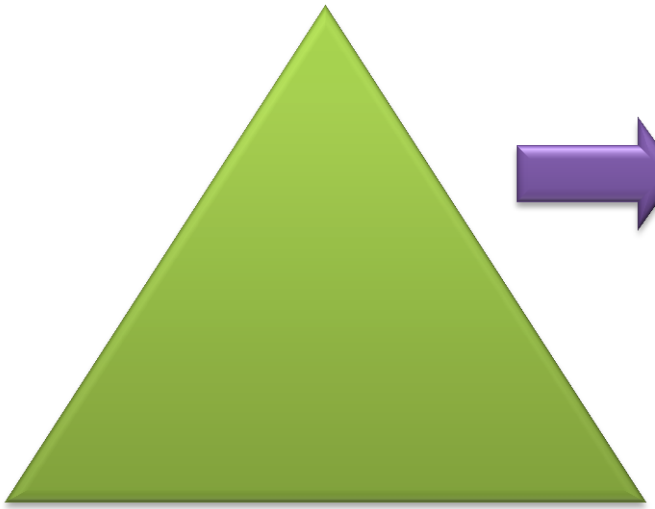


*p<0.001 (intervention vs control group); p=NS (education vs supplementation)
BINP=Bangladesh Integrated Nutrition Project; NS=Not significant

Source: S.K. Roy et al.; 2005

Component of intervention: Nutrition triangle (UNICEF)

Food Security



- Breastfeeding
- Complementary Feeding

Disease Control

Caring Practices

Source: S.K. Roy et al.; 2007

Prevention of Malnutrition using Home based food (Khichuri)

Components of intervention	
Nutritional education	Breast feeding, complementary food, introducing "khichuri" as complementary food and preparation, functions of food
Disease control	Identification of diseases, home management of common childhood diseases, proper referral of the sick children based on IMCI criteria.
Caring practices	child stimulation, personal hygiene and sanitation, allocation of extra time, care during illness and diseases

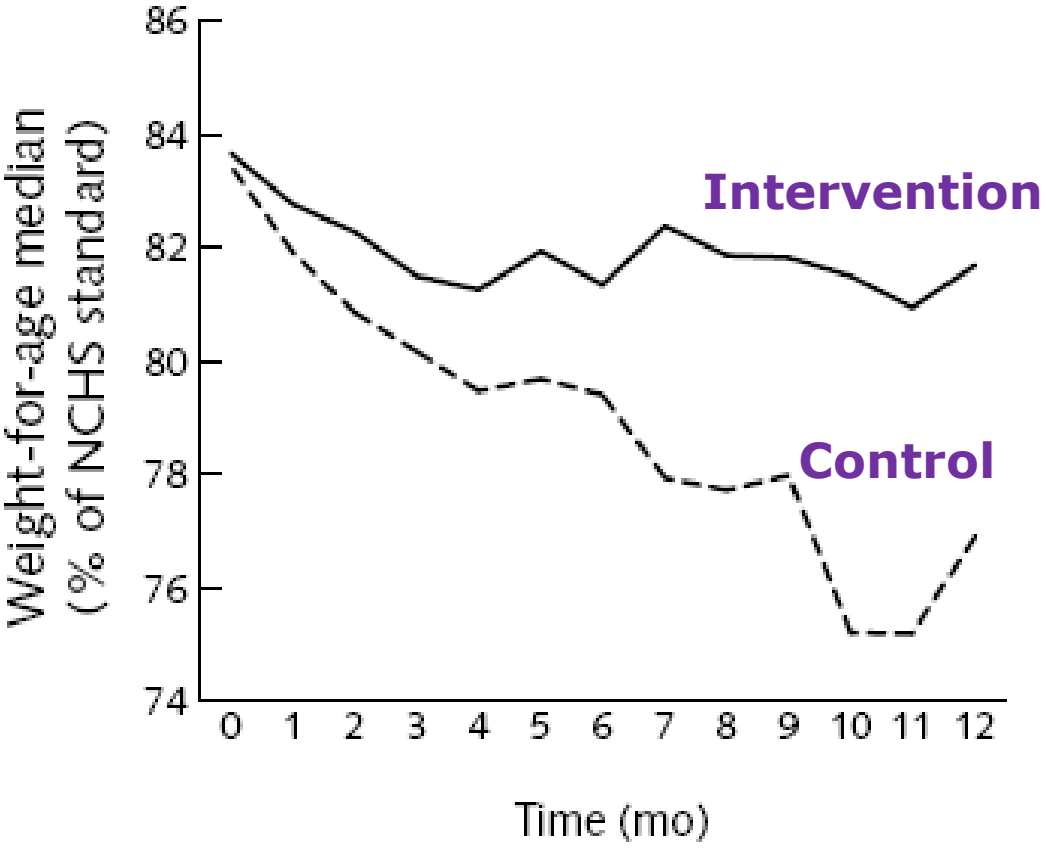
Source: S.K. Roy et al.; 2007

Continued...

Ingredients of khichuri	
Rice	2 fistful (65g)
Lentil	1 fistful (25g)
Oil	5 teaspoonfuls (18.8g)
Egg/Meat/ Fish	1 Piece (55g)
Green leafy vegetables	1 fistful
Total cooked volume	650g
Calorie	678 kcal
Protein	10.6

Source: S.K. Roy et al.; 2007

Mean weight-for-age median over the study period.



Source: S.K. Roy et al.; 2007

Experience of Managing Severe Malnutrition in a Government Tertiary Treatment Facility in Bangladesh

Intervention strategy	
Acute phase: initial treatment	Treatment and prevention of hypoglycaemia, hypothermia, dehydration, electrolyte imbalance, shock, infections and other problems, including vitamin A deficiency, severe anaemia, and heart failure.
In the Nutrition Unit	Mothers/caretakers were given locally-prepared therapeutic feed (special milk)—10 mL/kg Per feed Frequency: every two hours, day and night, during the initial 1-2 day(s).
Nutrition Rehabilitation Phase	The nutrition rehabilitation phase was begun with F-100 (The therapeutic diet for catch-up growth, was started).

Source: Md. Iqbal Hossain et al.; 2009

Special milk-1 (F-75 Formula)	
Dried whole milk	35
Sugar	100 g
Soybean oil	20
Water	1,000 mL
Filwel® silver tablet	1
Special milk-2 (F-100 Formula)	
Dried whole milk	110
Sugar	50
Soybean oil	20
Water	1
Filwel® silver tablet	1,000 mL

Source: Md. Iqbal Hossain et al.; 2009

Pattern of weight gain by age and sex (% of total)

Weight gain (g/kg/day)	% of total	6-12 months		13-24 months		25-36 months		37-60 months	
		Boys (n=14)	Girls (n=26)	Boys (n=18)	Girls (n=26)	Boys (n=13)	Girls (n=08)	Boys (n=10)	Girls (n=7)
No change in weight	3.7	7.1	0	5.6	0	0	0	10.0	0
Weight loss	19.8	7.1	26.9	5.6	3.8	23.1	37.5	40.0	14.3
Poor (<5)	14.7	14.3	0	16.7	23.1	7.7	0	30.0	42.9
Moderate (5-10)	30.9	50.0	26.9	44.4	42.3	23.1	25.0	0	28.6
Good (>10)	30.9	21.4	46.2	27.8	30.8	46.2	37.5	20.0	14.3

Source: Md. Iqbal Hossain et al.; 2009

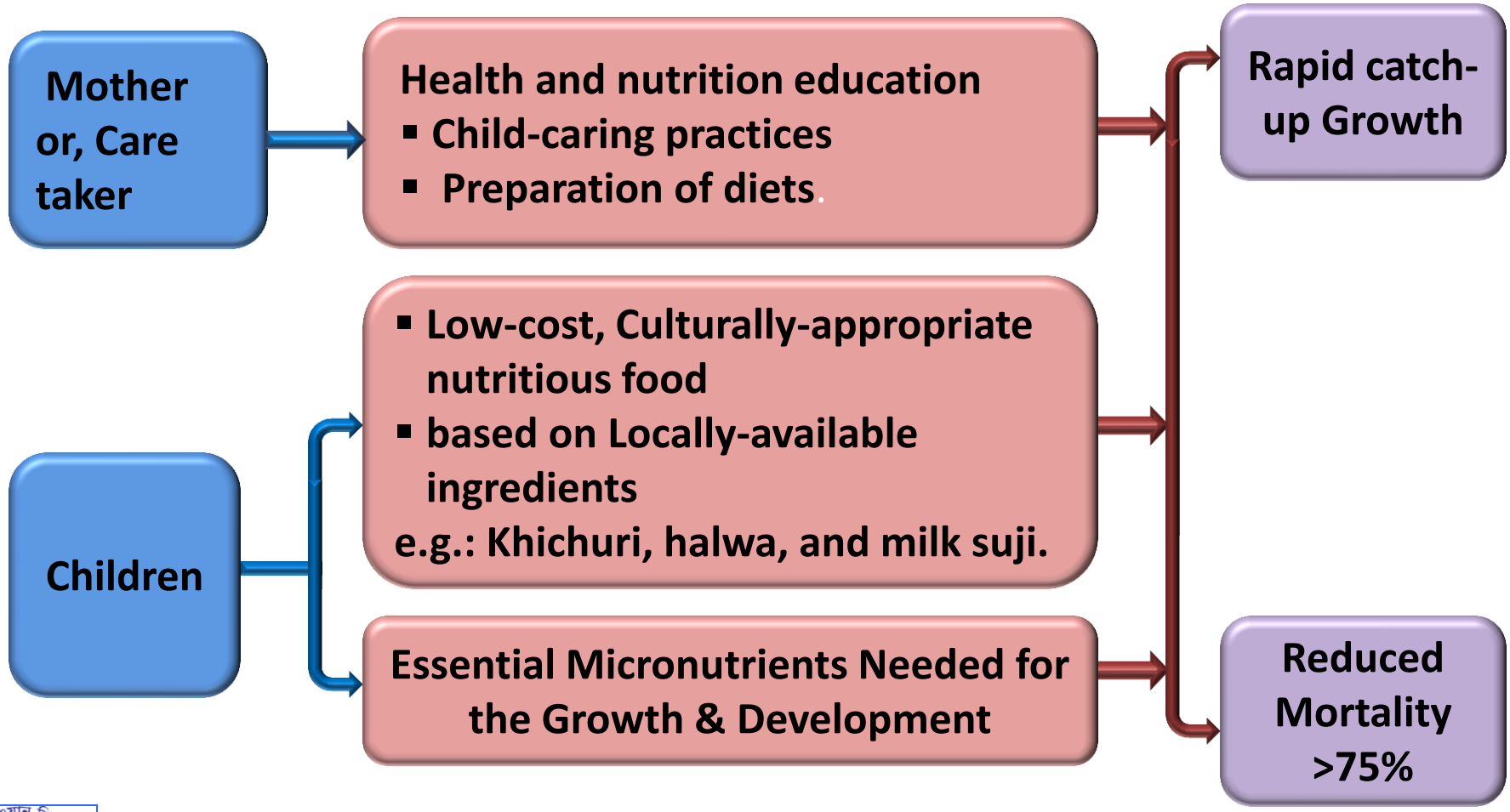
Comparison with indicators for monitoring therapeutic programmes

Variable	CMCH	Acceptable limits	
		Sphere standards*	WFP/UNHCR*
Recovery rate (%)	88.4	>75	>75
Death rate (%)	10.8	<10	<10
Mean±SD weight gain (g/kg/day)	7.73±8.30	>8	≥8
Mean±SD length of stay	14.81±6.94 (days) or 2 weeks approximately	3-4 weeks	<3-4 weeks
Defaulter (%)	19.3	<15	<15

*Sphere standards (13); WFP/UNHCR (14); CMCH=Chittagong Medical College Hospital; SD= Standard deviation; UNHCR=United Nations High Commissioner for Refugees; WFP=World Food Programme; W/H=Weight-for-height

Source: Md. Iqbal Hossain et al.; 2009

A Standardized diet protocol has been developed for management of severely-malnourished children



Source: Glimpse, September 2004,P:3-5

Ingredients of *halwa*

Ingredient	Amount	Energy (kcal)	Protein (g)
Wheat flour (*atta*)	7 ounces (200 g)	682	24
Lentils (*mashur dal*)	4 ounces (100 g)	343	26
Soybean oil	3 ounces (100 mL)	900	-
Molasses (brown sugar or *gur*)	4 ounces (125 g)	479	0.5
Water	600 mL (to make a thick paste)	-	-
Total weight of *halwa*	1,000 g	-	-
Total energy and protein per kg	-	2,404	50.5

100 g of cooked *halwa* contains 240 kcal energy and 5 g protein. One cup (130 g) of cooked *halwa* contains 312 kcal energy and 6.5 g protein.

Preparation: Soak *dal* in water for 30 minutes and then mash. Fry *atta* in a hot pan for a few minutes. Mix *atta*, mashed *dal*, and oil with water. Melt *gur* and add to the mixture to make a thick *halwa*.

Source: Glimpse, September 2004,P:3-5

Ingredients of khichuri

Ingredient	Amount	Energy (kcal)	Protein (g)
Rice	4 ounces (120 g)	415	8
Lentils (*mashur dal*)	2 ounces (60 g)	206	15.6
Soybean oil	2 ounces (70 mL)	630	-
Potatoes	4 ounces (100 g)	97	1.6
Pumpkin	4 ounces (100 g)	25	1.4
Leafy vegetable (*shak*)	3 ounces (80 g)	22	2
Onions (2 medium size)	2 ounces (50 g)	25	-
Spices (ginger, garlic, turmeric, coriander powder) to taste	50 g	22	1
Water	2 pints (1,000 mL)	-	
Total weight of *khichuri*	1,000 g	-	-
Total energy and protein per kg	-	1,442	29.6

100 g of *khichuri* contains about 145 kcal energy and 3 g protein. One cup (130 g) of *khichuri* contains 190 kcal energy and 4 g protein.

Preparation: Place the rice, *dal*, oil, spices, and water in a pot and boil. After about 20 minutes, add the potatoes, pumpkin (cut into pieces), and spices. Just 5 minutes before the rice is cooked, add the cleaned and chopped leafy vegetable. Keep the pot covered during cooking. It takes about 50 minutes to cook *khichuri*. *Khichuri* and *halwa* can be kept at room temperature for 6-8 hours.

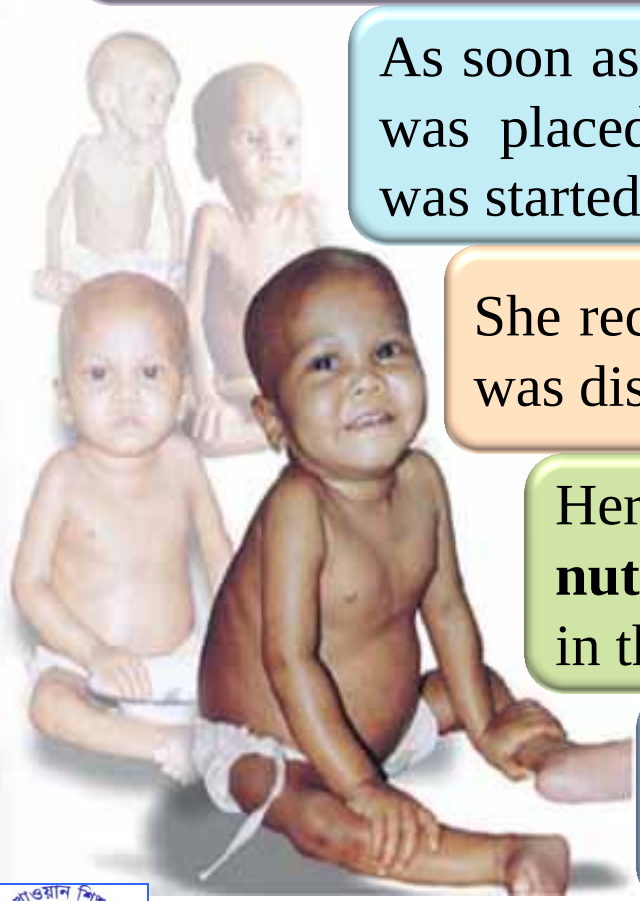
Source: Glimpse, September 2004,P-5

Ingredients of Milk Suji	
Whole milk powder	40 g
Rice powder	40 g
Sugar	25 mg
Soybean oil	25 g
Magnesium chloride	0.5 g
Potassium chloride	1.0 g
Calcium lactate	2.0 g
Cooked volume	1.0 L
Energy	67 kcal/100 mL
Protein	1.4 g/100 mL

Source: Glimpse, September 2004,P:3-5

A case study at NRU of ICDDR'B

When Sheema's was 2 years old, admitted Dhaka hospital of icddr,b suffering from profound malnutrition, pneumonia, and diarrhoea.



As soon as her **pneumonia and diarrhoea** improved, She was placed in the NRU where nutritional rehabilitation was started using **local, low-cost diets.**

She recovered from the state of acute malnutrition and was discharged **after five weeks**.

Her aunt (care taker) received **health and nutrition education** while she stayed with Sheema in the NRU.

At the end **of 5 months** of follow-up Sheema was a **normal, healthy child**

Source: Glimpse, September 2004,P-5

Conclusion

- **Severe Malnutrition can be prevented using home base food.**
- **Nutritional status of malnourished children can be significantly improved by home based food like khichuri, Halwa, milk suji.**
- **Prevention of malnutrition can be successfully done by nutrition education and home based diet.**
- **Use of home based food is sustainable, feasible and Cost effective for prevention and management of child malnutrition.**

Thank you very much