

**RAPID ASSESSMENT OF NUTRITIONAL STATUS AMONG THE
POPULATION AFFECTED WITH TSUNAMI**



by

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SUMMARY

The tidal wave hit Sri Lanka taking lot of people away and giving extensive damages to infrastructure facilities. Even before the tsunami disaster, under nutrition was the single developmental challenge for Sri Lankan children. This situation expected to increase the risk of under nutrition among the vulnerable groups in particular children and women.

The objective of the study was to collect baseline nutrition information in the displaced population residing in camps.

This was a cross sectional study. All the children less than 5 years in the district were included for the assessment. Birthday, sex, birth weight, weight and height/length were recorded by the health staff in the predetermined clinic centres.

A total of 905 children were assessed. 49.1% were boys. 20.2%, 16.1% and 34.9% were stunted, wasted and underweight, which is more than the national prevalence. Boys were more affected than girls.

More than two third of the children under 5 years of age suffered from acute respiratory tract infections and nearly one in 5 children had diarrhoeal disease. Although the general foods distribution for adults was adequate in quantity, it lacked diversity and children did not get appropriate supplementary food to meet their nutritional requirements. Thripasha – a blended food rich in micronutrient was only available to 14% of under five children. Although vitamin A capsules are readily available in the country, only 23% of children got vitamin A supplements. Vitamin A is an important micronutrient for child survival. Perhaps, the fact that many children had acute respiratory infections could be attributed to inadequate vitamin A supplements.

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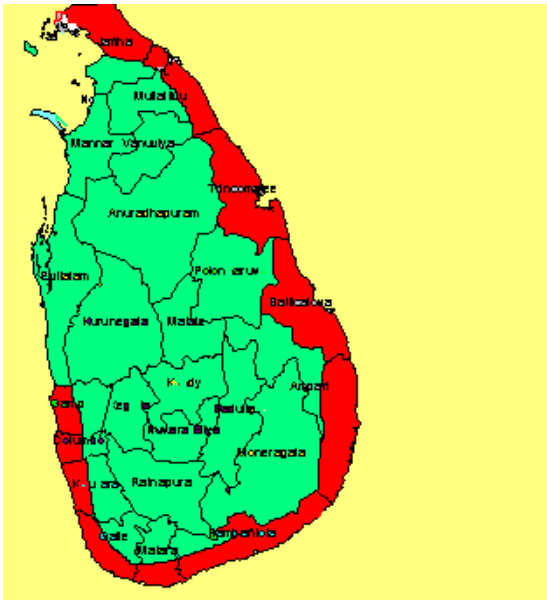
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INTRODUCTION

When the tidal waves hit Sri Lanka on the 26th December 2004, about 30,527 people died while 773,636 were displaced and 15,686 were injured. The extent of damage to



infrastructure was so extensive as far as housing is concerned, 96,541 houses were fully destroyed and the 26,528 houses were partially damaged. About 739 camps were established to accommodate the displaced population in temples, schools, churches etc. At present, 645 camps exist as at 06.01.2005 due to people moving back to their/relative's homes and amalgamation of small camps.

Figure 1: Sri Lankan map with tsunami affected areas demarcated in red

The disaster has caused massive displacement of entire communities. Displacement is a situation where needs are great, human and material resources are scarce and action must be immediate. Displaced people are often suffering from the devastating effects of exhaustion, bereavement, separating from loved ones, ill health or injury, poor shelter, inadequate nutrition and food availability, poor water supply and sanitation and impoverishment (Tool and Waldman 1993).

Indicators related to nutritional status is considered the most vital, basic public health indicators of the well being of the population in the context of emergencies. These indicators are useful to identify needs, to prioritise resources and to prevent the deterioration of the nutritional status of the population.

Even before the tsunami disaster, under nutrition was the single developmental challenge for Sri Lankan children. Although Sri Lanka has made impressive achievements in child survival, under nutrition among children remained to be a significant public health problem. With the onset of tsunami and subsequent

population displacement, people have lost their natural sources of food in addition to being exposed to additional environmental risk like inadequate safe water supply and environment sanitation and hygiene. This situation is expected to increase the risk of under nutrition among the vulnerable groups in particular children and women.

According to the available data the National prevalence of wasting, stunting and underweight among under fives in the year 2000 is 14%, 13% and 29% respectively (DHS 2000). The prevalence of wasting among children under fives is 21% in the Mullative district which is the worst affected district for Tsunami (Jayatissa & Wijesinhga 2004). Therefore a nutrition survey is urgently necessary to measure the extent and severity of malnutrition among the affected population and to plan appropriate interventions, which will be short term, medium and long term. The results of the nutrition survey will provide an update on the nutritional status of the affected population and will be used as baseline data for monitoring the impact of interventions.

In order to collect baseline information in the displaced camps and facilitate relevant actions and subsequently monitor the situation, UNICEF jointly with the World Food programme supported the Medical Research Institute of Ministry of Health, Nutrition & Uva Wellassa development to conduct a nutrition survey in camps.

OBJECTIVES:

1. To measure the nutritional status and determinants of the children under fives, lactating women and pregnant women affected with tsunami.
2. To gather information on existing infrastructure influence on the nutritional status to launch activities to improve it.
3. To collect baseline information to monitor nutrition interventions and food aids.
4. To assess the mortality among them due to the Tsunami.

METHODOLOGY

A cross sectional 30-cluster rapid assessment survey was carried out. Camps were considered as clusters. Sample size was calculated considering the estimated prevalence of wasting among displaced population is 20% with the 95% confidence interval and 5% error. Design effect was taken as 3.5 due to clustering effect. Calculated sample size was 900 children under fives.

Sampling

Although the 14 districts were reported to be affected by the tsunami only 12 districts were included in the sample. Because the displaced population from these affected 12 districts were moved into these 2 districts and the population in these districts were not really affected. Number of camps from each district was determined by considering the proportion of the population affected in the districts out of the total population affected by the tsunami in Sri Lanka.

The locality of the camps was selected using population proportion to the size (PPS) sampling technique by considering the total number of population in the camps. In each selected camp 30 children was randomly selected from the list maintained by the camps using computer generated random numbers. When the required number of children was not in the selected camps closest camp was visited to fulfil the number of children. All the pregnant women and lactating mothers in the visited camps were included in the study.

Data collection

Survey team consists of 2 or 3 members from the staff in the Department of Nutrition and staff in the Nutrition co-ordinating division. Six teams worked each covering 5 camps (one camps per day) during the survey. Data was collected by using the 4 techniques.

1. Interviewer administered questionnaire (Annexure - 1)

An interviewer-administered questionnaire was used to collect information from the mother of the child or from a responsible caregiver in the case of children under 5 years and from pregnant or lactating women. The following information was gathered:

- Basic information - Birth day if not age, sex
- Morbidity and feeding data
- Access to water, sanitation and personal hygiene
- Dietary diversity data
- Mortality data during the disaster
- Anthropometric measurements
 - Weight, Height / length
 - Mid Upper Arm Circumference for pregnant women & lactating mothers

2. Direct observation of camp

During the survey the interviewers were asked to observe the following factors and the check-list was provided with them (Annexure – 2).

- Food availability and access
- Health and sanitation
- Existence of intervening agencies and their field operations

3. Interview the key informants in the camp

The key informant in the camps was interviewed by using a checklist (Annexure – 3) to collect details on:

- Food availability, access and storage
- Visiting of health staff, sanitation and water facilities
- Existence of intervening agencies and their field operations, during the current period and for the next 1-3 months.

4. Focus group discussion with mothers

A focus group discussion was conducted by 3 supervisors by using a check-list ((Annexure – 4). About 12-15 focus group discussions were conducted among 6-10 participants from each selected camps.

Quality control measurers

All the interviewers and measurers have previous experience in involving with number of nutritional surveys and they are the trained personnel. They were trained on method and the questionnaire. Pre test of different data collection techniques was carried out at the closest camp and the few corrections and re wording of the questionnaire was completed. Close monitoring of fieldwork was done by the medical officers of the Department of Nutrition, Medical Research Institute.

Data analysis and indicators

Data was entered in Epi-info package and the analysis was carried out by using SPSS software package. The suggested indicators were wasting, stunting, BMI for women, morbidity indicators, water and sanitary indicators, feeding indicators etc..

Age was calculated in months from the child's birthday. Weight-for-age, weight-for-height and height-for-age were calculated for children by using anthro-software (no corrections have been made for the weight of the clothing which average 50g). The NCHS reference data was used and the children below the -2SD was taken as cut off values to estimate age and sex specific prevalence of stunting, wasting and underweight according to the recommendations made by WHO (1995). Data analyses were carried out by using SPSS software package.

Body mass index (BMI) was calculated for lactating mothers by using weight and height data. The mothers who were below the 18.5 of BMI were considered as

underweight and who were above the 24.9 of BMI was considered as overweight (WHO 1995).

Cut off points for mid upper arm circumference (MUAC) was taken for lactating mothers as; $MUAC \leq 185\text{mm}$ for acute under nutrition and $MUAC < 160\text{mm}$ for severe acute under nutrition. The pregnant women the $MUAC \leq 230\text{mm}$ as acute under nutrition and $MUAC \leq 207\text{mm}$ as severe under nutrition.

Ethical consideration

Approval was obtained from the Director General of Health Services. Data collection period was 17th January – 28th January 2005.

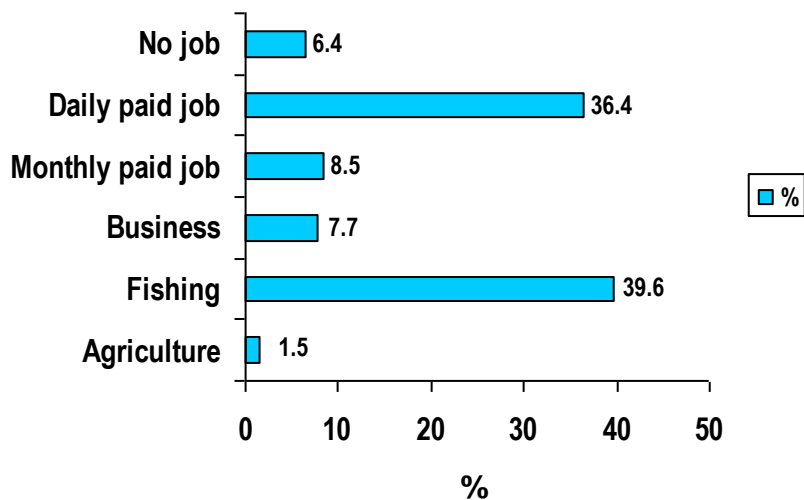
RESULTS

Altogether 40 camps were included in the study to cover the required sample size of children. A total of 905 children less than five years, 163 lactating mothers and 138 pregnant women in the tsunami affected population were subjected to the study. The expected number of children from the Trincomale district was not covered due to logistic and survey administration problem. This number was taken from the Galle district.

Majority (89.6%) of respondents were mother of the child and 5.8% were father or a relative of the child and 4.6% were care givers due to non availability of the mother or father. The mean number of days stayed in the camp was 23.1 (3.9) days.

The livelihood system used by the respondents was questioned before the Tsunami when the respondents were a father or mother of the child, i.e. 95.4% of the sample.

Figure 2: Distribution of livestock pattern among the respondent (n=905)



About 40% of the respondents involved with the fishing and 36.4% of respondents had daily paid jobs before the Tsunami. Only 1.5% involved with the agriculture as their livelihood (Figure 2).

Children less than 5 years

There were 49.1% boys and 50.9% girls. In the sample, 194 (21.4%) children from the Galle district, 157 (17.3%) from the Ampara district as shown in the Figure 3.

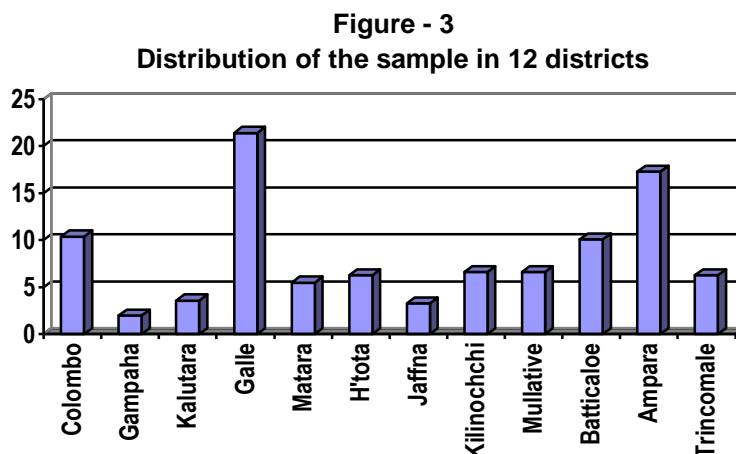


Table 1 show the age and sex distribution of the sample. The children were evenly distributed from the age of 1-5 years.

Table 1
Age and sex distribution of the study sample

Age (months)	Male	Female	Total
<12	92 (20.7%)	85 (18.4%)	177 (19.6%)
12 - 23.9	99 (22.3%)	102 (22.1%)	201 (22.2%)
24 - 35.9	100 (22.5%)	97 (21.0%)	197 (21.8%)
36 - 47.9	93 (20.9%)	97 (21.0%)	190 (21.0%)
≥48	60 (13.5%)	80 (17.4%)	140 (15.5%)
Total	444 (49.1%)	461 (50.9%)	905 (100%)

(*10 children did not have birthdays, age was taken for calculation)

Prevalence of stunting, wasting and underweight

Study findings revealed (Table 1) that the prevalence of stunting (percentage below the -2SD of NCHS/WHO height-for-age reference) was 20.2%. Because stunting is a cumulative process, the percentage of stunted children increases with age. The highest prevalence showed around the age of 36 - 47.9 months. This observation

indicates the nutritional status in this population was even affected before the Tsunami and it is a long standing problem.

Table 2

Mean Z scores of the study sample in relation to the age (n= 878)

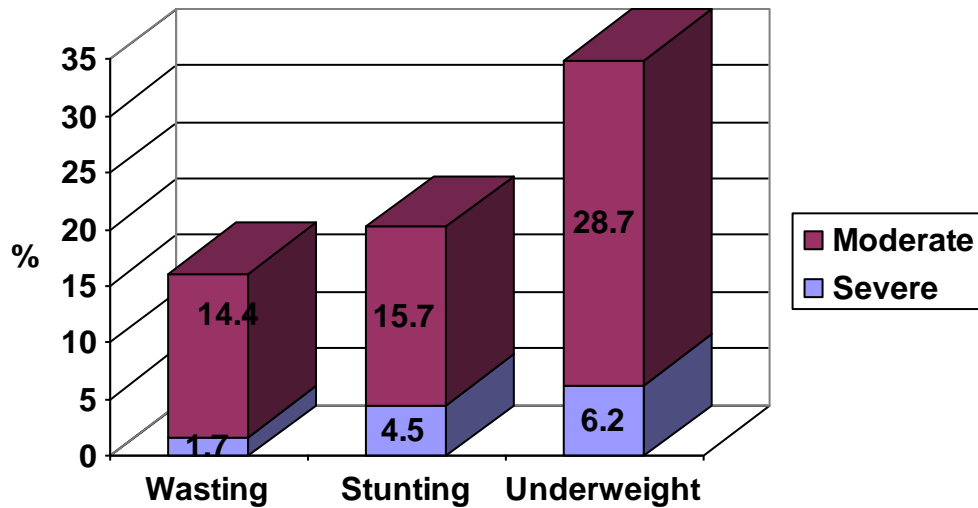
Age in months	Height-for-age		Weight-for-age		Weight-for-height	
	% below -2Z-score (Stunting)	Mean Z- score (SD)	% below -2Z-score (Underweight)	Mean Z-score (SD)	% below -2 Z-score (Wasting)	Mean Z- score (SD)
<12 (n=163)	10.4	0.4 (2.9)	15.3	-0.47 (2.1)	8.6	-.59 (2.0)
12-23.9 (n=199)	21.6	-0.85 (1.8)	38.2	-1.58 (1.1)	22.1	-1.32 (1.2)
24-35.9 (n= 193)	19.2	-0.84 (1.7)	36.3	-1.66 (1.0)	12.4	-1.19 (1.1)
36-47.9 (n= 185)	25.4	-1.33 (1.5)	43.2	-1.79 (1.3)	15.7	-1.22 (1.2)
≥ 48 (n = 138)	23.9	-1.35 (1.5)	39.9	-1.83 (0.9)	21.7	-1.22 (1.3)
Total (n=878)	20.2	-0.79 (2.04)	34.9	-1.47 (1.4)	16.1	-1.11 (1.4)

(*27 records were flagged)

The prevalence of wasting (percentage below the -2SD of NCHS/WHO weight-for-height reference) was 16.1%. It also increases with the age and lowest at the age of 24 – 35.9 months. The highest prevalence (22.1%) showed around 12 – 23.9 months (Table 3).

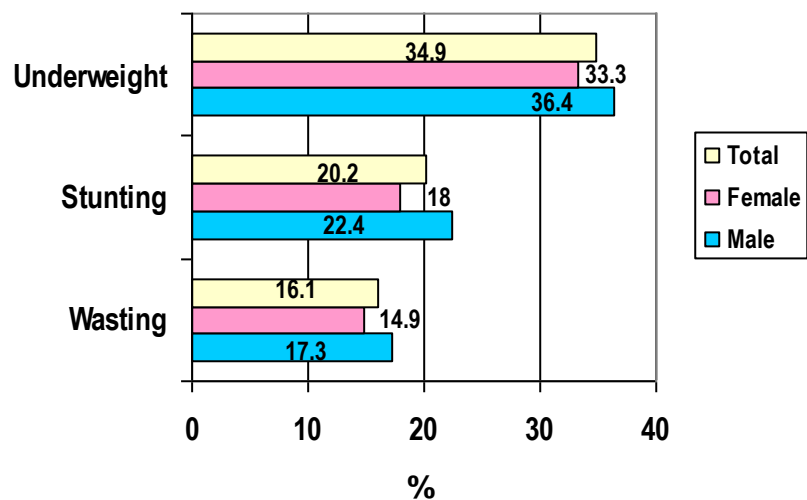
The prevalence of underweight (percentage below the -2SD of NCHS/WHO weight-for-age reference) was 34.9%. As with stunting, the prevalence of underweight also increases with age. In this population, the highest prevalence showed around third year. It is interesting to note that the prevalence of underweight was more than twice the prevalence of wasting.

Figure 4: Prevalence of wasting, stunting and underweight



Only 1.7% were severely wasted (percentage below the -3SD of NCHS/WHO weight-for-height reference), 4.5% were suffering from severe stunting (percentage below the -3SD of NCHS/WHO height-for-age reference) and 6.2% were severely underweight (percentage below the -3SD of NCHS/WHO weight-for-age reference). Majority of the stunted, wasted and underweight children were within the moderate category (between the -2SD and -3SD of NCHS/WHO reference) as shown in the Figure 4.

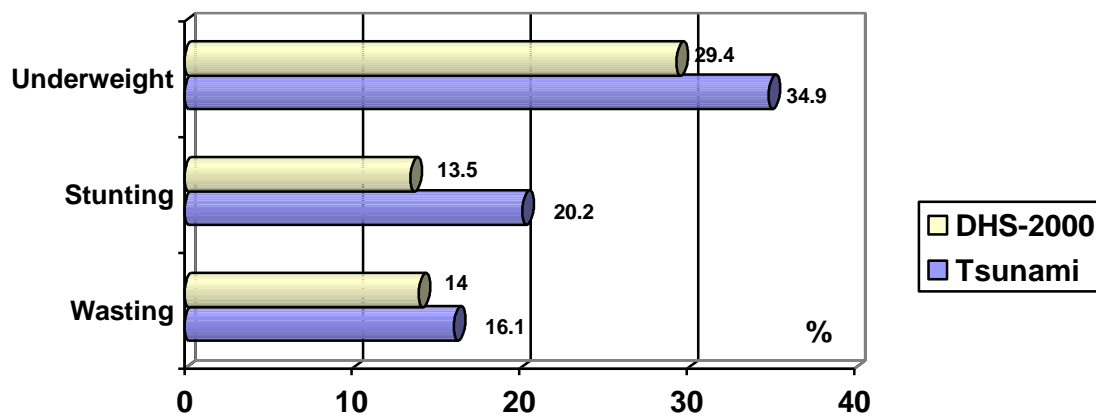
Figure 5: Prevalence of wasting, stunting and underweight by sex



It is interesting to note that boys appeared to have higher prevalence of wasting than girls (17.3% in boys and 14.9% in girls; $P = 0.37$). Figure 5 shows that the prevalence of underweight among girls (33.3%) was higher than boys (36.4%).

Study findings were compared with the National data of Demographic and Health survey (DHS) 2000 (Figure 6). The prevalence of wasting, stunting, and underweight among children in the population affected by Tsunami is higher than the National prevalence. The high prevalence of stunting in this population is a prominent feature.

Figure 6: Comparison of study data with the National data



Based on the proposed epidemiological criteria for assessing severity of under nutrition in population by the WHO, when the percentage of underweight is ≥ 30 and the percentage of wasting is ≥ 15 it indicates a very high prevalence. When the percentage of stunting is ≥ 20 it was indicated a moderate prevalence. In order to that this population indicates very high prevalence of underweight and wasting with the moderate prevalence of stunting.

Figure 7: Comparison of wasting in Tsunami affected population with DHS-2000 data in relation to the age in months

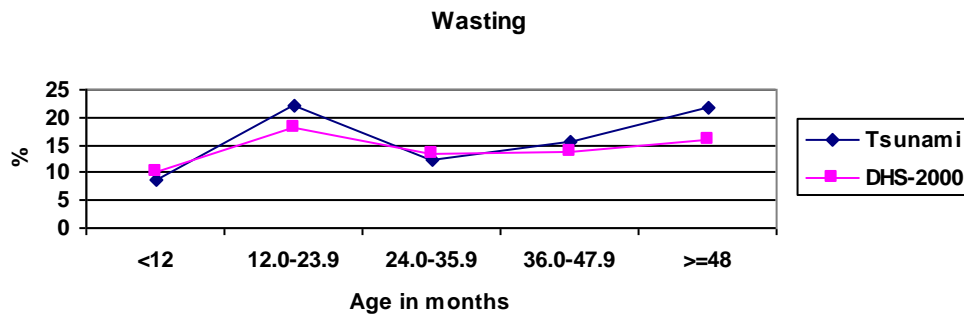


Figure 7 shows that the similar pattern to the National level. But the gap is wider between the 12 – 24 and >48 months.

Figure 8: Comparison of stunting in Tsunami affected population with DHS-2000 data in relation to the age in months

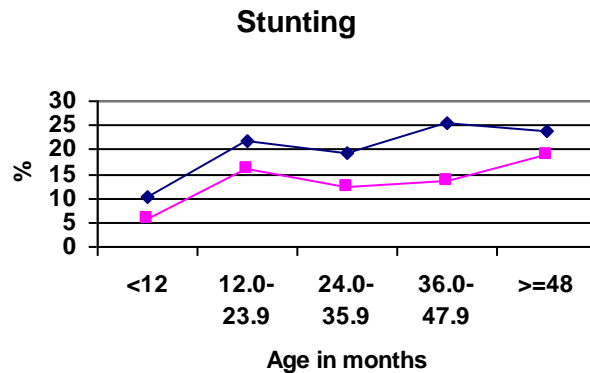
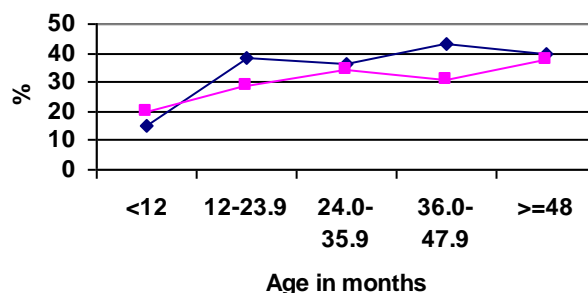


Figure 8 shows that the similar pattern as National. The stunting slows down during the age of 24-36 months and again there is a steady increase giving a wide gap.

Figure 9 show that the prevalence of underweight among children in the study has the similar pattern as National.

Figure 9: Comparison of underweight in Tsunami affected population with DHS-2000 data in relation to the age in months
Underweight



Geographical distribution of under nutrition

Table 3 shows the prevalence of wasting, stunting and underweight in the districts.

Table 3

Prevalence (%) of under nutrition in different districts & provinces

Districts / province	Wasting*	Stunting**	Underweight***
Colombo (N=94)	16.0	21.3	37.2
Gampaha (N=18)	27.8	27.8	61.1
Kalutara (N=32)	18.8	12.5	34.4
Western province (N=144)	18.1	10.4	39.6
Galle (N=185)	15.1	11.4	27.0
Matara (N=49)	4.1	8.2	24.5
Hambantota (N=55)	12.7	9.1	27.3
Southern province (N=289)	12.8	10.4	26.6
Jaffna (N=28)	10.7	21.4	39.3
Kilinochchi (N=57)	17.5	14.0	33.3
Mullative (N=57)	8.8	29.8	42.1
Northern province (N=142)	12.7	21.8	38.0
Batticaloe (N=90)	25.6	32.2	43.3
Ampara (N=152)	15.1	28.3	36.8
Trincomale (N=61)	23.0	24.6	37.7
Eastern Province (N=303)	19.8	28.7	38.9
Total (N=878)	16.1	20.2	34.9

(* $\chi^2= 19.0$, $P=0.061$, ** $\chi^2= 39.2$, $P=0.000$, *** $\chi^2= 19.4$, $P=0.055$)

These findings should be interpreted cautiously due to small sample sizes in different districts. The prevalence of stunting among districts varied from 8.2 – 32.2%. It showed that the lowest prevalence was in the children of Matara The highest prevalence was in the Batticaloe district.

When the prevalence of wasting is compared among districts, high prevalence was observed in the Batticaloe district (25.6%). Lowest prevalence was observed in Matara district (4.1%) like the prevalence of stunting and underweight.

Determinants of under nutrition

Data related to the factors contributing to under nutrition were also collected. The following determinants were considered.

- Disease prevalence
- Feeding practices
- Water and sanitation
- Mortality rates
- Coping strategies

Disease prevalence

The incidence of important child illnesses 2 weeks prior to the study was determined. Table 3 shows that 69.2% of children under fives were suffering from the acute respiratory tract infections and 17.6% had diarrhoeal diseases. Vitamin A mega dose supplementation is usually undertaken as a routine programme in Sri Lanka. All the children at the age of 9 months and 18 months are supposed to be given a respectively 50,000IU and 100,000IU single dose of Vitamin A during the immunisation sessions. This study revealed that only 32.9% children of the targeted age groups had received Vitamin A mega dose during the last 6 months period. This observation alerts the situation with the high incidence of respiratory tract infections as Vitamin A has a positive contribution to the overall wellbeing of an individual especially in relation to the infections.

Table 3
Disease prevalence of the study population

	No.	%
Incidence of major child illness (n= 905)		
Diarrhoea within two weeks prior to the survey	159	17.6
*ARI within two weeks prior to the survey	626	69.2
Vitamin A supplementation (n= 841)		
Children receiving Vit.A supplementation in the past 6 months	191	22.7
Children of 9–24 months receiving Vitamin A supplementation in the past 6 months (n=243)	80	32.9

(*ARI= Acute Respiratory Tract Infection - cough or cold with or without fever)

Feeding practices

Table 4 shows that the current breast feeding pattern among children in relation to the age. About 87.7% of children less than 6 months were breast-fed. More than two third of children (69.8%) between 1-2 years were also breast-fed. Over half of children (52.9%) had stopped breast-feeding after the age of 18 months. There were few children (3.3%) who had never breast-fed.

It is recommended to consume more than four feeds per day for children to meet the nutrient requirement because of the small feeds that they take. This study revealed that the children of 6-11 months, 1-2 years and over 2 years were fed more than four times 66.4%, 51.8% and 32.3% respectively. This observation is very important with the high prevalence of wasting in this population. The highest prevalence of wasting was observed between the 1 – 2 years of age and 38.1% of children of that aged only fed 3 times per day.

Table 4
Feeding practices of the study population

	No.	%
Current breast feeding pattern by age in months (n=884)		
< 6	57	87.7
6 - 11.9	89	83.2
12 – 23.9	141	69.8
24 – 35.9	81	42.6
36 – 47.9	31	16.8
≥ 48	12	8.9
Age when child stopped breast feeding (n = 482)		
< 6	41	8.5
6 - 11	61	12.7
12 - 18	109	22.6
≥ 18	255	52.9
Never breastfed	16	3.3
Feeding frequency (n=821)		
6-11 months		
Once	1	0.9
2 times	8	7.5
3 times	27	25.2
4 or more times	71	66.4
12-23 months		
Once	4	2.0
2 times	16	8.1
3 times	75	38.1
4 or more times	102	51.8
≥ 24 months		
Once	6	1.2

2 times	49	9.5
3 times	295	57.1
4 or more times	167	32.3

Dietary diversity

Eating variety of diet is very important to fulfil the daily nutrients requirement for children especially the calories, proteins, vitamins and minerals. Table 5 shows that the food consumption of children during the past 24 hours of the interview day. The children aged 6 – 11 months were mainly fed with the rice, milk and sugar. About three fourth (70.9%) were not even received any supplementary foods like Thriposha (produced in Sri Lanka by the Government), Con Soya Blend (CSB) and other commercial products in the markets.

The children aged 12 – 23 months were mainly fed with the rice, milk, pulses and sugar. About three fourth (70.9%) were not even received any supplementary foods like Thriposha (produced in Sri Lanka by the Government), Con Soya Blend (CSB) and other commercial products in the markets.

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Table 5

Dietary diversity of the children during the past 24 hours

Food groups	Age groups(months)		
	6-11 (n=110)	12-23 (n=202)	≥ 24 (n=527)
Rice, Cereals, grains, wheat flour preparations	%	%	%
None	47.3	13.4	6.6
Twice	21.8	22.8	14.6
3 times	20.9	29.7	29.4
4 times	10.0	33.2	48.0
5 or more times	0.0	0.0	0.0
Yam / potatoes / starchy foods			
None	76.4	79.2	66.8
Twice	16.4	17.3	28.5
3 times	6.4	3.0	4.6
4 times	0.9	0.5	0.2
5 or more times	0.0	0.0	0.0
Pulses / soya			
None	76.4	54.0	47.4
Twice	20.0	36.6	39.7
3 times	2.7	8.9	11.8
4 times	0.9	0.5	1.1
5 or more times	0.0	0.0	0.0
Milk & milk products (excluding breast milk)			
None	23.6	10.9	10.8
Twice	8.2	10.9	14.2
3 times	20.0	38.1	48.4
4 times	15.5	21.3	18.0
5 or more times	32.7	18.8	8.6
Fish/egg/ dry fish/ meat or meat products			
None	79.1	53.0	38.0
Twice	16.4	32.2	39.5
3 times	3.6	13.4	20.3
4 times	0.9	1.5	2.3
5 or more times	0.0	0.0	0.0
Added sugar in tea or beverages			
None	43.6	23.3	22.6
Twice	23.6	16.3	18.0
3 times	26.4	40.1	41.7
4 times	6.4	16.3	13.3
5 or more times	0.0	4.0	4.3

Fat / coconut/margarine			
None	90.9	71.8	60.3
Twice	8.2	17.8	20.1
3 times	0.9	8.9	18.2
4 times	0.0	1.5	1.3
5 or more times	0.0	0.0	0.0
Fruits			
None	88.2	84.2	85.6
Twice	8.2	14.4	12.3
3 times	2.7	1.5	1.7
4 times	0.9	0.0	0.2
5 or more times	0.0	0.0	0.2
Vegetables			
None	83.6	69.3	49.1
Twice	10.0	21.3	34.5
3 times	5.5	8.9	15.0
4 times	0.9	0.0	1.3
5 or more times	0.0	0.5	0.0
Green leaves			
None	97.3	98.0	93.0
Twice	0.9	2.0	6.1
3 times	0.9	0.0	0.8
4 times	0.9	0.0	0.2
5 or more times	0.0	0.0	0.0
Beverages & others			
None	99.1	96.5	96.8
Twice	0.0	3.0	3.0
3 times	0.9	0.0	0.2
4 times	0.0	0.5	0.0
5 or more times	0.0	0.0	0.0
Supplementary food (Thriposha / CSB / Commercial products)			
None	70.9	81.7	92.8
Twice	18.2	12.9	5.9
3 times	9.1	5.0	0.8
4 times	1.8	0.5	0.6
5 or more times	0.0	0.0	0.0

Water and sanitation

Table 6 shows that 70.4% of them were getting the drinking water from the bowsers and 57.9% got the water for cooking and used for the personal hygiene was also from bowsers. Majority (78.2%) has accessed to adequate quantity of water. About 70% used water sealed toilets. Only 68.6% and 60.6% always washed their hands after defecation and before preparation of foods respectively.

Table 6
Access to water, sanitation and hygiene by study population

	No.	%
Main source of drinking water (n= 905)		
Piped water	86	9.5
Well water	116	12.8
Bring by the bowsers	637	70.4
Others (Drinking water bottles etc..)	66	7.3
Main source of water for cooking & personal hygiene (n=905)		
Piped water	120	13.3
Well water	228	25.2
Bring by the bowsers	524	57.9
Others (Drinking water bottles etc..)	33	3.6
Availability of adequate quantity of water (n=887)		
Never	33	3.7
Sometimes	33	4.1
Almost always	124	14.0
Always	694	78.2
Type of the toilet used (n=905)		
Water sealed	633	69.9
Pit	44	4.9
Other (trench etc.)	228	25.2
Washing hand after defecation (n=905)		
Always	621	68.6
Often	91	10.1
Sometimes	178	19.7

Hardly rarely	15	1.7
Washing hand before eating or food preparation (n=901)		
Always	546	60.6
Often	113	12.5
Sometimes	187	20.8
Hardly rarely	55	6.1
Distance between toilet and water source in meters (n=703)		
1 - 5	30	4.3
6 – 10	91	12.9
11 – 20	84	11.9
21 – 29	107	15.2
>=30	391	55.6

Camp managers were interviewed to obtain the data on water and sanitation. They stated 83.9% of water was adequate and 96.8% of water was in good quality. About 67.7% of camps more than 20 people used one toilet.

Mortality rates

Average number of household members among the study population was 4.9 (SD = 1.7) members per household ranged 2 – 14 before the tsunami.

Crude mortality rate (CMR) is an estimate of the rate at which members of the population die during a specified period. This is the number of deaths from all causes per 10,000 people per day.

$$\text{CMR} = \frac{\text{Total number of deaths over a specified time period}}{\text{Total estimated population (current) specified time period in days}} \times 10,000$$

A total of 902 families were interviewed and 72 members from these families died during the Tsunami:

Then total no. of family members reported dead in the household surveyed = 72

$$\begin{aligned} \text{Total number of people living in those households at the time of the survey} \\ = 902 + 72. \end{aligned}$$

The estimated mid point of the population would be = $\frac{902 + 72 + 902}{2} = 938$

Therefore the Crude mortality rate
$$= \frac{72 \times 10,000}{938} = 767.5$$

Crude mortality in this population is 767.5 deaths / 10,000 persons due to Tsunami.

Under five Mortality rate (U5MR) is the number of deaths from all causes per 10,000 of under five year old children per day.

$$U5MR = \frac{\text{Total number of under 5 deaths over a specified time period}}{\text{Total estimated under 5 population (current) specified time period in days}} \times 10,000$$

A total of 902 families were interviewed and 39 children died during the Tsunami:

Then total no. of children reported dead in the household surveyed = 39

Total number of children under 5 living in those households at the time of the survey

$$= 902 + 39.$$

The estimated mid point of the population would be
$$= \frac{902 + 39 + 902}{2} = 921.5$$

Therefore the U5MR
$$= \frac{39 \times 10,000}{921.5} = 423.2$$

U5MR is therefore 423.2 deaths / 10,000 children under 5 due to Tsunami.

Coping strategies

About 730 (80.8%) mentioned children had enough food to eat during the last 7 days. Others coped up with limiting portion size at mealtime, by restricting consumption of adults in order for small children to eat, reducing number of meals in a day, skipping entire days without eating and getting food from outside the camp (friends, relatives and purchasing) 3-6 times week.

Risk factors in relation to under nutrition

Table 8 shows that the children who were suffering from diarrhoea and respiratory tract infections had more risk of developing wasting and underweight.

Being a Male child had given a more risk of suffering from wasting, underweight and stunting than a female child.

Table 8
Association between under nutrition and other factors

Factors	Wasting	Stunting	Underweight
Diarrhoea	(OR=1.8, CI=1.17-2.69)	(OR=1.2, CI=0.82-1.86)	(OR=1.4, CI=0.98-1.97)
Yes	38 (23.9%)	37 (23.3%)	66 (58.5%)
No	111 (15.0%)	145 (19.7%)	251 (33.8%)
ARI	(OR=1.4, CI=0.94-2.11)	(OR=0.79, CI=0.56-1.16)	(OR=1.0, CI=0.76-1.37)
Yes	112 (18.0%)	119 (19.2%)	220 (35.3%)
No	37 (13.5%)	63 (23.1%)	97 (34.9%)
Sex	(OR=1.1, CI=0.79-1.59)	(OR=1.1, CI=0.78-1.59)	(OR=1.1, CI=0.84-1.45)
Male	77 (17.4%)	77 (17.4%)	161 (36.3%)
Female	72 (15.8%)	72 (15.8%)	156 (34.1%)

Focus group discussions with mothers

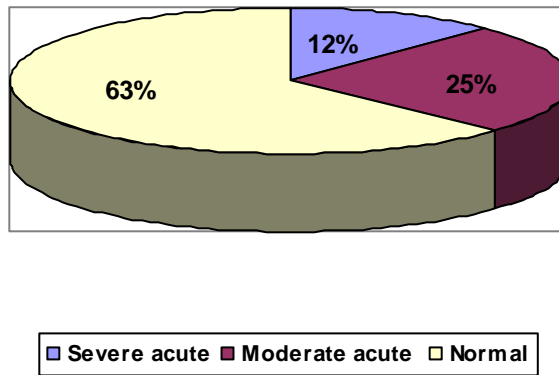
About 6-10 mothers were grouped together and the following questions were forwarded to them and discussions were made. They were asked about the common food given to the children below 3 years, frequency, any change in food consumption in children after coming to the camp and constraints on adequate care for children.

Nutritional status of pregnant women

During the study nutritional status among 168 pregnant women were determined by using the mid arm circumference (MUAC). Figure 9 shows that 12% of them were suffering from the severe acute under nutrition and overall 37% of them were at risk.

Figure 9

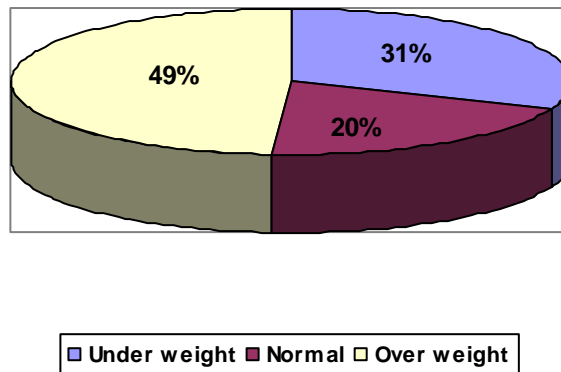
Distribution of the mid arm circumference of pregnant women



Nutritional status of Lactating mothers

Only 97 lactating women (within 6months of delivery) were found in camps which were visited. About one third (31.1%) were under weight (<18.5 BMI), 19.8% were overweight (>24.9 BMI).

Figure 10
Distribution of the Body Mass Index of Lactating mothers



Conclusions and Recommendations

The prevalence of under nutrition among children less than 5 years in the Tsunami affected areas was higher than the national prevalence. The prevalence of wasting, stunting and underweight among them was 18.1%, 20.1% and 36.8% respectively. Stunting is higher than wasting. About one fourth of the children of 1 - 2 years of age were suffering from wasting. Under nutrition was more prominent in the Eastern province than other provinces. Two thirds of children are suffering from respiratory tract infections. Wasting was higher among children with diarrhoea and ARI. About one third of lactating mothers are under weight. Over one third of pregnant women are at risk.

It is recommended to:

- Launch a one day Vitamin A mega dose supplementation campaign to children aged 6 months to 5 years in the Tsunami affected areas.
- To initiate the supplementary feeding programme (Thriposha or CSB) for all the children under 5 years, pregnant women and lactating mothers in the Tsunami affected areas for a minimum of one year.
- Establishment of nutrition surveillance system in tsunami ravaged areas.
- Advice social services department and camp managers to provide a special food ration for Children.
- Capacity building of health workers on key nutrition interventions in emergencies is also needed.

REFERENCES

1. Toole MJ and Waldman RJ 1993, Refugees and displaced persons: war, hunger and public health. *Journal of the American Medical Association*,18: 283-312.
2. Demographic and Health survey (DHS) 2000, Department of census and statistics, Sri Lanka.
3. Jayatissa R and Wijesingha S 2004, Rapid assessment of nutritional status among children under five in Mullative districts, World Food Programme.
4. World Health Organisation (WHO) 1995, Physical status: the use and interpretation of anthropometry, No. 854;Geneva.
5. Nutrition working group 2004, Nutrition survey guidelines; Recommendations for Somalia, USAID/OFDA.

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ANNEXURE – 1

List of camps by district

District	Name of the camp
1. Colombo	1. Subodharamaya, Ratmalana
	2. Bellkagama Temple, Moratuwa
2. Gampaha	1. Palangathuraya Don Bosco
3. Kalutara	1. Galabodaviharaya, Panadura
	2. Pothupitiya College, Kalutara
	3. Matugama church
	4. Kalwari , Kalutara
	5. Model camp, Panadura
4. Galle	1. Malwenna Pushparamaya. Hikkaduwa
	2. Sri Wardharamaya, Galle
	3. Wellathota Temple, Habaraduwa
	4. Ugallwala Temple, Immaduwa
	5. Jumma church, Galle
5. Hambanatota	1. Kudawella
	2. Nilwela
6. Matara	1. Wajirawansa punchi panasala, Devinuwara
	2. Midigama Viharaya, Waligama
7. Jaffna	1. Jaffna palai
8. Kilinochchi	1. Palai central college
	2. Killi Kanistha MV
9. Mullative	1. Roman catholic GTMS
	2. Kokkutoduwai GTMS
10. Batticaloe	1. Mohideen Thaika, Palammai
	2. Dance and music college, Narakkuda
	3. Chrytypalain MV, Chrtypalaim
11. Trincomale	1. Sandycove fishing center, Trinc. town
	2. Keenya central college
12. Ampara	1. Ninathavur Jumma mosque
	2. Oluvil Al Hamara V.
	3. Akkaraipaththu Ayna Balika
	4. Maratahmunai Jummah mosque
	5. Manalchanai

ANNEXURE – 2

Members of the steering committee

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2. Dr. A.M.S. Mahamithawa, Nutrition Division, Medical Research Institute
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4. Dr. Aberra Bekele, UNICEF
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- 6.

