NUTRITIONAL ANTHROPOMETRIC SURVEY
CHILDREN FROM 6 TO 59 MONTHS

ACCHAM DISTRICT, NEPAL

September 2008

Final report

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ACKNOWLEDGMENTS

This nutritional survey was a real challenge to perform as it had to be prepared and carried out in a very short time, to avoid interfering with the famous and popular Nepali Dashain festival. So, it left us only one month to prepare the survey, train the teams and collect the data.

It was both stressful and challenging so I would like to thank all the ACF teams involved in this survey, especially our logistic and administration departments. A special thanks to Christophe ROUX, who was in charge of the preparation of the survey and the data collection.

The help of the Social Welfare Council and the Ministry of Health and Population regarding the authorization to work in Accham district was highly appreciated.

I would like to thank RUDEC (Rural Development Center), a local NGO and Helvetas an International NGO, working in Accham district on suspension bridges and Community Development, for their precious help during the preparation of this survey.

I also would not like to forget all the people met in the field who kindly answered to all our questions.

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GLOSSARY

SUMMARY

The nutritional survey covered the entire district of Accham. It began on the 17th of September and finished on the 30th of the same month of 2008.

1. METHODOLOGY

The survey carried out in Accham district was based on a 2 stage cluster methodology. All the children from 6 to 59 months old or 60 to 110 cm when the age could not be precisely defined, in the selected households included in the survey. The sample size and the selection of households determined using the SMART methodology.

Data were analyzed with ENA for SMART software (version October 2007). 51 clusters of 16 children were randomly selected among the under 5 population, which is estimated to be 35,918 individuals (census of 2001 from the Central Bureau of Statistics). The smallest geographical entity with data available and defined boundaries is the ward.

A sample of 824 children was surveyed, including 5 absences, 2 data with the height missing, 3 data with the WHZ not calculated by the software and 5 data out of range (according to the WHO standards from 2005).

In parallel to the nutrition survey, a gross motor development test was performed for all the children. This test consists of showing 5 figures to the mother (see paragraph *8 Child development* in the chapter "Methodology") and asking her: "when looking at these pictures, what is the best stage reached by your child". The interviewer comments each picture according to the sentence attached to the figure.

Analysis of this study has been done only for children from 6 to 36 months as after 36 months, all children except those with a physical handicap should be able to walk without assistance and so this test is no longer specific.

2. RESULTS

2.1. Prevalence of acute malnutrition among children from 6 – 59 months old (n=809)

Global Acute Malnutrition (in z-score):

With WHO new standards	18.0%	[CI[1] 95%: 14.6% ↔ 21.5%]
With NCHS reference	18.1%	[CI 95%: 14.9% ↔ 21.3%]

Severe Acute Malnutrition (in z-score):

With WHO new standards	3.6%	[CI 95%: 1.8% ↔ 5.4%]
With NCHS reference	1.1%	[CI 95%: 0.3% ↔ 1.9%]

2.2. Prevalence of chronic malnutrition among children from 6 –59 months old (n=788)

Chronic Malnutrition in z-score:

Global	63.5%	[CI 95%: 58.8% ↔ 68.1%]
Severe	32.2%	[CI 95%: 27.6% ↔ 36.9%]

2.3. Child development

- Girls and boys' gross motor development are within the WHO intervals for each step of development, except for the two last ones "standing alone" and "walking alone".
- Malnourished children (wasting and/or stunting) reach the different steps of development later than well nourished children.

[1] 95% Confidence Interval

3. RECOMMENDATIONS

- To carry out a comprehensive assessment in Accham district to understand the major direct causes of malnutrition;
- To implement a Community-based Management of Acute Malnutrition (CMAM) programme to prevent and treat severe acute malnutrition;
- To determine in collaboration with the MoHP, UNICEF and Concern the "new" criteria to use for detection, referral and admission in a nutritional center;
- To reinforce counseling activities on care practices, balanced diet and non discrimination between gender in health posts and sub-health posts as well as at community level through FCHVs;
- To support and promote child development through stimulation of children and promotion of adequate care practices of the caregivers.
- To distribute micronutrients for children from 6 to 36 months in parallel to a food aid program to reinforce the nutritional status of the children and to contribute to the prevention of acute malnutrition and stunting.
- To define and implement a food security program to respond to the on going food crisis;
- To implement a surveillance system via the FCHVs to monitor the nutritional situation in Accham district on a regular basis. This surveillance could take place during the growth monitoring sessions.

INTRODUCTION

Situated in the lap of the Himalayas and landlocked between India and China, Nepal is a relatively small country of 141,181 square kilometers and 26 million inhabitants.

Geographically, it can be divided into three distinct belts stretching from east to west across the country: Mountains in the north, Hills in the middle and the plain of the Teraï in the south. There are five development regions in Nepal - Eastern, Central, Western, Mid-western and Far-western, divided into 14 zones and 75 administrative districts. Districts are further divided into Village Development Committees (VDCs) and Municipality. Each VDC is sub-divided into nine wards, which are the smallest administrative units with known population data.

Nepal is a multicultural, multi-religious and multiethnic society with numerous castes, which contribute to the complexity of the context of Nepal and so to the complexity of defining an appropriate/adequate intervention responding to the needs of everyone.

The Human Development Index (HDI) is based on 3 indicators: longevity as measured by life expectancy at birth, educational attainment as measured by adult literacy rate and school enrollment ratio and standard of living as measured by GDP par capita. Nepal Human Development Report quotes the HDI to be 0.471 for 2001, 0.527 for 2004 and 0.534 for 2005, which gives the country a rank of 142nd out of 177 countries with data.

By comparison, Bangladesh, which is a neighboring country of Nepal is ranked 140th over 177 with a HDI of 0.547.

Accham district is situated in the Far-Western development region, surrounded to the west by Bajhang, Doti and Kailali districts, to the south by Surkhet district, to the east by Dailekh and Kalikot districts and to the north by Bajura district. The altitude throughout Accham varies from 400 to 3820 meters above sea level.

Administratively speaking, Accham district is divided into 75 VDCs including the municipality of Mangalsen. Its surface area is 1680 square kilometers with a population of 231,285 inhabitants[2]. With a density of 138 inhabitants/km², Accham is situated 47th out of 75 districts, with Kathmandu in first position being the most populated district (national average is 156 inhabitants/km²). Accham district supports 46 770 households with an average size of 5.6 persons per household.

Accham is one of the remotest districts in Nepal, ranked 72 over 75 districts in terms of development parameters. Mangalsen, the district headquarters, is eight hours walk from Sanfebagar, a town in Accham supporting a non-functional domestic airport. A seasonal road exists from Sanfebagar to Mangalsen but is often closed during the monsoon season.

In terms of health, there is one governmental hospital in Mangalsen with a capacity of 15 beds, 1 Primary Health Care centre, 13 Health Posts, 60 Sub-Health Posts, 3 Ayurvedic Health Facilities, 26 pharmacies and 227 Primary Health Care Outreach Clinics[3].

With an infant mortality rate of 98.8 per 1000 live births[4], Accham district is far above the national level which is 48 deaths per 1000 live births (NDHS 2006).

Acute Respiratory Infections (ARIs) are a leading cause of childhood morbidity and mortality throughout the world. Early diagnosis and treatment with antibiotics can reduce the number of deaths caused by ARIs, particularly deaths resulting from pneumonia. Pneumonia has emerged as the leading

[2] Data come from the census done in 2001 by CBS (Central Bureau of Statistics)
[3] Source: Annual report 2005/2006, Department of Health Services, MoHP and District Health Profile 2007, Department of Health Services, Nepal
[4] District Development Profile of Nepal, 2004

cause of death among children under age five in Nepal. In the 2006 NDHS, the prevalence of ARI was estimated by asking mothers whether their children under age five has been ill with a cough accompanied by short, rapid breathing and difficulty breathing as a result of a problem in the chest, in the two weeks preceding the survey. It should however be noted that the morbidity data collected are subjective in the sense that they are based on the mother's perception of illness without validation by medical personnel. It appears that in the Far Western Development Region, 6.5% of children under five years of age showed symptoms of ARI at some time in the two weeks preceding the survey, which is above the national prevalence of 5%.

Severe diarrhea is another major cause of morbidity and mortality among young children. In the 2006 DHS survey, in the Far-Western Hill Sub-region, 14% of all children under the age of five had diarrhea in the two weeks prior to the survey, while the national prevalence is 12%.

The NHDR[5] 2001 reports that 15% of the population of Accham has access to toilet facilities and 44.3% has access to safe drinking water revealing that hygiene and sanitation are a serious issue in Accham district which need to be tackled to prevent the high prevalence of ARI and diarrhea in children less than 5 years old.

According to the District Development Profile of Nepal 2004, the food availability, in terms of cereal, in Accham is 22 944 MT and the requirement is 46867 MT, showing a food deficit of about 23923 MT. A recent study[6] conducted in June 2008 by the Ministry of Agriculture and Co-operatives (MoAC) and WFP, showed that chronic food insecurity is a major problem in Accham, classifying this district as one of the most affected districts by the food crisis. One of the recommendations of this report is to launch an immediate emergency assistance for the most affected districts, including Accham. More than 90% of the surveyed population is facing severe food shortage, the situation being exacerbated by rising fuel and food costs, recurrent droughts, hailstorms, landslides and crop losses in the past.

District Administration Office statistics show that there are more than 100 local NGOs registered in Accham. Few of them are functional. International NGOs or organisations working in Health and nutrition in Accham are UNDP (HIV/AIDS), UNICEF (Decentralized Planning for the Child Programme, DPCP), Save the Children Fund/UK (HIV/AIDS awareness program), WFP (Food for Work, feeding for school children in 218 primary schools), DANIDA (Health and Forestry Sector), GTZ (Reproductive Health Program), ADB (Drinking Water Supply projects), WHO (Prevention and control of disease through District Health Office), HKI/Nepal (Vitamin A promotion in 8 VDCs). Similarly, INGOs working in community awareness, empowerment and development sector are NORAD, World Service (community empowerment projects), Helvetas Nepal (suspension bridges, Community development), UMN (Community awareness development), World Bank (NISP, Agricultural Program), CARE/Nepal (community development activities) and IDA (Hill Community Forest Project).

This survey will allow us a better understanding of the nutritional situation, in particular of acute malnutrition, in one of the districts most affected by the food crisis and therefore will help to design an operational response if the data highlight serious nutritional problems.
Alongside of the nutrition anthropometric survey, a food security assessment was carried out which will help to have a broader vision of the actual context of Accham.

If CMAM could be a solution to response to the nutritional issue, Accham will be part of the on going pilot project aiming at implementing and testing the feasibility of CMAM (Community-based Management of Acute Malnutrition) programme in different districts of Nepal. So, this survey will also serve as a baseline for the pilot project.

Three main actors are involved in this project: UNICEF, Concern and ACF. They all agree to implement and test the CMAM programme in 3 different agro-ecologic zones. For now, ACF is taking

[5] NHDR: Nepal Human Development Report
[6] Emergency Food and Security Assessment (EFSA)

the lead to implement CMAM in Mugu district (Mountains area) and Kanchanpur district (Terai) while Concern will implement CMAM in Bardiya district (Terai) and UNICEF plan to launch CMAM in Parsa and Saptari districts (Terai) and in Surkhet district (Hills area).

After the pilot phase, recommendations regarding the best way of implementing such a programme in the 3 agro-ecological zones will be shared with the Ministry of Health and Population and all the stakeholders involved in nutrition activities.

Therefore, the aim of this pilot project is to demonstrate that CMAM could be adapted to the Nepali context and be used nationwide as the major guidelines to treat acute malnutrition.

In addition to the anthropometric measurements, a gross motor development test was performed for all the children surveyed, but data analysis was performed only for children under 36 months old. It has been proven that the acquisition of bipedal locomotion is an important aspect of gross motor development, that ultimately affects the cognition of young children. Combined results of several studies[7] show an association between children's length and weight-for-length and the attainment of bipedal locomotion in several populations on different continents.

Evidence for association between nutrition-related variables and walking acquisition exists. A cross-sectional study[8] started in December 2000 in one VDC of Sarlahi district showed that growth, anemia and diet are independently associated with delays in the onset of bipedal locomotion among young Nepali children. Children with higher length-for-age z-score and no anemia walked at en earlier age than children with lower z-scores and anemia.

[7] Kariger PK, Stoltzfus RJ, Olney D, Sazawal S, Black RE, Tielsch JM, Frongillo EA, Khalfan SS, Pollitt E. Iron deficiency and physical growth predict attainment of walking but not crawling in a cross-sectional sample of poorly nourished Zanzibari infants. J Nutr. 2005; 135:814-9
Pollitt E, Husaini MA, Harahap H, Halati S, Nugraheni A, Sherlock AO. Stunting and delayed motor development in rural west Java. Am J Hum Biol. 1994;6:627-35
Cheung YB, Yip PSF, Karlberg JPE. Fetal growth, early postnatal growth and motor development in Pakistani infants. Int J Epidemiol. 2001;30:66-74

[8] Emily H. Siegel, Rebecca J. Stoltzfus, Partricia K. Kariger, Joanne Katz, Subarna K. Khatry, Steven C. Leclerq, Ernesto Pollitt, and James M. Tielsch. Growth Indices, Anemia, and Diet Independently Predict Motor Milestone Acquisition of Infants in South Central Nepal, American Society for Nutrition, June 2005

OBJECTIVES

- To evaluate the nutritional status of children aged 6 to 59 months in Accham district
- To identify higher risk groups for malnutrition: gender, age
- To assess child development according to the age, sex and nutrition status
- To serve as a baseline nutritional survey for the CMAM pilot project for Nepal if Accham becomes an eligible district to implement CMAM as a pilot
- To make recommendations for nutritional interventions

METHODOLOGY

1. Selection of Survey Area within the Districts

The survey has covered the entire district, excluding the institutional areas (military, police and university campus where in principle, families are not allowed to stay).

2. Sampling Methodology

A two stage cluster sampling methodology, following the SMART guidelines and using the supporting ENA[9] software was used, because no accurate population register was available for systematic sampling and households are not located in a way that can be visited systematically. The ward is the smallest administrative unit in Nepal with population figures and definite boundaries.

However, some wards in Accham district having really few inhabitants (estimated population of children under 5 less than 30) have been grouped together to form a cluster with at least 30 children less than 5 years old, in order to be able to find the required number of children per cluster. Among the 675 wards, 117 were populated enough to form a cluster, 276 wards were grouped by 2 to form 138 clusters, 183 were grouped by 3 to form 61 clusters, 68 were grouped by 4 to get 17 clusters, 25 by 5 and 1 cluster was formed with 6 wards together to obtain a total of 339 clusters.

The two stages of sampling are therefore:

- the cluster (ward or group of wards) which have been selected randomly and proportionally to their population size from the total list of clusters (n=339);
- the required number of children under 5 years old within each cluster was selected randomly using the EPI methodology;

The number of children to survey in one cluster has been chosen so that one team can complete one cluster per day.

3. Sample size and sampling procedure for anthropometric data

Sample size for anthropometric data
The sample size for the anthropometric survey is determined using the calculation sheet of the ENA software. The variables used to calculate the sample size were the under five years population of the district (n=35918), an estimated prevalence of acute malnutrition of 18.0% with a precision of 4%, and a design effect of 2.3. The total population size for the district geographical units (wards), and the percentage of children less than 5 years of age used to calculate under five population (15% of the total population) are based on the CBS 2001 census data.

[9] ENA software for SMART, developed by Dr. Juergen Erhardt in cooperation with Prof. Michael Golden, October 2007, available from the website: www.nutrisurvey.de

The calculated sample size of children to survey is 807. This sample was not increased by 10% as the SMART methodology recommends it to take into account the missing children and the disabled children.

However, as more children than planned were surveyed during the data collection, this has no effect at all for the data analysis.

Selection of Clusters

The actual number of clusters is calculated on the basis of the required total sample size and the number of children that can be surveyed in one day. This depends on the topography of the area and its accessibility. Cluster size is standardized for each district, and each cluster includes data from a specified number of children to reach the minimum sample size by the end of the survey period.

After discussion with the nutritional teams and knowing the difficulties to move from one village to another one in Accham district, we decided to survey 16 children per cluster and per day, which brings the total number of clusters to survey to 51.

However, the survey time being very close to the monsoon, 4 "buffer" clusters were selected in addition to the 51 required clusters, to be able to cope with the situation where clusters were not accessible.

So 55 clusters were selected together with ENA software and among these 55 clusters, 4 were randomly selected to be part of the "buffer" group.

At the end of the survey, the 51 clusters were surveyed (no problem of accessibility or security). Finally, the 4 "buffer" clusters were finally not assessed.

Selection of Households and Children

For this survey, a household is defined as all persons who eat from the same cooking pot.

They are several methods of choosing the household (HH) from the cluster. According to the SMART methodology, the best way is to treat each cluster as if it is a "small population" and to select the houses using the simple or systematic random sampling methods according to the size of the geographic area and household's layout. If this is not possible because the population or area is too big and there is no household list or systematic arrangement of households, the widely known EPI method is used.

In this survey, EPI 2-stage methodology was used in all the selected clusters.

The EPI 2-stage method:

- Go to the centre of the cluster (ward). If one cluster is composed of several wards, the geographical center used is the center of all the wards together.

- Randomly chose a direction by spinning a bottle, pencil or pen on the ground and noting the direction it points when it stops.

- Walk in the direction indicated to the end/boundary of the ward. At the end of the ward spin the bottle again until it points into the body of the ward.

- Walk along this second line counting each house on the way, up to the opposite edge of the ward.

- Using a random number table, select the first house to be visited by drawing a random number between 1 and the total number of households counted when walking.

- Go to the first house and examine all of the children aged 6-59 months in the household. If there are no children aged 6-59 months in the household, select the nearest household on the right until a household with eligible children is found.

- The subsequent households are chosen by proximity.
  A. In a village where the houses are closely packed together, choose the next house on the right. Continue in this direction until the required number of children has been measured.
  B. If the village is spread out, choose the house with the door closest to the last house surveyed, whether on the right or left. Continue the process until the required number of children has been measured.

- If the team comes to the edge of the cluster before the minimum number of children has been measured, then they spin the bottle from the edge and start the procedure again counting all the houses in the direction indicated by the bottle and select randomly the first house to survey.

When the house has been selected, if there are more than one household in one house or compound:

- Then one household among all was randomly selected and only children from this household were measured. As no mortality questionnaire was asked, households without children between 6 – 59 months were not part of the selection.

- If there were several mothers (daughters in law) or wives and their children living in the same house (joint family or polygamous family) but eating from the same cooking pot, these were considered as one household and then all of the children between 6 – 59 months were measured.

- If in the last house surveyed, there were more children than the number required to complete the cluster, all the children were measured.

- If there were not enough children in the cluster surveyed, then the team randomly selected one of the adjacent wards, which was not already part of the original survey sample clusters.

- If in the selected house, there was no child, then the house was skipped and the next house was selected following the selection method used.

- If for any reason, one selected house could not be surveyed (refusal of the house occupants, the staff fear dog, etc) then the house was not substituted by another one. The team wrote a note and went to the next house according to the rules.

- If the selected house was empty, the neighbours were asked about the family living there. In the data collection form, a note was taken specifying why the house was empty. If the residents were likely to return before the team left that cluster, the team returned to the house to include the children in the survey.

- If the house was permanently empty, this house was skipped

- In case of temporary absence (defined as less than one day) of children or informants to answer the questionnaires, the household was not omitted, skipped or substituted in the data. The team visited the household again at the end of the working day. If the child/informant was still not available at the end of the day then this was noted by the team leader and registered as an absent child. So, in that case, there was one child's data missing in the anthropometric questionnaire for this cluster. If at the end of the survey there were more than 5% absent children (n=40), then teams went back to the clusters with absent children and tried to find the children to obtain the missing data.

- Disabled children that would otherwise be eligible were included where possible. If it was not possible to measure the height and weight due to deformity or other abnormality, the child was given an ID number and the data recorded as missing and a note taken.

- If a child (of the surveyed household) has been admitted to a hospital or health center, the team went to this structure and measured the child. If it was not possible to visit the center, the child was included in the datasheet and a note added.

Each household was asked whether they would like to participate in the survey. If the household refused to participate, then the household was noted by the team leader as such, but not replaced.

4. Data collection and measurement techniques

Anthropometric data

The following data were collected for children from 6 to 59 months of age:

Age: was recorded by birth date (mm/dd/yyyy) according to the Gregorian calendar, after converting it from the Nepali date with a date conversion sheet. This birth date was confirmed by vaccination card, growth card, birth certificate or other form of identification. If it could be confirmed then a "Y" was marked on the anthropometric form in the appropriate column. If the age could not be verified, then the date of birth or age in months was recorded as stated by caretaker and a "N" was marked on the anthropometric form in the column for confirmation of date of birth.

A "Calendar of Events" was provided to each team to assist the mother with the identification of the birthdate, if no proof was available.

The team leader calculated the age of the child in months before performing the anthropometric measurements. If the age could not be confirmed and the mother was unclear of the age of the child, the team leader included all children with a height of 60 cm – 110 cm. This was a last resort for the decision on inclusion or exclusion to the survey.

Sex: of the child was recorded as "M" for male or "F" for female.

Weight: was measured using 25 kg hanging Salter scales and recorded in kilograms to the nearest 100 grams. The Salter scales were calibrated each morning by the team leader using a known weight of 2kg. The scale was hung from a stick held by two measurers, and recalibrated to zero with the hanging pants attached to the scale before the child was put into weighing pants. The teams weighed all children without clothing.

Height: was measured in centimeters using a 1.30 meter height board graduated to 0.1cm with a movable block. Children were measured recumbent if their height was below 85cm. Children were measured standing if they measured 85 cm or above. The height was recorded to the nearest 0.1 cm. All children were measured barefoot, and without caps or hairdo. For children measured standing up, the measurers were trained to ensure that the child's head, shoulder blades, buttocks, calves and heels were touching the boards and they were looking straight ahead. Children measured lying down were placed in the middle of the board with the head touching the fixed end, the knees pressed down and the heels touching the movable block.

Oedema: was assessed by applying normal thumb pressure to the anterior surface of both feet for three seconds. If an indentation remained after the pressure was removed, presence of oedema was considered positive and a "Y" entered on the data collection form. If the thumb imprint did not persist, or if the oedema was not bilateral, the child was recorded as not having oedema and an "N" entered on the data collection form.

MUAC or Mid upper arm circumference was measured in centimeters, to the nearest 0.1cm, using standard ACF MUAC measuring tape. The measurers were trained to locate the mid-point between the shoulder and the tip of the elbow on the left arm with the arm bent at a right angle and to note the mid-point. The measurement was taken at this mid-point with the arm extended and relaxed.

For malnutrition cases found - each child who was detected as severe acute malnutrition (MUAC < 110mm and/or oedema) or as moderate acute malnutrition (MUAC < 125mm) with medical complications was referred to the closest health facility, as no Nutritional Rehabilitation Home exists in Accham district.

5. Training and supervision

Five teams of 3 members – two measurers and one team leader – were trained during 4 days, including 2 days on the SMART methodology (theory), 1 day on anthropometric measurement (practice) and 1 day for a pre-test survey in a non-selected cluster.

Due to the difficulties to move from one cluster to another one (no road, long distance to cover, time-consuming, energy-consuming, difficulties to locate a team once they had already started to measure children), the supervision was not uniform for the 5 teams. One team was supervised by the nutritional survey advisor, one team was supervised by the food security officer and a third one was followed by the food security supervisor. The 2 remaining teams were alone during all the time of the survey.

However, the teams have been asked to check their data collection sheets for completeness and errors before leaving the area.

6. Data analysis

Data entry and analysis were done with the ENA software.

7. Indicators and Formulae

Acute Malnutrition

The main indicator of nutritional status used in this survey was wasting or acute malnutrition, which assesses how thin the sample population is relative to their height, compared with a reference population (WHO standards of 2005).

Weight-for-height was expressed in z-score which is usually used to measure the prevalence of malnutrition at a population level. The classification of GAM (Global Acute Malnutrition) and SAM (Severe Acute Malnutrition) using z-score is as follows:

Table 1: GAM, MAM and SAM expressed in Z-Score

	Z- Scores
Global Acute Malnutrition	< - 2 and / or oedema
Moderate Acute Malnutrition	≥ -3 to < - 2, no oedema
Severe Acute Malnutrition	<-3 Z-score and/or oedema

The weight for height index is the most appropriate index to quantify wasting in a population in situations where acute forms of malnutrition are the predominant pattern. However the mid-upper arm circumference (MUAC) is a useful tool for rapid screening of children at a higher risk of mortality. MUAC measurements were taken for all children from 6 to 59 months.

Table 2: Classification of the Nutritional Status using MUAC

Nutritional Status	MUAC criteria
Adequate nutritional status	≥ 13.5 cm
Risk of malnutrition	12.5 – 13.4 cm
Moderate acute malnutrition	≥ 11.0 - <12.5 cm
Severe acute malnutrition	<11.0 cm

Chronic Malnutrition

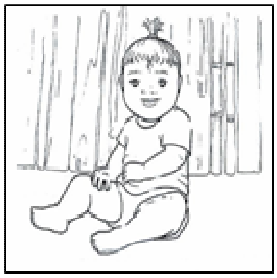
Children who have a low height-for-age (HFA) are considered as stunted. Measuring the height of a child in relation to a standard of a child of the same age gives an indication of the growth of a child. HFA is usually used as an indicator for chronic malnutrition. We should mention that age is difficult to obtain accurately and that errors in age strongly influence the results for HFA/chronic malnutrition.

8. Child development

In parallel to the nutrition survey, a gross motor development test was performed for all the children. This test consists of showing 5 figures to the mother (see below) and ask her: "when looking at these pictures, what is the best stage reached by your child?". The interviewer comments each picture according to the sentence attached to the figure.

Stage 0: the child is not able to sit alone
Stage 1: the child is sitting without support
Stage 2: the child is standing with assistance
Stage 3: the child is walking with assistance
Stage 4: the child is standing alone
Stage 5: the child is walking alone

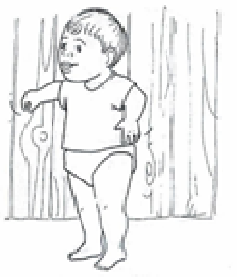
Even if the question was asked for all of the children surveyed, analysis of this study was performed only for children from 6 to 36 months, as after 36 months, all children except those with a physical handicap should be able to walk without assistance and so this test is no longer specific.



Stage 1

Stage 2

Stage 3



Stage 4

Stage 5

RESULTS

The current international growth reference, the National Center for Health Statistics (NCHS) reference, is widely used to compare the nutritional status of populations and to assess the growth of individual children throughout the world. Recently, concerns were raised regarding the adequacy of this reference for assessing the growth of breast-fed infants. A study developed in Brazil shows that infants who were exclusively or predominantly breast-fed for the first 4-6 months and partially breast-fed thereafter, grew more rapidly than the NCHS reference in weight and length during the first 3 months, but appeared to falter thereafter. The average growth of all infants, regardless of feeding pattern, was faster than the NCHS reference until 6 months, after which their growth became slower than that of the NCHS sample. These findings suggest that the infancy portion of the NCHS reference does not adequately reflect the growth of either breast-fed or artificially fed infants. This probably results from characteristics of the original sample and from inadequate curve-fitting procedures. An improved international growth reference that reflects the normal infant growth pattern was developed by WHO in 2005.

The use of the new WHO standards needs to be tested and the previous cut-offs used with the NCHS reference to determine the gravity of a given situation, certainly need to be revised and adapted to fit with reality.

Some countries have already adopted the new WHO standards as the standard of use to define the prevalence of malnutrition and for admission and discharge criteria in nutrition programmes. Nepal is one of these countries.

For consistency purposes, analysis of the data will be presented first with the WHO standards 2005 and then with the NCHS reference.

1. Characteristics of the sample

Due to the weather and some authorization procedures, the methodology defined above was not accurately followed in all the clusters. Indeed, the cluster number 32 in Darna VDC, composed initially of 2 wards (wards 6 and 8) was reduced to one ward only. Due to heavy rain and a rapid increase of the river level, ward 6 was inaccessible and so the cluster was reduced to ward number 8. The data collection was done only in this ward.

In the selected cluster number 30 in Budhakot VDC, initially composed of 2 wards (wards 2 and 3), only 2 children were measured. Right after the beginning of the survey, the president of the ward, unhappy not to have been informed about the current survey, refused to give his authorization for the nutritional team to continue. So the team had no other choice than to switch from this cluster to the nearest non-pre-selected cluster (following the methodology described above). So cluster 30, wards 2 and 3, was replaced by the cluster composed of wards 5 and 7 in the same VDC.

The 2 children measured in the former cluster 30 were maintained in the analysis and the 14 children needed to complete the cluster were surveyed in wards 5 and 7.

During the survey, due to logistical and distance constraints, 2 teams were not supervised (cf methodology, chapter 5 “Training and supervision”). Among these 2 teams, one team found 9 cases of oedema over the 11 in total for the whole nutritional survey. This high number of oedema cases, compared to the other team (1 case for team 3 and 1 case for team 5) is dubious, even if during the debriefing after the survey, the members of this team were able to give an accurate definition of a nutritional oedema.

In a care of transparency and professionalism, these 9 cases of oedema have been excluded and the analysis of the data done without them. So the prevalence of acute malnutrition may be under-estimated due to this deletion.

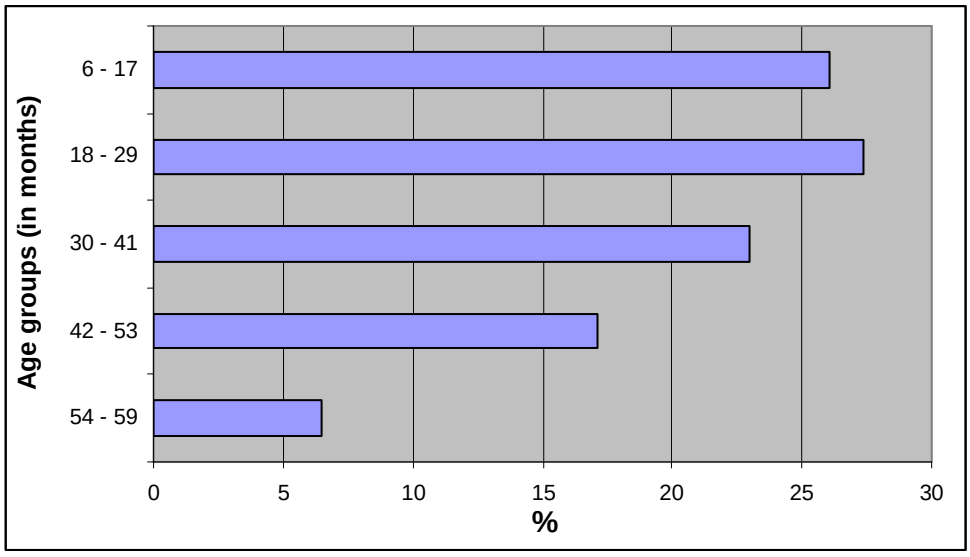
824 children under 5 years old were surveyed. Among these 824 children, 15 were excluded from the analysis (GAM and SAM) because of missing or aberrant data (weight and/or height). Three children had missing or aberrant age data.

Table 3: *Distribution of age and sex of the sample, Accham district, Nepal, September 2008*

	Boys		Girls		Total		Ratio
	no.	%	no.	%	no.	%	Boy: girl
6-17 months	114	53.3	100	46.7	214	26.1	1.1
18-29 months	102	45.3	123	54.7	225	27.4	0.8
30-41 months	94	49.7	95	50.3	189	23.0	1.0
42-53 months	79	56.4	61	43.6	140	17.1	1.3
54-59 months	35	66.0	18	34.0	53	6.5	1.9
Total	424	51.6	397	48.4	821	100.0	1.1

The sex ratio of the survey (1.1) is included in the interval 0.8 – 1.2, meaning that both sexes are equitably represented, which validates the representativity of the sample.

Graph 1: *Distribution of children per age, Accham district, Nepal, September 2008*



The graph above shows an equitable repartition of children for the age groups 6 – 17 months, 18 – 29 months and 30 – 41 months. However, the age group 42 – 53 months is a bit under-estimated as well as the age group 54 – 59 months. For the last group, it can be partly explained by the fact that the four first groups (from 6 to 53 months) covered a period of 12 months each whereas the age group 54 – 59 months covered a period of only 6 months. But still, this difference of period coverage only gives a partial explanation as the age group 54 – 59 months should have represented at least 10%.

The real design effect of the survey is 1.74 which is a bit lower than the assumption made for the sample calculation (design effect = 2.3).

Children from 6 to 29 months represent 53.5% (n=439) of the total sample.

2. Prevalence of acute and chronic malnutrition

Acute malnutrition or wasting is defined by the Weight-for-Height (W/H) index and/or the presence of bilateral oedema. The W/H index of a measured child is calculated by taking into consideration the median weight of the WHO standards from 2005, for the same height. Acute malnutrition is therefore expressed only in Z-score. Percentage of the median is used only when the prevalence of malnutrition is expressed according to the NCHS reference.

2.1. Prevalence of acute malnutrition using WHO standards 2005

Table 4: *Prevalence of acute malnutrition by age based on weight-for-height z-scores and/or oedema, Accham district, Nepal, September 2008*

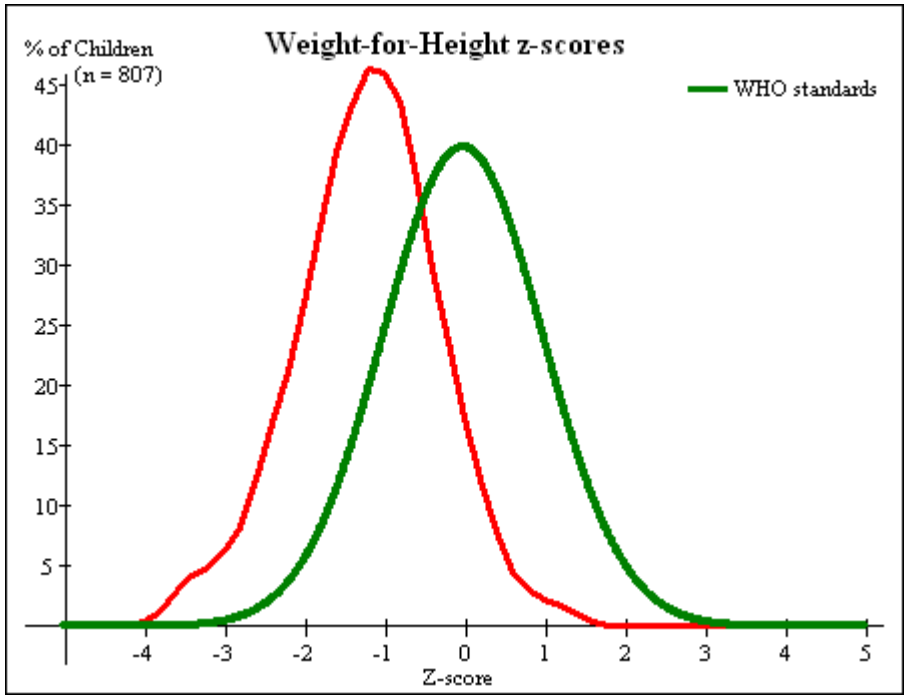
		Severe wasting (<-3 z-score)		Moderate wasting (≥-3 and <-2 z-score)		Normal (≥-2 z score)		Oedema	
Age (months)	Total	n	%	n	%	n	%	n	%
6-17	212	8	3.8	36	17.0	167	78.8	1	0.5
18-29	222	14	6.3	27	12.2	180	81.1	1	0.5
30-41	187	3	1.6	28	15.0	156	83.4	0	0.0
42-53	139	5	3.6	19	13.7	115	82.7	0	0.0
54-59	53	0	0.0	7	13.2	46	86.8	0	0.0
Total	813	30	3.7	117	14.4	664	81.7	2	0.2

Table 5: *Distribution of acute malnutrition and oedema based on weight-for-height z-scores*

	<-3 z-score	≥-3 z-score
Oedema present	Marasmic kwashiorkor n= 0 (0.0 %)	Kwashiorkor n= 2 (0.2 %)
Oedema absent	Marasmic n= 30 (3.7 %)	Normal n= 784 (96.1 %)

Table 6: *Prevalence of global and severe acute malnutrition (WHO standards) in children 6-59 months old, in z-score, Accham district, Nepal, September 2008*

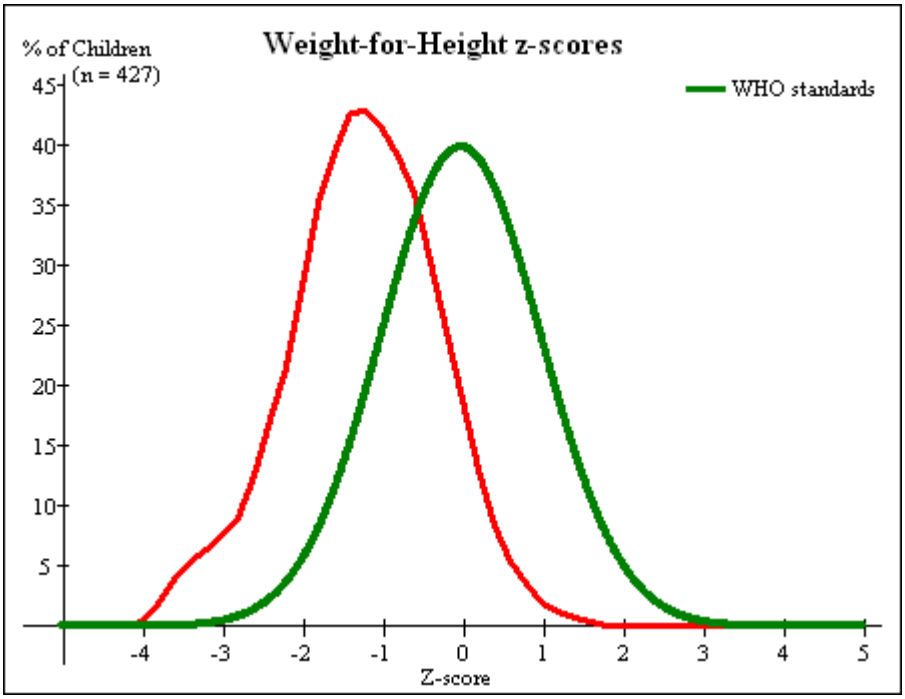
	6 - 59 months (n=809)
Global Acute Malnutrition	**18.0 %** [CI 95% : 14.6% - 21.5%]
Severe Acute Malnutrition	**3.6 %** [CI 95% : 1.8% - 5.4%]



The mean and standard deviation of the distribution are respectively -1.21 z scores and 0.88.

Table 7: *Prevalence of global and severe acute malnutrition (WHO standards) in children 6-29 months old, in z-score, Accham district, Nepal, September 2008*

	6 - 29 months (n=429)
Global Acute Malnutrition	**19.6 %** [CI 95% : 14.6% - 24.6%]
Severe Acute Malnutrition	**4.9 %** [CI 95% : 2.5% - 7.3%]



The mean z score of the population of children between 6 – 29 months is -1.24 and the standard deviation 0.91.By comparing the nutritional status (GAM and SAM) of children aged from 6 to 29 months with children aged from 30 to 59 months, it appears that children aged from 6 to 29 months are 2.30 [1.30 – 5.14] times more at risk of severe acute malnutrition than children aged from 30 to 59 months ($p<0.05$ and uncorrected $Khi^2=4.43$). However, no significant difference was found when comparing the global acute malnutrition prevalence of the 2 groups.

Table 8: *Prevalence of acute malnutrition based on weight-for-height in z-scores (and/or oedema) and by sex, Accham district, Nepal, September 2008*

	All n = 809	Boys n = 416	Girls n = 393
Prevalence of global malnutrition (<-2 z-score and/or oedema)	**18.0 %** [CI 95%: 14.6 - 21.5]	**20.7 %** [CI 95%: 16.5 - 24.9]	**15.3 %** [CI 95%: 10.6 - 19.9]
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	**14.5 %** [CI 95%: 11.7 - 17.2]	**16.6 %** [CI 95%: 13.0 - 20.1]	**12.2 %** [CI 95%: 8.4 - 16.0]
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	**3.6 %** [CI 95%: 1.8 - 5.4]	**4.1 %** [CI. 95%: 1.8 - 6.4]	**3.1 %** [CI 95%: 1.1 - 5.1]

By comparing the nutritional status of boys and girls, a significant difference[10] shows that boys are more at risk of being acutely malnourished than the girls. There is no significant difference regarding severe acute malnutrition. Boys and girls have the same risk of being severely acute malnourished.

[10] $p<0.05$; Uncorrected $Khi^2 = 3.99$ and Relative Risk = 1.35 [1.00 – 1.83]

2.2. Prevalence of acute malnutrition using the NCHS reference 1977

Table 9: *Prevalence of global acute malnutrition for children 6-59 months old (NCHS reference), Accham district, Nepal, September 2008*

	6 – 59 months
Expressed in Z-score (n=814)	**18.1** % (CI 95%: 14.9% - 21.3%)
Expressed in % of median (n=817)	**9.3** % (CI 95%: 6.7% - 11.9%)

Table 10: *Prevalence of severe acute malnutrition for children 6-59 months old (NCHS reference), Accham district, Nepal, September 2008*

	6 – 59 months
Expressed in Z-score (n=814)	**1.1** % (0.3% - 1.9%)
Expressed in % of median (n=817)	**0.6** % (0.0% - 1.3%)

Regarding the Global Acute Malnutrition expressed in z-score, the nutritional situation in Accham district is alarming, being above the WHO cut-off classifying the severity of a situation (GAM >15%).

2.3. Prevalence of acute malnutrition according to MUAC criteria

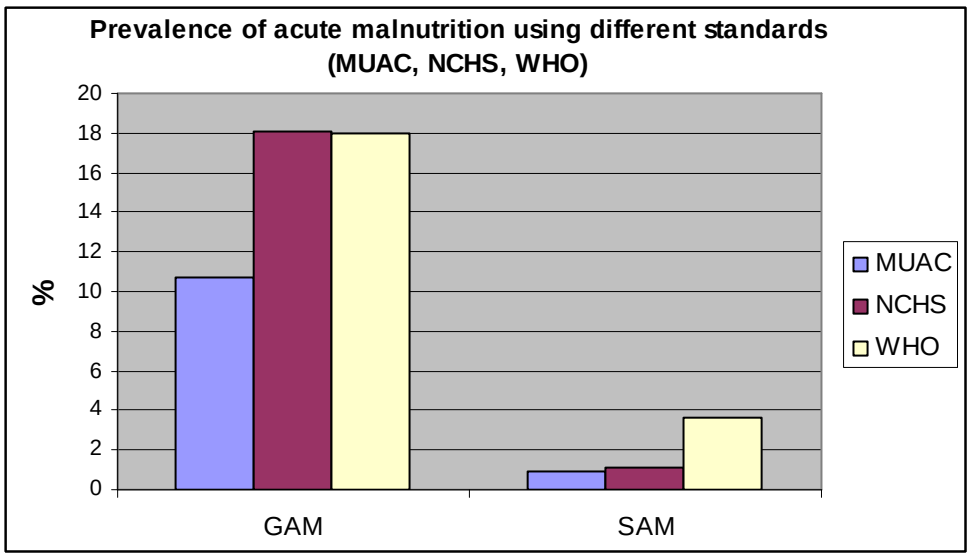
Table 11: *Prevalence of acute malnutrition for children 6-59 months old, MUAC, Accham district, Nepal, September 2008*

MUAC (mm)	Length / Height (cm)		Total
	≥65 & < 90	≥90	
<110	7	-	7
≥ 110 & < 125	75	9	84
≥125	535	159	694
Total	617	168	785

According to MUAC criteria, 0.9% of the children surveyed with a height ≥ 65cm were severely malnourished, 10.7% were moderately malnourished and 88.4% had adequate nutritional status. This table shows that children with a height between 65 and 90 cm are more malnourished than children taller than 90 cm, meaning that children less than approximately 30 months are more at risk of mortality than the other, MUAC being the best indicator to express this risk.

Table 12: *Prevalence of acute malnutrition calculated with MUAC, WHO standards 2005 and NCHS reference, expressed in z scores Accham district, Nepal, September 2008*

	n	Global Acute Malnutrition	Severe Acute Malnutrition
MUAC	785	10.7%	0.9%
WHO standards 2005	809	18.0%	3.6%
NCHS reference	814	18.1%	1.1%



Comparison of the prevalence of global and severe malnutrition calculated with MUAC, with the NCHS reference and the new WHO standards 2005, shows a huge difference between the different malnutrition rates. This observation raises the question of admission and discharge criteria (which reference/standards to use and which cut-offs) in an eventual nutritional programme.

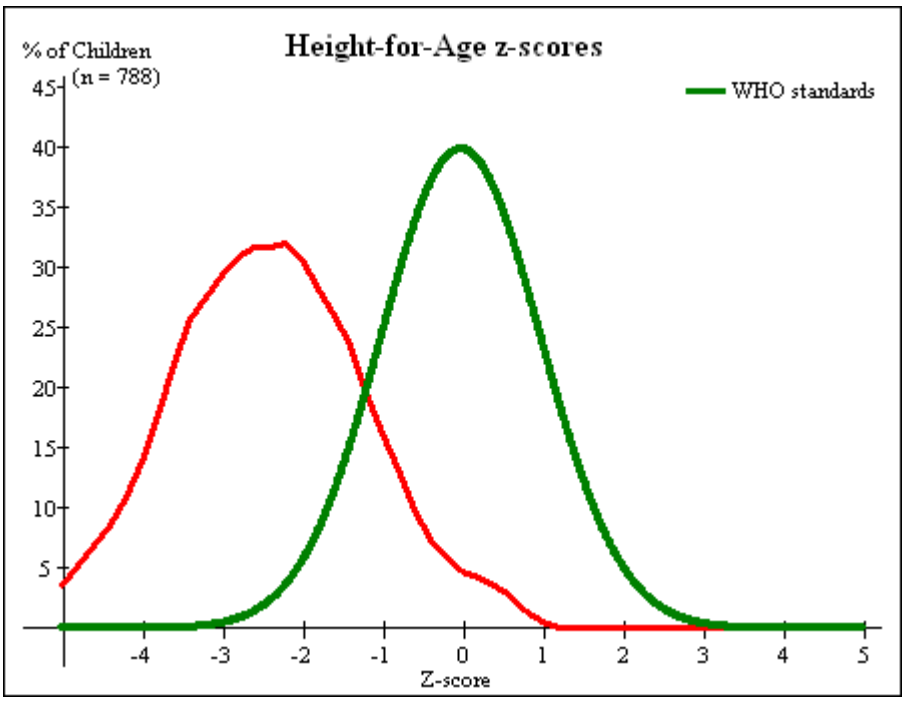
2.4. Prevalence of chronic malnutrition using the WHO standards 2005

Table 13: *Prevalence of chronic malnutrition, in z-score (WHO standards), Accham district, Nepal, September 2008*

	6 – 59 months (n=788)
Global stunting malnutrition <- 2 Z Score	**63.5** % [CI 95%: 58.8% – 68.1%]
Severe stunting malnutrition <- 3 Z Score	**32.2** % [CI 95%: 27.6% – 36.9%]

The prevalence of chronic malnutrition is 63.5% while the severe stunting is 32.2%. The mean z score of the population is -2.4 and the standard deviation is 1.17. These rates are similar to those found in the DHS[11] (2006) for the Far-Western hill Sub-region (global stunting: 65.5%, severe stunting: 32.9%).

[11] Demographic and Health Survey 2006



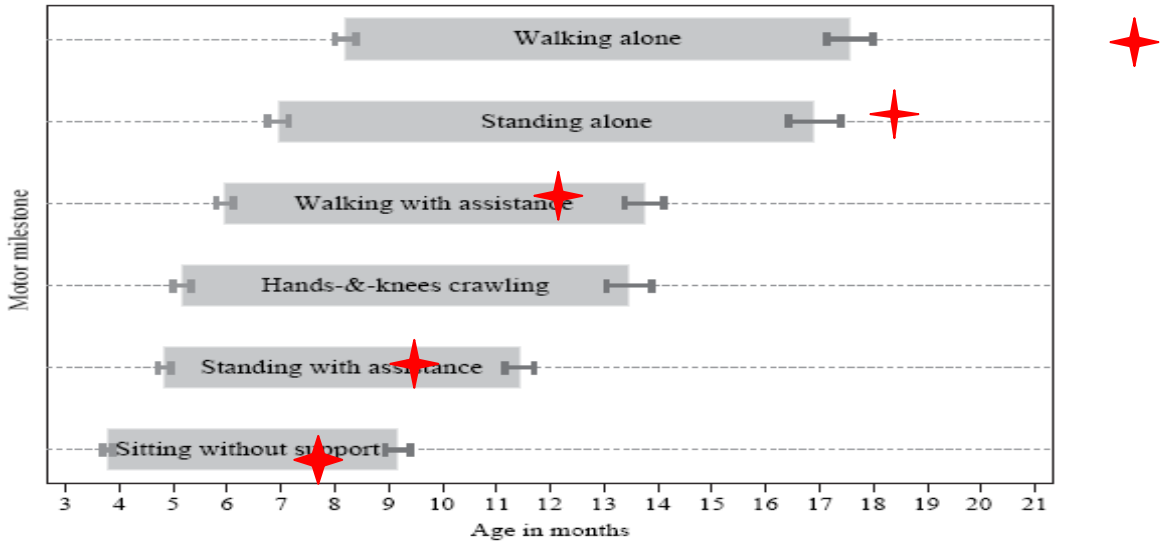
According to the data, 27.8% of the children's ages collected in the field were confirmed either by a vaccination card, a registration card or cross-checked with a calendar of event. Sometimes, mothers knew the date of birth of her child and this data was only cross-checked with the events calendar to confirm it.

These rates should be taken with precaution knowing that it is extremely difficult to collect the age of each child with a high precision. Nevertheless, even assuming that there was some imprecision in the collection of the dates of birth, the global stunting malnutrition still stays high.

3. Child development

In 2006, the WHO Multicentre Growth Reference Study Group validated windows of achievement for gross motor milestones for at least 5 different stages. These windows are the international reference to compare with and decide if a given child has a retardation of motor development for its age or not.
Only children aged less than 36 months old are included in this study.
The presented data provide useful data on child development even if the reader must consider that the number of children in each group is sometimes very small and doesn't allow general extrapolations.

Here are the windows:



Represents the average age (in months) for children under 36 months old in Accham district to reach a development step.

Table 14: *WHO standards for child development*

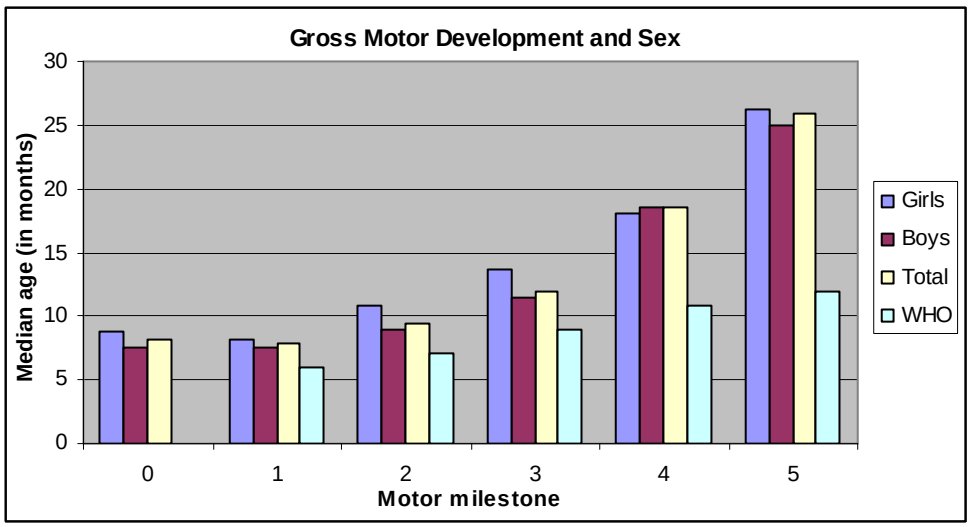
Motor Milestone	Box boundary (age in months)					
	Left-bound	95% C.I.		Right-bound	95% C.I.	
		Lower	Upper		Lower	Upper
Sitting without support	3.8	3.7	3.9	9.2	8.9	9.4
Standing with assistance	4.8	4.7	5.0	11.4	11.2	11.7
Walking with assistance	6.0	5.8	6.1	13.7	13.4	14.1
Standing alone	6.9	6.8	7.1	16.9	16.4	17.4
Walking alone	8.2	8.0	8.4	17.6	17.1	18.0

Motor Milestone	Nepal (Siegel, 2005)	WHO
Sitting without support	6 months	5.9 months
Standing with assistance		7.1 months
Walking with assistance	11 months	9 months
Standing alone		10.8 months
Walking alone		12 months

3.1. Child development and gender

Table 15: *Median age, in months, to reach a specific stage of motor development, according to sex, Accham district, Nepal, September 2008*

Child development stage	Girls (n=279)		Boys (n=268)		Total (n=547)	
	Median	n	Median	n	Median	n
0 (not able to sit)	8.8	3	7.6	9	8.1	12
1 (sitting without support)	8.2	24	7.5	17	7.8	41
2 (standing with assistance)	10.8	22	9.0	25	9.4	47
3 (walking with assistance)	13.6	23	11.5	21	12.0	44
4 (standing alone)	18.1	27	18.6	20	18.5	47
5 (walking alone)	26.2	180	25.0	176	25.9	356



The order of the attainment of motor milestones is comparable with the one found in other countries, confirming the universal steps in motor development (except for crawling). However, there is incoherence between medians for "not able to sit" and "able to sit without support". The latter seems to be attained earlier than "not able to sit". Presently, no satisfying response can explain this result.

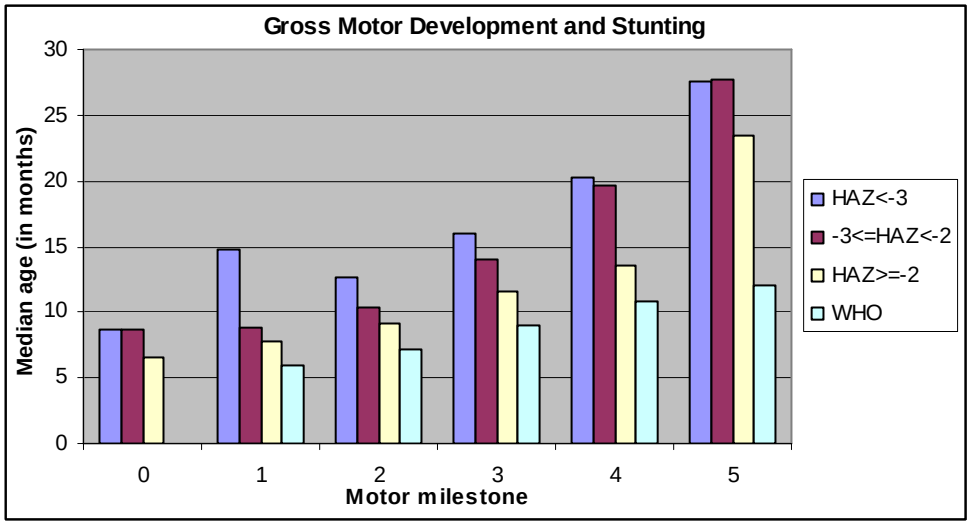
Half of the sample could sit without support by 7.8 months, standing with assistance by 9.4 months, walking with assistance by 12 months, and standing alone by 18.5 months. When compared to WHO data, Nepali children attained milestones later than children from Ghana, India, Norway, Oman and USA.

Nepalese boys attained milestones before Nepalese girls. No information in this specific study explained this difference but one hypothesis might be that this difference reflects gender discrimination and differences in the education regarding stimulation and parenting behaviors.

3.2. Child development and nutritional status

Table 16: *Median age, in months, to reach a specific stage of motor development, according to the Height for Age criteria, in z-score, WHO standards Accham district, Nepal, September 2008*

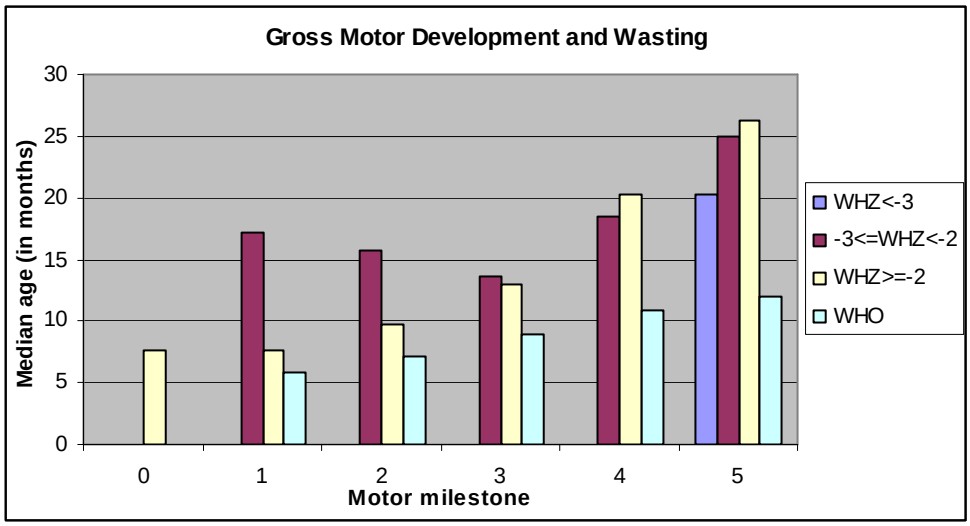
Child development stage	HAZ<-3 (n=84)		-3≤HAZ<-2 (n=128)		HAZ≥-2 (n=214)	
	Median	n	Median	n	Median	n
0 (not able to sit)	8.7	1	8.7	2	6.6	2
1 (sitting without support)	14.8	5	8.9	2	7.7	21
2 (standing with assistance)	11.3	4	10.3	11	9.1	22
3 (walking with assistance)	16.0	2	14.0	12	11.5	16
4 (standing alone)	20.3	15	19.7	16	13.5	8
5 (walking alone)	27.6	57	27.7	85	23.5	145



Data illustrates that the achievement of motor milestones are associated with the stunted status of the children. Children with higher height for age attain motor milestones earlier than children with lower height for age. These results are congruent with previous researches, which indicate that nutrition factors affect partly child development.

Table 16: *Median age, in months, to reach a specific stage of motor development, according to the Weight for Height criteria, in z-score, WHO standards; Accham district, Nepal, September 2008*

Child development stage	WHZ<-3		-3≤WHZ<-2		WHZ≥-2	
	Median	n	Median	n	Median	n
0 (not able to sit)	-	0		0	7.6	5
1 (sitting without support)	-	0	17.2	4	7.7	24
2 (standing with assistance)	-	0	15.8	3	9.7	34
3 (walking with assistance)	-	0	13.6	9	13.0	21
4 (standing alone)	-	0	18.5	8	20.3	31
5 (walking alone)	20.3	5	25.0	42	26.3	238



The order for attaining the motor milestones for the wasted children are not in the expected order: walking with assistance, standing with assistance and then sitting without support. It has to be noticed that half of the children can sit only without support by 17.2 month. The number of children per group is very small and the data must be taken with caution. One explanation might be associated with the impact of nutrition on the current capacity of the children ; it is possible that some children reach better milestones but regressed because of acute malnutrition. Some children might also be acutely malnourished for a long time, which has impaired their motor development. The age for attaining the milestones is much delayed and is associated with the wasted status of the children. These results corroborate evidence found in other studies.

DISCUSSION

The anthropometric survey population is equally represented when considering both genders. The sex ratio of 1.1 is within the accepted limits (from 0.8 to 1.2). The mean weight-for-height is -1.21 ± 0.88 and the standard deviation of WHZ which is equal to 0.991 z-scores is also within the accepted limits (0.85 to 1.10). However, the repartition of children by age group is not uniform. Indeed, the age groups 42-53 months and 54-59 months are under represented.

The Global Acute Malnutrition calculated with the WHO standards is equal to 18.0% (CI 95%: 14.6 – 21.5) is not significantly different from the prevalence reported in the 2006 DHS[12] for the sub-region of Far-Western Hill (15.7%). The same remark can be made for the prevalence of severe acute malnutrition[13].

The prevalence of malnutrition observed in Accham district is however worrying, taking into consideration that the prevalence of SAM could be under-estimated due to the deletion of nine oedema cases from the team four, in which some cases of oedema may have been real cases.

Moreover, the impact of the food crisis, which has a long term effect will probably increase the prevalence of acute malnutrition in the coming months. Children from 6 to 29 months should be prioritized, as they are 2.3 times more at risk of acute malnutrition than children from 30 to 59 months. This finding is not really surprising as it has been well documented now that children from 6 to 29 months are generally more vulnerable than children from 30 to 59 months. Indeed, after 6 months of age, the child should receive a complementary food in addition to the breast milk and this transition phase between exclusive breast feeding and introduction of appropriate complementary food such as porridge is really critical.

Messages regarding care practices and non discrimination between girls and boys should be diffused as it appeared that boys are more at risk of malnutrition than girls.

By comparing the rates of acute malnutrition with the NCHS reference, the situation is still alarming. The prevalence of global acute malnutrition (18.1% [CI 95%: 14.9-21.3]) is above the 15% cut-off of WHO to classify the severity of a situation.

By comparing the rates of acute malnutrition calculated with the WHO standards 2005 and the MUAC (severe wasting, MUAC<110mm), a huge difference is observed between the two rates, which is really problematic to determine which admission and discharge criteria teams in the field should use and with which cut-off. A deeper study should be done including all the available data of WHZ and MUAC in Nepal and a common decision should be taken between the principal nutrition actors in Nepal (UNICEF, Concern and ACF) and the Ministry of Health and Population.

The prevalence of chronic malnutrition (WHO standards) in Accham (global stunting: 63.5% (CI 95%: 58.8 – 68.1) and severe stunting: 32.2% (CI 95%: 27.6 – 36.9)) and in the Far-Western hill sub region (DHS 2006) (global stunting: 65.5% and severe stunting: 32.9%) are very similar.
But as mentioned above, these rates should be taken with precaution knowing that it is extremely difficult to collect the age of each child with a high precision. Nevertheless, chronic malnutrition is generally linked with poor quality of food in term of vitamins and minerals. Micro-nutrient deficiencies increase the risk of infant and young child illness, the immune system being unable to respond adequately to attack from micro-organisms.
According to the DHS 2006, nearly one in two (48%) Nepalese children 6-59 months old are anemic, with 26% mildly, 22% moderately and less than 1% severely anemic. In the Far-Western Hill region, 21% of children 6-59 months old are mildly, 20% are moderately and 0.0% are severely anemic.
It is interesting to note that children 24 months and above are less likely to be anemic than younger children.

[12] 2006 Demographic and Health Survey, Government of Nepal & New Era, May 2007.
[13] Nutritional survey September 2008: SAM=3.6% [CI 95%: 1.8 – 5.4]
2006 DHS for the Far-Western Hill: SAM= 4.4%

Regarding vitamin A deficiency, although the national prevalence is decreasing, it still poses a serious health problem in Nepal. According to the 1998 Nepal Micronutrient Status Survey, the overall prevalence of sub-clinical Vitamin A Deficiency (VAD)[14] is 32% for preschool children. An important strategy for overcoming vitamin A deficiency in Nepal has been the distribution of vitamin A capsules through the Nepal National Vitamin A Program, which has been in place since 1993.

The high prevalence of malnutrition (acute and chronic) is for the moment stable compared with the malnutrition rates found in 2006. The situation does not appear to have evolved. However, in addition to the recurrent natural disasters (drought, landslides, and floods), which largely affect the annual crop production, the population of Accham district will soon have to cope with the food crisis, which is going to be exacerbated by the drastic rise of fuel and food prices.

Another point to be highlighted is the diversification of food. Population in the area consume only *Dal Bhat* (rice with a soup of pulses or beans), *Roti* (bread made from wheat, millet), chili, spices and oil on a daily basis. Some of them consume milk, vegetables or potatoes on a weekly basis but rarely foods rich in proteins such as egg, meat or fish (1 or 2 times per month). Vegetables, fruits (mostly apples and to some extent banana) and meat intakes depend on the seasonal variation for vegetables and fruits and special occasions or celebrations for meat and fish. The tiny intake of foods rich in animal source protein as well as vegetables and fruits suggests that vulnerable population like children under-five years old may suffer from micronutrients deficiency and growth retardation which may aggravate their health status with increased infection. This poor dietary diversity almost certainlt also contributes to the high rates of wasting observed in the district.

According to WFP[15], mid-June (which matches with the end of the survey) to August is the most critical period related to low food stocks and as a consequence, households will be more dependent on markets for their food supply. Thus, the nutritional status of children is more likely to worsen in the coming months due to the deterioration of food availability with a 45% crop loss in Accham district and food accessibility with the increase in food prices at the market[16].

Gross motor development is an important aspect of the development of young children. Through the attainment of specific motor skills, children begin to explore their environment and engage in new experiences that promote learning and development of other components. Tracking motor milestone acquisition has informed researchers about the motor development proficiency of young children. The time that children spend in any given milestone or take to achieve some of the more advanced milestones (e.g. walking without support) is variable and often depends on whether they achieved a preliminary milestone[17]. Growth faltering is prevalent in developing countries in which children are susceptible to infection and malnutrition. Delays in motor milestone acquisition, including walking, were found among cohorts of stunted, underweight Indonesian, Zanzibari and Guatemalan infants, and among stunted and wasted Pakistani infants.

The present study demonstrates that Nepalese children attain motor milestones later than children from WHO cohort, even if the order for achievement of milestones is comparable. Boys seem to attain motor milestones earlier than girls maybe due to different care and parental practices. The age for attaining the motor milestones is associated with the nutritional status of the children, both wasted and stunted. It corroborates evidence found in other researches: nutrition factors affect partially child development. The study highlights the importance of supporting child development in Nepal for mitigating the intergenerational cycle of malnutrition and poverty.

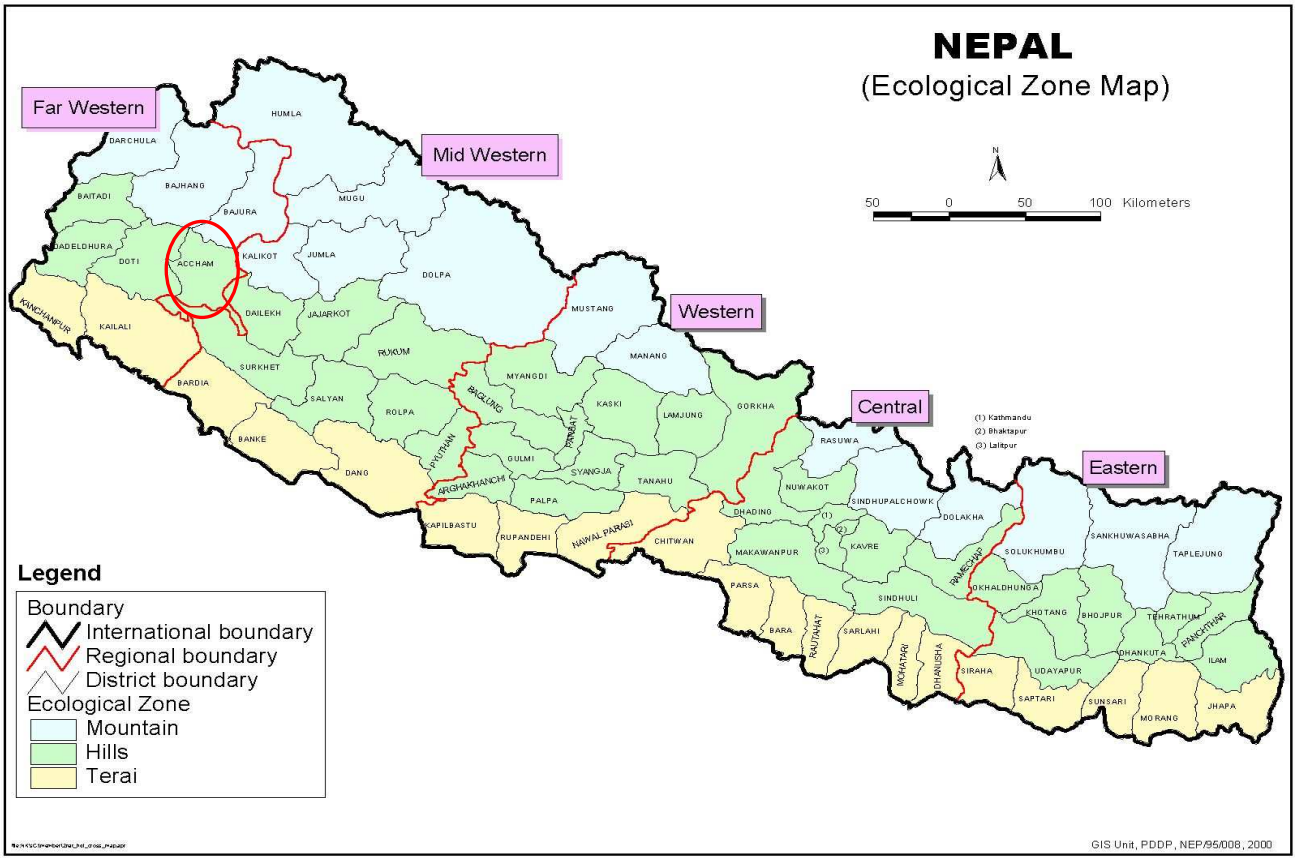
[14] Serum retinol levels < 0.70µmol/l
[15] Emergency Update – 4, United Nations World Food Programme, June 2008
[16] WFP Food Security Report, June 2008
[17] Robson P. Prewalking locomotor movements and their use in predicting standing and walking. Child Care Health dev. 1984;10:317-30

RECOMMENDATIONS

- To carry out a comprehensive assessment in Accham district to understand the major direct causes of malnutrition;
- To implement a Community-based Management of Acute Malnutrition (CMAM) programme to prevent and treat severe acute malnutrition;
- To determine in collaboration with the MoHP, UNICEF and Concern the "new" criteria to use for detection, referral and admission in a nutritional center;
- To reinforce counseling activities on care practices, balanced diet and non discrimination between gender in health posts and sub-health posts as well as at community level through FCHVs;
- To support and promote child development through stimulation of children and promotion of adequate care practices of the caregivers;
- To distribute micronutrients for children from 6 to 36 months in parallel to a food aid program to reinforce the nutritional status of the children and to contribute to the prevention of acute malnutrition and stunting;
- To define and implement a food security program to respond to the on going food crisis;
- To implement a surveillance system via the FCHVs to monitor the nutritional situation in Accham district on a regular basis. This surveillance could take place during the growth monitoring sessions.

APPENDIX 1

Map of Nepal - Accham district



APPENDIX 2

Planning for each team (Accham district, Nepal, September 2008)

Cluster nb	Name of the cluster
1	Chalsa 6 + 7
2	Dhodasain 8
3	Hichma 3
4	Jalapadevi 5 +6
5	Janalikot 1+2+3
6	Jupu 6+7
7	Kalekanda 1+3+4
8	Kalika 6+7+9
9	Khaptad 1+2+5+6
10	Kushkot 7+8+9
11	Lungra 3+4
12	Malatikot 4+7+8
13	Mangalsen 5
14	Mangalsen 9
15	Nandegada 1
16	Nawathana 3+4+5
17	Oligau 8+9
18	Payal 3+4
19	Toli 4+5
20	Babala 3+4
21	Bannatoli 7
22	Baradadivi 7+8
23	Batulasen 1+9
24	Bayala 1+7
25	Bhairabsthan 1+3
26	Bhatakatiya 1+4
27	Bhuli 3+4
28	Binayak 5+6

Cluster nb	Name of the cluster
29	Bindhyawasini 5+6
30	Budhakot 2+3
31	Chandika (Bayalpaka) 7+8+9
32	Darna 6+8
33	Dhakari 1
34	Dhaku 6+7+8+9
35	Dhamali 9
36	Dhungachalna 1+2
37	Duni 1+2+3
38	Khodasadevi 2+4
39	Kuika 2+3
40	Kundibandali 4+8+9
41	Mashtanamdali 6+7+8+9
42	Pulletala 1+2
43	Rahaph 5+6+7
44	Ramarosan 7
45	Ridikot 1+2+3+4
46	Risidaha 6+7
47	Sera 2+3+9
48	Siddheswor 4+5
49	Siudi 4+5
50	Soukat 4
51	Sutar 1+2
52	Thanti 6+7
53	Tosi 3+4+5
54	Walant 1+3
55	Warla 1+3

Buffer clusters non surveyed

APPENDIX 3

Anthropometric questionnaire:

District_____Village: _____ VDC: _____Ward: _____ Date: _____

Cluster number: _____ Team number: _____

Child #	HH #	Name	Sex F or M	Date of Birth dd/mm/yy	Confirmed Y or N	Age in months	Weight (kg) ± 0.1 kg	Height (cm) ± 0.1cm	Oedema Y or N	MUAC ± 0.1cm	What is the best stage of development reached by your child? 1=Sit 2=Stand with support 3=Walk with support 4=Stand alone 5=Walk alone 0=None of the above. **Use figures**

APPENDIX 4

Calendar of event:

Event calendar - Accham

	Season		annual events	2060		2061		2062		2063		2064	
	Weather	Agriculture											
Baisakh	dry		New year (1) Democ (11) Labour (18)		#		#		#	Peolple's movement went on till (17)	#	Mother's day(4) Buddha b'day(19)	#
Jestha	dry	Seed maize			60		48		36		24	Full moon(17)	12
Asad	rain	Seed rice	Vaccation for rain (15)		59		47		35		23	Full moon(16)	11
Sawan	rain	Plant rice	Vaccation for rain		58		46		34		22		10
Bhadra	rain	Harvest corn	Bhadra sakrati(1) End rain vac(2)		57		45		33		21	Janai purnima(11) Krishna astami(18) Gauraparv (18) Teej(28) Rishi Panchmi(30)	9
Asoj	mild	cut rice			56		44		32		20	Ghatsthapna(25)	8
Kaartik	mild	harvest rice			55		43		31		19	Dashain (4) Full Moon (9) Laxmipuja(23) Gobhardan(24) Bhaitika(25)	7
Mangsir	cool	seed wheat seed mutard			54		42		30		18		6
Push	extreme cold				53		41		29		17		5
Magh	extreme cold		Maghe sankrati(1) Martyre day (16)		52		40		28		16	Shreepanchami (28)	4
Falgun	mild	Harvest mustard			51		39		27		15	Mahashivratri(23)	3
Chaitra	dry	Harvest wheat			50		38		26	peolple's movement begin (28)	14	Falgupurnima(8)	2