



EVALUATION OF GROWTH PROGRESS AMONG MALNOURISHED CHILDREN ATTENDING VILLAGE CHILD NUTRITION CENTRE (VCNC) UNDER THE PROGRAMME 'MISSION BALAM SUKHAM' IN A TRIBAL AREA OF WESTERN INDIA

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ABSTRACT

Background: Government has started a programme “Mission Balam Sukham” to combat the malnutrition with 3 tier approach including Village Child Nutrition Center (VCNC), Child Malnutrition Treatment Center (CMTC) and Nutrition Rehabilitation Center (NRC). Present study was conducted with the aim to evaluate this programme at VCNC level in a tribal area of western India.

Methods: Hundred malnourished children according to weight for age criteria by WHO, were selected from 10 VCNCs. Their growth progress was recorded and compared with other 100 malnourished children attending anganwadies from the area nearby, where the programme was not yet launched. VCNC intervention was done for 1 month. Children were followed for 3 months.

Results: There was 2 times higher chances of malnutrition grade improvement among VCNC children as compared to anganwadi children with relative risk at the end of 1 month (95% CI =1.2609 to 3.5662) (P-value< 0.05). After completion of 3 months malnutrition grade improvement was similar in both the groups. The difference in growth progress was not statistically significant at the end of 3 months (P = 0.8656).

Conclusions: The result suggests that VCNC intervention was not able to give sustained result over 3 month of period. VCNC intervention only gives short term benefits in improving malnutrition grades of borderline malnourished children.

Key Words: Malnutrition, VCNC, Evaluation

BACKGROUND

According to NFHS 2005-06 in India, 48 % of children under 5 years of age are stunted and 43 percent are underweight.¹ In Gujarat state ongoing interventions to tackle the problem of malnutrition are mainly through Anganwadi centers under the “Integrated Child Development Services” (ICDS) Scheme. Malnourished children are provided 800 kilocalories and 20-25 grams of protein per day according to ICDS norms.

Government of Gujarat has started “Mission Balam Sukham” to combat the malnutrition in which integrated management of malnourished children is done through – 3 tier approach including Village Child Nutrition Center (VCNC), Child Malnutrition Treatment Center (CMTC), Nutrition Rehabilitation Center (NRC).²

At village level VCNC runs at anganwadi centers managed by Anganwadi worker (AWW), Anganwadi helper (AWH) and Accredited Social Health Activists (ASHA). Severe

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acute malnutrition (SAM) and moderate acute malnutrition (MAM) children aged 6 months to 6 years without any medical complications are enrolled for 30 days. Nutrition supplements are given as per standard protocol including micronutrients like Vitamin-A, Iron, folic acid and Zinc. Malnourished Children are provided 5 meals per day including 2 ICDS meals containing total 1000 kcal and 30 grams of proteins for 6 to 36 months age and 1270 kcal and 40 grams of proteins for 3-6 years of children. Parents of malnourished children are also counselled for home based care, health and sanitation³.

The present study was undertaken to know the effect of this programmes on malnutrition status of children aged 6 months to 6 years and to record and compare the growth progress in ICDS anganwadies and VCNCs.

METHODS

It was a Prospective Cohort study conducted during the period from February 2014 to December 2014 in a tribal area of Gujarat as the programme was initiated in tribal area.

Sample size

Assuming significant weight gain as a malnutrition grade improvement according to WHO Growth chart over 1 month, and assuming 20% of malnourished children would improve their malnutrition grade at anganwadi level and 40% of malnourished children would improve their malnutrition grade at VCNC, 80% power and 95% Confidence Interval sample size comes to 91 for each group. Considering 10% drop out rate or loss to follow up sample size came to be 100 for each group.

Study setting and population

Exposed (VCNC) group:

100 children of 6 months to 6 years of age having moderate to severe malnutrition according to WHO growth chart from selected VCNC from Naswadi block acted as a study group to know the effect of VCNC on improvement in malnutrition as it is a newer initiative and provide additional supplementary nutrition to malnourished child.

VCNCs under Mission Balam Sukham work thrice in a year for 1 month every time in anganwadies. After that anganwadies continue to work as guideline under ICDS. So in VCNC group, VCNC food and medicines were provided for 1 month only. After that VCNC group was provided food and services same as anganwadies under ICDS.

Unexposed (Anganwadi) group:

100 children of 6 months to 6 years of age having moderate to severe malnutrition from selected anganwadi of Sankheda

taluka acted as control group. Sankheda was selected for anganwadi as control group because it is near Naswadi so there was environmental, geographical, occupational, cultural similarity which helped to remove possible confounders. Matching was done for grades of malnutrition, age and sex to the nearest possible level.

Inclusion exclusion criteria

All the children included were within the age range of 6 months to 6 years, malnourished and permanent residents of the area.

Children above the age of 6 years or having any disease or complication at the time of survey were excluded from study. Those children whose parents were not permanent residents of the area were excluded from study. Those children whose parents refused to give consent were also excluded from study.

Sampling technique

Considering the final calculated sample size of 100 children, 10 anganwadi from Sankheda block and 10 VCNC from Naswadi block were selected. From each anganwadi and VCNC average 10 malnourished children of age 6 months to 6 years were selected randomly. Anganwadies and VCNCs were selected by systemic sampling technique.

Data questionnaire

Data was collected by using semi-structured questionnaire. All the information was collected from the immediate caregivers, who were usually the mothers and anganwadi workers. Questionnaire included Introduction of child, age, sex, immunization detail, History of micronutrient given or not and anthropometric measurements including weight, height and MUAC. Anthropometric measurements were taken using standard methods and instruments⁴. Salter spring balance (Model 235 PBW) was used for weighing 1 to 6 years age children. For children less than 1 year infantometer was used. Vertical measuring non stretchable tape was used for height measurement. For infants and children under 2 years of age, recumbent length was measured. Arm circumference is measured with special circumference measuring tapes called Shakir's strip.

Follow up of same individuals was done after 1 month to check growth progress in exposed and unexposed group as VCNC services provided mainly for first 1 month in VCNC group. Further follow up after 2 and 3 month was done for both groups to ascertain the continued progress or otherwise.

Data management and statistical analysis

The Data collected was entered in Microsoft excel worksheet and analyzed using WHO Anthro and Medcalc software. The Z-score of anthropometric data was calculated using

the new international reference population released by the WHO (ONIS 2006) and accepted by Government of India. The relative risk and attributable risk of all anthropometric parameters was calculated within the Anganwadi and VCNC group. Chi-square test was used to assess the difference between the frequency distributions. Z-test was used to compare difference between the means.

Consent

At the time of data collection, the purpose of study was clearly explained to the guardians/parents. Parental/ guardian consent for assessment of nutritional status of child was taken. As it is not an interventional study, there was minimal or less than minimal risk to the children involved in study. Anganwadi children who are not getting extra benefit were natural control because government had not implemented the programme in the area.

RESULTS

In the exposed group, 100 malnourished children from 10 VCNCs were selected and their baseline data was collected. Follow up was done for next 3 months to evaluate growth progress every month. Out of them 2 were lost to follow up. In the unexposed group, 100 malnourished children from 10 anganwadies were selected for baseline data collection. 5 children out of 100 could not be followed up till the end in unexposed group. So the final analysis was done for 98 children in VCNC group and 95 children in Anganwadi group.

For comparisons of growth progress, children in both the group should be comparable at baseline. Growth progress among malnourished children depends on their age, sex and malnutrition grade which were taken in to consideration during baseline data collection. Matching was done for age, sex and malnutrition grade according to weight for age WHO growth standards as much as possible in both VCNC and Anganwadi groups. Table-1 suggests that there was no statistically significant difference in age, sex or malnutrition grade in both groups. There was no statistically significant difference for other factors associated with malnutrition like education of mother, socio-economic class, immunization status, birth order, birth weight, exclusive breast-feeding for 6 months given or not and age of starting complementary feeding.

The analysis of the nutritional status of children in this study is based on a new international reference population released by the WHO (Onis 2006) and accepted by the Government of India. The nutritional status indicator is expressed in standard deviation (SD) units (Z-scores) from the median of the reference population. Children whose weight for age Z-score is below the three standard deviations (<-3 SD) are considered in severely underweight (red) classification ac-

ording to WHO growth chart. Children whose weight for age Z-score is below -2 SD are considered in underweight (yellow) classification according to WHO growth chart.

Weight-for-age is a composite index of height-for-age and weight-for-height. It takes into account both acute and chronic malnutrition.

Average weight gain in total children:

All children in both the groups were weighed during baseline data collection at the first visit. The child's baseline weight was compared with weight measured during 2nd, 3rd, and 4th visit at the end of 1 month, 2 months and 3 months respectively. An average weight gain in both the groups was calculated and compared.

During first month, when VCNC added supplementation to ICDS anganwadi, there was 100 grams more average weight gain in children attending VCNC as compared to anganwadi ($P=0.1171$). After 1 month, when both groups were receiving usual ICDS supplementation there was no statistically significant difference in average weight gain in 2nd and 3rd month ($P=1.0000$) (Table-2). Intervention as VCNC food and medicines supplementation was only during 1st month in VCNC group.

On further analysis of the data, 12(12.24%) children lost their weight, 4(4.08%) children not gained or lost the weight, 82(83.67%) children gained weight after 1 month of attending VCNC. 9(9.48%) children lost their weight, 18(18.95%) children not gained or lost the weight, 68(71.57%) children gained weight after 1 month of attending Anganwadi. There was large variation in weight gain among children attending VCNCs and anganwadies over a first month.

Distribution of weight gain (gm/kg/day) among children attending Anganwadi center and VCNC

The figure-1 is a box and whisker plot which shows Distribution of weight gain (gm/kg/day) among children attending AWC and VCNC in 1st month. The distribution of average weight gain is better shown by the inter-quartile range, the median being the line in the box. The dots are the outliers (figure-1). There was not much difference in the average weight gain among VCNC and Anganwadi children during the first month.

Average weight gain during 1st month among VCNC (VCNC group) children was 1.56 ± 1.61 gm/kg/day. Median was 1.45 gm/kg/day with the range of 8.33 to -1.96 gm/kg/day.

Average weight gain during 1st month among AWC (Anganwadi group) children was 1.19 ± 1.60 gm/kg/day. Median was 0.87 gm/kg/day with the range of 8.09 to -1.77 gm/kg/day.

Average z-score difference (weight for age) in total children:

Ages of children were calculated using birthdates and the visit dates of the child by WHO anthro software. Z-score for weight for age criteria was calculated using WHO anthro software at the end of every month. An average difference in Z-score for weight for age was calculated and compared at the end of every month between both the groups.

There was more Z-score improvement among children attending VCNC but it was not statistically significantly higher than Anganwadi group (P=0.3246) (Table-3).

The similar Z-score improvement result over 2 and 3 months duration suggests that improvement in malnutrition grade was not sustained after completion of one month of VCNC intervention. There was no statistically significant difference for z-score in both groups over 2 months (P=0.9917) and 3 months (P=0.7566).

Relative risk and chi-square test:

Relative risk suggests that a chance of improvement of malnutrition grade among VCNC children is 2 times higher than Anganwadi children (95% CI =1.2609 to 3.5662) over 1 month. Chi-square value also suggests that difference between the two group is statistically significant (P-value <0.05).

Association between VCNC intervention and malnutrition grade improvement was not statistically significant over 2 and 3 months duration (table-4). Relative risk and chi-square value over 1, 2 and 3 months also suggest that VCNC nutrition and medicine supplementation over Anganwadi nutrition supplementation was beneficial till it was continued, in this study for 1 month period. After discontinuation of VCNC intervention the result was not sustained.

According to weight for height classification:

Weight and height of all children was noted during the baseline data collection and at the 3rd month during last visit. Weight for height Z-score for all children was calculated using WHO anthro software for initial reading and last reading. Average Z-score difference and malnutrition grade improvement in both the group was calculated and compared.

In VCNC group according to weight for height criteria total 40 children out of 98 were malnourished. At the end of 3 months 21(52.5%) children improved their malnutrition grade and 7 children worsened the malnutrition grade according to weight for height criteria with average Z-score difference of 0.4612±0.8558 for all children.

In Anganwadi group according to weight for height criteria 47 children out of 95 were malnourished. At the end of 3 months 31(65.95%) children improved their malnutrition

grade with average Z-score difference of 0.4907± 0.8088 for all children.

There was no statistical significant difference for average Z-score difference for weight for height criteria between both the groups (P=0.8060). Relative risk 0.7960 (P=0.2132) also suggest that there was no statistically significant association for weight for height grade improvement and VCNC intervention over 3 months.

VCNC children showed somewhat less Z-score improvement compared to Anganwadi children, possible explanations are 1) Smaller sample size (only 40/98 children in VCNC and 47/95 children in Anganwadi according to weight for height criteria were malnourished among selected sample) 2) It may be by chance suggested by P-value.

MUAC (Mid upper arm circumference):

MUAC circumference using Shakir's tape was measured in both the group during baseline data collection and at the end of 3 month during last visit. Average difference in MUAC in both the group was calculated and compared.

In VCNC group average increase in MUAC was 0.1489+0.3347 cm as compared to 0.0926 +0.339 cm in Anganwadi group. (P=0.2467) There was no statistical significant difference for average MUAC difference over 3 months in both the groups.

DISCUSSION

There was large variation in the weight gain among children attending VCNC and Anganwadi also suggested by large standard deviations. Average weight gain difference for 1st month was not found statistically significant and result was almost similar for average weight gain. The result could be better if all children attended VCNC with full attendance and all of them had got proper medical treatment in time as described by guidelines.

This study was done to compare the effectiveness of VCNC under 'Mission Balam Sukham' over ICDS anganwadi intervention. No observations were made to confirm that either mothers actually fed their children all the meals or that standard therapy was being rigorously administered. For children less than 2 years it was difficult to make them sit at Anganwadi center without their parents or mothers from 9 am to 5 pm. Mothers were probably less willing to be with their child 5 times/day because it required that they leave their other children at home and subsistence farms during the sowing season and stay in the Anganwadi for about half day for one whole month.

A review study involving thirty-three studies of community-based rehabilitation for malnourished children were exam-

ined and concluded that eleven (33%) programs were considered effective. Effectiveness was defined as mortality of less than 5% and an average weight gain of at least 5 g/kg/day. High energy intakes (> 150 kcal/kg/day), high protein intakes (4–6 g/kg/day), and provision of sufficient micronutrients are essential for success of any programme⁵.

It was also observed during the visits that comparatively 1) attendance of children, 2) participation by mothers/parents, and 3) average weight gain among the children was also affected by AWW's knowledge, participation, enthusiasm and education.

There was significant number of children improved their malnutrition grade over 1st month of VCNC as compared to Anganwadi. But over 3 months comparison of malnutrition grade improvement was almost similar in VCNC group and Anganwadi group. The result suggests that short term VCNC supplementary nutrition was helpful to borderline malnourished children to overcome/improve their malnutrition grades in short period. Over a 3 months or long term period, VCNC supplementation for 1 month was not found adequate to give sustained result. If mothers/caretakers follow the same nutrition supplementation to child at home after the first VCNC month, it may give the better and sustained malnutrition improvement.

The reasons for the ineffectiveness of some day-care centers for malnourished children include intermittent attendance due to distance, competing demands on caregivers, Too few meals provided, Children not fed ad libitum, opportunity cost, Nosocomial infections, Meals not sufficiently energy-dense, persisting electrolyte and/or micronutrient deficiencies limiting growth.⁵

Jyoti et al in Madhya Pradesh studied Predicators for Weight Gain in Children Treated for Severe Acute Malnutrition showed that Other than therapeutic diet, some other factors such as occurrence of socioeconomic status, recurrent infections, and presence of systemic illness play role in deciding the weight gain in children treated for SAM. To reduce childhood malnutrition emphasis should be given in improving the knowledge and practice of mothers on appropriate infant and young child feeding practices.⁶ This reasons and factors may be obstacle for sustained weight gain in VCNC children under 'Mission Balam Sukham'.

Table 5 summarizes data from six studies of day-care nutrition centers in comparison with Mission Balam Sukham at VCNC level. All provided cooked meals that were eaten on site. Effectiveness was low; the reasons were that few and low energy and nutrient density meals were offered, attendance was poor.

A limitation of the present study was that VCNC intervention was started for the first time in the area. It was first experi-

ence for Anganwadi workers and parents of malnourished children. Result may improve or differ over a time with subsequent VCNC interventions.

CONCLUSIONS

With reference to growth progress, there was 100 gm more average weight gain in children attending VCNC as compared to Anganwadi during 1st month but it was not statistically significant. Similarly for average z-score (weight for age) difference, it was slightly higher 0.2 in VCNC group as compared to 0.15 in Anganwadi group over 1 month. After completion of 3 months, average weight gain and Z-score difference were similar in both the group. There was no significant statistical difference. Relative risk suggests that a chance of improvement of malnutrition grade among VCNC children is 2 times higher than Anganwadi children (95% CI =1.2609 to 3.5662) over 1 month. Chi-square value also suggests that difference between the two group is statistically significant (P-value <0.05). After completion of 3 months, malnutrition grade improvement was also similar in both the groups. VCNC intervention only gives short term benefits in improving malnutrition grades of borderline malnourished children.

Parents/mothers should be encouraged to take actions for their children's malnutrition and to accompany their children for all meals during one month of VCNC and then after. Recommended medicines and articles for malnourished children under "Mission Balam Sukham" should be supplied to all VCNC on time. Further detailed research for evaluating VCNC can be done considering total attendance and meal taken by children as well as compliance of continued feeding at home after VCNC.

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Ethical Clearance: Approval of PG Scientific Review Committee and Ethical Committee

(IECHR, Medical College Baroda & SSG Hospital) was taken before starting the data collection. (Letter is attached below)

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REFERENCES

1. NFHS-3 Reports. 2005-06.
2. Guidelines for Management of Severe Acute Malnutrition (SAM) Children at Nutrition Rehabilitation Center. Department of Health & Family Welfare, Government of Gujarat; 2012.
3. Guidelines on Management of Bal Shaktim Kendra (Village Child Nutrition Center) at the level of Anganwadi. Health and family welfare department, Government of Gujarat; 2012.
4. WHO child growth standard; Methods and development. WHO; 2006.
5. Ashworth A. Efficacy and effectiveness of community-based treatment of severe malnutrition. Food and nutrition bulletin. 2006;27(3 Suppl):S24-48. Epub 2006/11/02.
6. Sanghvi J, Mehta S, Kumar R. Predicators for weight gain in children treated for severe acute malnutrition: A prospective study at nutritional rehabilitation center. ISRN Pediatrics. 2014;5.
7. Brown R, Brown J, Teeter R. Evaluation of a nutrition center program in rural Africa. J Trop Pediatr. 1980;26.
8. Ojofeitimi EO, Teniola SO. Evaluation of nutrition rehabilitation centre in Ile-Ife, Oyo State, Nigeria. World Rev Nutr Diet. 1980;35:87-95.
9. Stanton B, Phillips N, Clemens J, Wroot B, Gafur Z, Fleischman J, et al. An urban nutrition education and rehabilitation centre: a description of the programme and change in nutritional status of children who were enrolled. Trop Geogr Med. 1987;39.
10. Fronczak N, Amin S, Laston SL, Baqui AH. An evaluation of community-based nutrition rehabilitation centers. 1993.
11. Chapko M, Prual A, Gamatie Y, Maazou A. Randomized clinical trial comparing hospital to ambulatory rehabilitation of malnourished children in Niger. J Trop Pediatr. 1994;40:225-30.
12. Monte C, Ashworth A, Sa M, Diniz R. Effectiveness of nutrition centers in Ceara state, northeastern Brazil. Rev Panam Salud Publica. 1998;4:375-82.

Table 1: Age, sex, Malnutrition grade wise distributions of children in exposed (VCNC) and unexposed (Anganwadi) group:

	VCNC	ANGANWADI	P-VALUE
AGE			
6 MONTH-1 YEAR	6(6.12%)	6(6.32%)	0.8099
1 YEAR-3 YEAR	49(50%)	49(51.58%)	0.9398
3 YEAR-6 YEAR	43(43.88%)	40(42.11%)	0.9180
SEX			
MALE	45(45.91%)	41(43.16%)	0.8108
FEMALE	53(54.08%)	54(56.84%)	0.8097
MALNUTRITION GRADE			
RED	39(39.8%)	38(40%)	0.9056
YELLOW	59(60.20%)	57(60%)	0.9056
TOTAL	98	95	-

Table 2: Average weight gain (grams) in total children:

	MEAN (grams)	SD	N	SIGNIFICANCE LEVEL(Z-test)	95 % CI
Duration-1 month					
VCNC	400	463.8	98	P = 0.1171	-0.2253 to 0.0253
AWC	300	416.6	95		
Duration-2 month					
VCNC	600	607.5	98	P = 1.0000	-0.1662 to 0.1662
AWC	600	561.8	95		
Duration-3 months					
VCNC	800	688.0	98	P = 1.0000	-0.1866 to 0.1866
AWC	800	623.6	95		

Table 3: Average z-score difference (weight for age) in total children:

	MEAN	SD	N	SIGNIFICANCE LEVEL (Z-test)	95 % CI
Duration-1 month					
VCNC	0.2	0.3541	98	P = 0.3246	-0.1498 to 0.0498
AWC	0.15	0.3490	95		
Duration-2 months					
VCNC	0.27	0.4448	98	P = 0.9917	-0.1334 to 0.1320
AWC	0.2707	0.4895	95		
Duration-3 months					
VCNC	0.3003	0.5224	98	P = 0.7566	-0.1779 to 1295
AWC	0.3245	0.5605	95		

Table 4: Malnutrition Grade Improvement (weight for age):

Weight for age grade	VCNC (n=98)	Anganwadi (n=95)	Relative risk	Chi-square value	Attributable Risk %
Duration-1 month					
Improved	35	16	2.1205 (P = 0.0046)	7.893 (P = 0.0050)	52.84%
Not improved	63	79	95% CI (1.2609 to 3.5662)		
Duration-2 months					
Improved	29	21	1.3387 (P = 0.2390)	1.046 (P = 0.3065)	25.28%
Not improved	69	74	95% CI (0.8238 to 2.1755)		
Duration-3 months					
Improved	31	28	1.0733 (P = 0.7450)	0.0286 (P = 0.8656)	6.829%
Not improved	67	67	95% CI (0.701 to 1.6433)		

Table 5: Studies of community-based treatment of malnutrition in day-care centers

Authors	Country	Type of study	Age Admission criteria or severity of malnutrition	No. of children studied	Duration of treatment Food given out	Weight gain or progress
Present study		Cohort study	6 months to 6 years	98	1 month 3 meals+2 snacks/day 6 days/week	Mean weight gain 1.56+1.61 gm/kg/day Weight gain of VCNC children not significantly different from that of controls
Brown et al.	Zaire ⁷	RCT	5–24 months Only 29% < 85% W/H	106 pairs (controls were children in villages with no center)	12 week 3 meals 6 days/week (maize/legume gruel) Parents contributed fruits and veg- etables	Weight gain of center attendees not significantly different from that of controls matched for age and W/H
Ojofeitimi and Teniola	Nigeria ⁸	Observational	9–48 months	30	12 week 1 meal 1 day/week	Mean weight gain 1.9 g/kg/day Home-feeding advice was not implemented
Stanton et al.	Bangladesh ⁹	Observational	18–48 months MUAC < 12.5 cm Mean W/A 55% Mean W/H 78%	85	3–5 week 3 meals + 2 snacks 6 days/week	Median weight gain 3.3 g/kg/day Median W/H (%): At entry 78 After 3 week 83 After 5 week 86
Fronczak et al.	Bangladesh ¹⁰	Observational	6–59 months MUAC 9–11.9 cm or W/H 60%–79%, nonedematous Mean W/A 51%	161	Mean 4 week 3 meals + 2 snacks daily High-protein, high- energy family foods	Mean weight gain ~5 g/kg/day Mean W/H (%): At entry 73 After 4 week 83
Chapko et al.	Niger ¹¹	RCT	5–28 months WHZ < -2 SD or kwashiorkor Median WHZ -3.16 SD	100	Mean stay: (a) 13 days hospital (b) 12 days NRC (a) 3 meals/day (b) 1 or 2 meals/ day Parents contributed food	No difference in W/H gain during treatment between the two groups
Monte et al.	Brazil ¹²	Observational	53% < 18 months Most used Gomez grades. Also social need Grade I 40% Grade II 47% Grade III 14% Only 27% < 80% W/H	1,399 (20 centers)	Mean 8.7 months Meals 5 days/week	Distribution of weight gain: < 2 g/kg/day 79% 2–4 g/kg/day 16% > 4 g/kg/day 5%

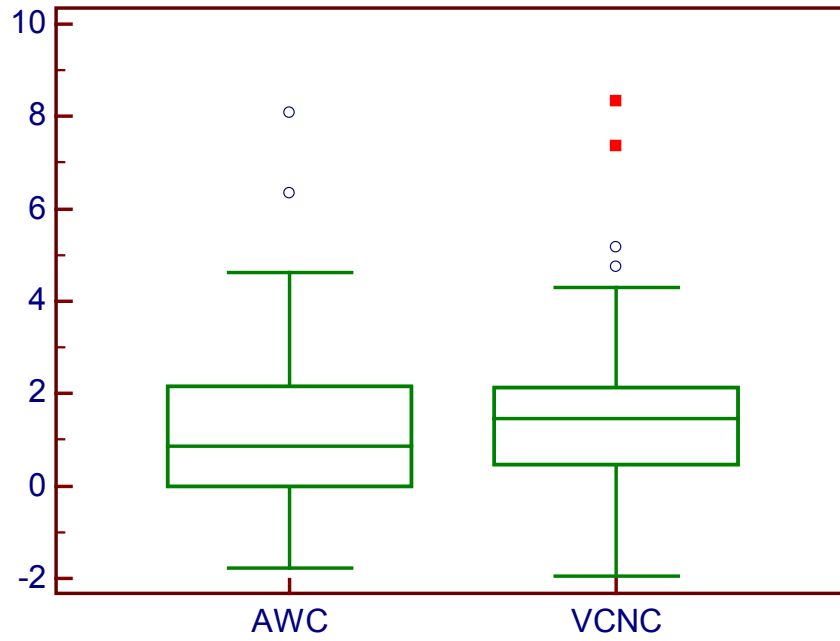


Figure 1: Distribution of weight gain (gm/kg/day) among children attending Anganwadi center and VCNC.