ANTHROPOMETRY AND RETROSPECTIVE MORTALITY SURVEY

Final Report

WADI-SALEH LOCALITY, CENTRAL DARFUR OF SUDAN

FUNDED by: SIDA

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ACRONYM

AAH:-	Action Against Hunger
CDR:-	Crude Death Rate
CI	Confidence Interval
CMR	Crude Mortality Rate
ENA	Emergency Nutrition Assessment
EPI	Extended Program of Immunization
FSL	Food Security and Livelihood
GAM	Global Acute Malnutrition
HAZ	Height for Age Z score
INGO	International Nongovernmental Organization
IPC	Integrated Phased based classification
MUAC	Mid Upper Aram Circumference
RNG	Random Number Generation
S3M	Simple Spatial Survey Method
SAM	Sever Acute Malnutrition
SMART	Standardized Monitoring and assessment of transit and Relief
SMOH	Sudan Minster of Health
SPSS	Statistical Package for social science
U5DR	Under five children Death rate
UNICEF	United Nation Child's Fund
WASH	Water Hayegen Sanitation
WAZ	Weight for Age Z score
WHO	World Health Organization
WHZ	Weight for Height Z score

EXECUTIVE SUMMARY

Introduction: Action Against Hunger (AAH) has been implementing key humanitarian interventions in the Republic of Sudan since 2018, with programing in; integrated health and nutrition services through strengthening the health system, supporting the CMAM program, Water sanitation and Hygiene (WASH), food security and livelihood (FSL). Action Against Hunger conducted integrated nutrition SMART survey in March 2022 in Central Darfur state, Wad-Saleh locality to assess the nutrition status among children aged 6 – 59 months, and the women of childbearing age (15 – 49) years among other indicators.

Objective: The overall objective of the SMART survey was to determine the nutritional status of children 6-59 months of age and maternal nutrition status and the mortality rate among U5 children as well as the general population in Wad-Saleh Locality of Central Darfur State of Sudan.

Methodology: A Cross-sectional community-based study design using a two-stage cluster sampling technique was employed. The **first stage** of the survey involved assigning 40 randomly selected clusters using ENA for SMART software (Jan. 11th, 2020 version), based on the Probability to Population Size (PPS) method. The **second stage** involved the random selection of households (15 households per cluster) using the RNG PLUS mobile application.

Malnutrition: A total of 458 children were included in the sample to collect anthropometric measurements (Weight, Height, and MUAC). In this survey, the prevalence of Global Acute Malnutrition (GAM) among children aged 6-59 months using Weight for Height < -2 Z-score or Oedema was found to be **11.6% (9.0-14.9 95% CI).** The prevalence of Severe Acute Malnutrition (SAM) using Weight for Height < -3 Z-score or Oedema was **2.2% (1.0- 4.6 95% CI).** The combined GAM rate based on weight-for-height and MUAC was **13.3 % (10.7 - 16.5 95% C.I.).** The survey finding indicated that the acute malnutrition level is **critical and persistently high** based on the UNICEF malnutrition threshold cut-off (Dec 2018).

The overall stunting rate was found to be **34.7 %(29.3 - 40.6 95% C.I**.), and the prevalence of underweight is **30.1 %(25.9 - 34.8 95% C.I.)**.The prevalence of stunting and underweight are found to be **very high** based on the recently published (2018) UNICEF malnutrition threshold level cut-off. The high prevalence of stunting and underweight rates in the locality reflect the presence of long-term nutritional stress which is potentially resulted from inadequate dietary practices and complementary feeding practices, and/or widespread occurrence of infectious disease in the survey area. This finding also indicates that children are not getting adequate nutrition which is getting worse among children above 29 months of age.

Morbidity and Immunization: The survey findings further indicated that **58.3%(53.7-62.7,95% CI)** of children reported illness in the past two weeks prior to the survey. Fever (59.2%(53.2-64.8,95%CI)) and cough (48%) were the most reported symptom in this survey followed by diarrhea (14.8%) and other kinds of diseases like skin and eye infection. The coverage of measles immunization was 55.6%(51.3-60.4,95%) which is below the Sphere (>95%) and WHO (>80%) recommended coverage level.

Mortality: based on a 93-day recall period, CDR and U5DR in this survey were 0.56%(0.29-1.05, 95% CI))/10,000/day and 0.71%(0.22-2.23, 95% CI)/10,000/day respectively. The CDR reported in this survey was found to be low and the values of CDR and U5DR were below the WHO threshold of 1 person/10,000/days and 2 person/10,000/day for CDR and U5DR respectively.

A Summary of Key Survey Findings

Table 1: The summary of key survey findings, March 2022

Anthropometry - Children 6-59 months based on WHO 2006 reference		
Index	**Indicator**	**%**
WHZ- scores	Prevalence of global malnutrition (<-2 z-score and/or oedema)	(53) 11.6 % (9.0 - 14.9 95% C.I.)
	Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(43) 9.5 % (7.2 - 12.4 95% C.I.)
	Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(10) 2.2 % (1.0 - 4.6 95% C.I.)
MUAC	Prevalence of global malnutrition (< 125 mm and/or oedema)	(24) 5.2 % (3.6 - 7.6 95% C.I.)
	Prevalence of moderate malnutrition (< 1205mm and >= 115 mm, no oedema)	(22) 4.8 % (3.2 - 7.1 95% C.I.)
	Prevalence of severe malnutrition (< 115 mm and/or oedema)	(2) 0.4 % (0.1 - 1.8 95% C.I.)
WAZ- scores	Prevalence of underweight (<-2 z-score)	(138) 30.1 % (25.9 - 34.8 95% C.I.)
	Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(108) 23.6 % (19.8 - 27.8 95% C.I.)
	Prevalence of severe underweight (<-3 z-score)	(30) 6.6 % (4.2 - 10.1 95% C.I.)
HAZ-scores	Prevalence of stunting (<-2 z-score)	(157) 34.7 % (29.3 - 40.6 95% C.I.)
	Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(108) 23.9 % (19.9 - 28.4 95% C.I.)
	Prevalence of severe stunting (<-3 z-score)	(49) 10.8 % (7.7 - 15.1 95% C.I.)
Maternal MUAC		
MUAC	PLW at risk of Malnutrition (<23 cm)	(21)18.3% (11.3-25.2, 95%CI)
Mortality		
Mortality	CMR Deaths/10,000 people/day	(15) 0.56%(0.29-1.05, 95% CI)
	U5 MR Deaths/10,000 children U5/day	(3) 0.71%(0.22-2.23, 95% CI)
Child Vaccination Status		
Measles vaccination	Measles with EPI card + mother recall	(244) 55.6%(51.3-60.4,95%CI

	Measles with EPI card confirmation	(152) 34.3%(30.0-38.6, 95% CI)
Child Morbidity Status		
Prevalence of Illness before 2 weeks	Illness	(267) 58.3%(53.7-62.7,95% CI)
	Not	(191) 41.7%(37.3-46.3, 95%CI)
Types of illness	Fever	(158)59.2%(53.2-64.8,95%CI)
	Cough/ARI	(162)60.7%(55.1-66.7,95%CI)
	Diarrhoea	(42)15.7%(11.2-20.2,95%CI)
	Other illnesses	(16)6.0%(3.4-9.0, 95%CI)
Health Seeking Behaviour		
Proportion of Children Sought Treatment	Not Sought Treatment	(88) 33.0%
	Yes Sought Treatment	(179) 67.0%
Health Seeking Behaviour	Government Health Facility	(101) 56.4%
	Private Clinic	(24) 13.4%
	Pharmacy	(42) 23.5%
	Other/traditional	(12) 6.7%

1. INTRODUCTION

Malnutrition rates in Sudan have not improved in the last 30 years, and worse, the number of stunted and wasted children has increased since 1987, particularly in Sudan's conflict-torn Darfur region and the eastern states. Sudan has one of the world's highest rates of malnutrition among children. Malnutrition affects 2.7 million children under the age of five, with more than half a million suffering from severe acute malnutrition. These children are at risk of serious illness, developmental delays, and death if they do not receive treatment (UNICEF Sudan 2020). Sudan's national prevalence rate of global acute malnutrition (GAM) is 14.1% (13.9-14.3 95% CI). Wasting affects three million children under the age of five (too thin for their height). SAM affects 574,000 children, who are 11 times more likely to die than healthy children.

Between April and May 2021, an estimated 7.3 million Sudanese (16 percent of the population analyzed) were experiencing severe acute food insecurity (IPC Phase 3 or higher) and required immediate action. Approximately 5.5 million of these people were classified as being in Crisis (IPC Phase 3), while approximately 1.8 million were classified as being critically food insecure and were classified as being in Emergency (IPC Phase 4). Red Sea State's most affected localities (Halaib and Jubayt-el-maaadin) were classified as Emergency (IPC Phase 4). An increase in localized conflicts resulted in population displacement, which, when combined with economic deterioration, resulted in higher-than-usual levels of acute food insecurity. As a result, North Darfur has the highest prevalence of people in Crisis (IPC Phase 3) or worse (25 percent), followed by West Darfur (22 percent), North Kordofan (20 percent), South Kordofan (20 percent), Gedarif (19 percent), and Central, East, and South Darfur states, which range from 17 to 18 percent. 1.3 million people will be in IPC Phase 4 (Emergency) during the second projection period (October 2021 to February 2022), corresponding to the harvest season, with 4.6 million people in Crisis (IPC Phase 3) or worse, and over 15 million people in Stressed (IPC Phase 2). There has been no progress in reducing anemia among women of reproductive age, with 36.5 percent of women aged 15 to 49 years affected. In the meantime, there is insufficient data to assess Sudan's progress toward meeting the low birth weight target, and there is insufficient prevalence data.

According to IPC phase classification Wadi Saleh is in phase 3 (Crisis) with 49,636 (15%) of the population faced food deficit during April 2021-May 2021. The number of assistace needy population increased to 82,727(25%) during June 2021-September 2021. But case were stabilized and decreased to 33,091 (10%) of the total population during October 2021-February 2022. This is the projection done in October 2021.

[1] *Sudan IPC Acute Food Security Analysis April 2021 – February 2022*

2. SURVEY OBJECTIVES

2.1. Main Objectives

The overall objective of the SMART survey was to determine the nutritional status of children in the age group 6-59 months and maternal nutrition status and mortality rate among U5 children and the general population in Wad-Saleh Locality of Central Darfur State of Sudan.

2.2. Specific Objectives

- To estimate the prevalence of acute malnutrition, stunting, and underweight among children aged 6-59 months.
- To estimate retrospective crude mortality rates (CMR) and under-five mortality rates (U5MR) using 93 days recall period.
- To assess 2 weeks retrospective childhood morbidity rates among children 6-59 months.
- To understand the health-seeking behavior of the caretakers of children aged 6-59 months.
- To assess the coverage of measles vaccination in children 9-59 months age group.
- To assess the key infant and young child feeding indicators among children 0 – 23 months.
- To estimate the nutritional status of pregnant women and lactating mother through MUAC measurement.
- To outline recommendations on actions to guide and support the nutrition program in Sudan. [2]

3. SURVEY METHODOLOGY

3.1. Survey Design

The SMART survey applied a cross-sectional study design involving a two-stage cluster sampling approach based on probability proportional to population size as per the SMART methodology guidance. The first stage of the sampling involved the selection of clusters from the updated list of the villages found in the locality and the second stage followed simple random sampling techniques to select households from the sampled clusters.

3.2. Study Area

The survey was conducted in Wad-Saleh locality, the Central Darfur State of Sudan, and covered all the population settlements & geographical areas (169 villages) found in the locality.

3.3. Study Period

This nutrition SMART survey was conducted from the 25th to the 31st of March 2022. The survey was carried out during the dry season when the community is largely engaged in farmland preparation activities.

3.4. Target Population

The target population for this survey was children aged 6 – 59 months for the anthropometric measurements, while the general population in the sampled households in selected clusters was targeted for the mortality survey. Caregivers of children aged 0-59 months were targeted to provide the relevant information for the health, IYCF, and nutrition sections of the survey questionnaire.

[2] *Simple Spatial Survey Method (S3M-II), 2018*

3.5. Sample Size Determination

The sample size was calculated using the ENA for SMART software based on the most recent population parameters for each cluster as demonstrated in the following table below.

Table 2: Estimated sample sizes for the Anthropometry survey, March 2022

Parameter	Values used	Rationale
Estimated prevalence %	21.15	Sudan 2018 S3M II Report. Point Prevalence of Wadisaleh Locality used. GAM 21.15 (16.16-27.49).
±desired precision %	4.5	SMART Methodology Guide
Design effect	1.5	SMART Methodology Guide (default)
Average household size	6	Recommendation from SMOH
% of children under-five	17	National EPI Estimate
% of non-response households	5	Anticipated non-response rate
Children to be included	517	Determined by ENA SMART Software based on the above-given parameters
Households to be included	592	Determined by ENA SMART Software based on the above-given parameters

Table 3: Estimated sample size for the retrospective mortality survey, March 2022

Parameter	Values used	Rationale
The estimated death rate per 10000/day	1.18	The lower confidence interval value of the October 2020 Mortality survey by IMC in East Jabel Mara Locality of South Darfur (1.99% (1.18-3.31 95% CI)) was taken with the assumption of relatively reduced mortality rates due to efforts contributed by the INGOs in the survey area.
±desired precision per 10000/day	0.5	SMART Methodology Guide 2017
Design effect	1.5	SMART Methodology Guide
Recall period in days	93	The default value is used. To be adjusted during training
Average household size	6	Based on SMOH recommendation for Wad-Saleh
% of non-response households	5	Anticipated nonresponse rate
Population to be included	3184	Determined by ENA SMART Software based on the above-given parameters
Households to be included	559	Determined by ENA SMART Software based on the above-given parameters

As the two indicators always produce different household samples, the larger of the two calculations, i.e.

592 was used as the final sample size for both mortality and anthropometric surveys.[3]

3.6. Sampling Procedure

The survey employed two-stage cluster sampling techniques based on the probability proportional to population size (PPS) approach. The first stage involved the selection of clusters (villages/blocks) and the selection of the household was carried out in the second stage of the sampling process using a simple random sampling technique.

3.6.1. Estimation of the Number of Required Clusters

To estimate the required number of clusters, estimated number of households that can be visited by one team in a day was calculated. As detailed in the Table 4, it was estimated that a total of 15 households could be visited and surveyed in a day by each team. Therefore, the total number of households estimated as sample (592 HH) was divided by 15 to estimate the total number of required clusters, which was 40.

Table 4: Calculation of estimated household to be visited per day

SN	Events	Time allocated
1	Time per day for field work from 7:30 to 5:30	600 minute
2	Average travel time to reach each cluster (one-way): 45 minutes	45*2=90minute
3	Duration for initial introduction and selection of first households	25 minute
5	Average time in the household	30 minute
6	Lunch break	35 minute
7	Total time spent	90+25+5+35=150

Average working time in each households

= (Total time available-Total time spent)

= 450 minutes [600-150]

Number of households per cluster = working time in household /Time spent in household

= (450/30)

= **15 households**

3.6.2. First Stage: Selection of Clusters

In the first stage, clusters were selected using the probability proportional to population size (PPS) approach. The sampling frame in the first stage of sampling was prepared during the initial mapping process that was completed ahead of one week before the start of the data collection. The list of 169 villages (the smallest administrative unit) along with their updated population size was prepared at the field level in consultation with local community representatives, a nutrition focal person from the Ministry of Health, and AAH staff. Finally, using ENA for the SMART Jan. 11th, 2020 version, a total of 40 clusters were sampled from the 169 villages found in Wad-Saleh Locality. During the actual data collection period,

[3] *SMART Survey Methodology guiding note 2017*.

mapping and demarcation of each selected village/cluster were conducted with the help of the local administration, village elders, and other key informants.

3.6.3. Second Stage Sampling: HH Selection

In the second stage of the sampling process, a simple random sampling technique was employed to select households from the updated list of households in the sampled clusters. Upon the immediate arrival of the survey team, the team leader introduced his/her team members and provided a brief explanation of the objective and methodology of the survey. Then after the team leader together with the local community guide developed a list of all active HHs found in each sampled cluster based of the HHs geographical location order. Then 15 households were randomly selected for the actual data collection from the complete list of households using the random number generator app mounted on SMART phones/tablets.

In the case of absent households or eligible children during the first visit, the team carried out subsequent revisits until the end of the data collection date. If the family members were not present in the selected households after the second visit, information was recorded in the cluster control form as absent but the household was not replaced with another one.

If the houses were scattered with more than 250 in number, the standard segmentation technique guided by SMART methodology was used. All eligible children present in the selected households were measured and information recorded into the questionnaire after taking written/verbal consent from the guardians/caretakers.

3.6.4. Case Defiantion and Inclustion Criteria

- **Household:** In this survey, a household was defined as a group of people who live together and share a common cooking pot.
    - Polygamous families were counted as one household as long as they were living together and sharing a common cooking pot.
    - Polygamous families or any other families living in the same house but not sharing a common cooking pot were counted as separate household in the household list.
    - Household with only institutional population i.e. students, employees living together without family members were not counted and excluded from selection.
- **Children:** All children in the selected households aged 6-59 months were included in the survey. Where possible, age was validated with a recorded birth date on an immunization card, birth registration card or any other valid card. If the birth date was not available and the exact age was not recalled by the caretaker, a local calendar of events (see Appendix -) for the last five years was used to help find the most accurate age for the child.
- **Pregannat and Lactating Women:** A women having visible pregnancy and Lactating monther having a child less 6 month old were included in the survey.

3.6.5. Anthropometric Indicators and Measurements

SEX: Sex was recorded as male or female.

WEIGHT: Children were weighed with/without clothes. If a child was measured with clothes then 'y' was recorded and if without clothes then 'n' was recorded in the questionnaire. Weight was measured to

the nearest 100 grams using SECA scale. Scales were checked for accuracy before and after each day's measurements using standard weight (2 kg). An average weight for clothes i.e. 200 gm was removed when relevant.

Scales were placed on a flat surface and calibrated to zero before each measurement. For younger children who cannot stand-alone and for children who did not cooperate, indirect weighing technique was used to weight the children (e.g. double weighing).

HEIGHT: Children's height was measured to the nearest 0.1 cm. Children aged less than 24 months or less than 87 cm were measured lying down on a horizontal measuring board. Children aged more than 24 months or 87 cm were measured standing up. If these principles could not be followed (i.e. disabled or sick child aged 24 or more months but unable to stand) the child was measured in an alternative manner, a note was written on the questionnaire and a correction factor was used.

OEDEMA: Children were assessed for oedema by a field team member applying a three-second moderate thumb pressure to the anterior surface of both feet. If, after the pressure was released, an indentation remained on each foot, the child was recorded as having oedema. No cases of oedema was found during the survey.

MID UPPER ARM CIRCUMFERENCE (MUAC): MUAC was measured at the mid-point of the left upper arm and measured in millimeter for both children and mothers of reproductive age groups.

3.7. Survey Team composition, Training, and Data Management

3.7.1. Survey Teams

Six survey teams were organized for this survey. Each team was composed of five individuals which include two measurers, one interviewer, one team leader, and one additional community mobilizer to guide the team during the data collection period. The team members were a mix of both males and females who were recruited from the local communities. The Survey Manager was responsible to led all the survey implementation process & two individuals who are trained in SMART survey managerial level training and one female individual having Nutritional survey experience were involved as a team supervisor during the data collection period.

3.7.2. Survey Training

A five days training was conducted from March 15-19 2022 for 18 selected enumerators/data collectors. The training was facilitated by one survey consultant and 2 trained SMART Survey Managers from Action Against Hunger and SMOH. The standard enumerator training package was adapted according to the objective of the survey which included sections on anthropometric measurements of children (6-59 months), retrospective mortality, morbidity, demography, IYCF, and maternal anthropometric measurements.

A standardization test was conducted in the Zalingei Hospital on the 3rd day of the training using 12 healthy children in the age group 6 -59 months. The training included a standardization test, which involved pairs of enumerators taking two sets of anthropometric measurements of 10 children, with a time interval between measurements of each child. The result from the pairs of enumerators were compared to results from the entire group and measurements taken by the supervisor. The aim was to identify the strengths and weaknesses of each enumerator in taking accurate and precise measurements, and to provide

feedback. Altogether six teams of three members each were formed based on the test results to ensure all teams have an equal level. Staff, who were poor or rejected for measurements, was given only measurer assistant roles to support measurer.

The field test was conducted in non-sampled village area with each team completing three questionnaires and at least five household visits following the systematic random sampling technique. The test was carefully supervised and provided an opportunity to correct any errors and clarify any issues prior to the initiation of the survey.

3.8. Data Quality Assurance Processes

To ensure data quality a number of steps were taken: (i) a standardization test was carried out on the 3rd day of training and the results were satisfactory which ensure the survey team members have adopted the required skill and knowledge to carry out the survey with an acceptable level of accuracy and precision. In addition, a local events calendar was developed by the survey teams which was used to estimate the age of the child with no formal date of a birth record. Moreover, at the end of each data collection day, anthropometric data were entered into ENA software, and a plausibility check was generated. Daily feedback was provided to the survey teams based on results found from the daily plausibility check.

3.9. Supervision

The supervision of the data collection was the critical component of the data quality control measures. This was mainly conducted to reinforce the adherence of the survey team to the survey protocol. Supervision of the data collection activities was conducted on daily basis and continued until the end of the data collection period. The survey consultant together with AAH and SMOH staff has led the field-level technical support and supervision of the data collection process. The supervision exercises mainly focused on the sampling of households, interview skills, and measurement and recording of anthropometric measurements

3.10. Data Management

Anthropometric, Mortality, IYCF, and health-related data were collected through android enabled tablets mounted with Kobo to collect application software. The hard copy of anthropometric data was also used to back up the electronic version of the data. The teams uploaded the collected data to a central server (https://kobo.humanitarianresponse.info) on daily basis to allow the survey manager to download, review and analyze the data on daily bases.

3.11. Data Analysis

Anthropometric data was entered and analyzed using ENA for SMART software (version updated January 11 2020) by Survey Managers.
The overall quality of the data was assessed across those quality measurement parameters: 1) missing/flagged data, 2) sex ratio, 3) age distribution, 4) digit preference for height, 5) digit preference for weight, 6) standard deviation (WHZ), 7) skewness, 8) kurtosis (WHZ), and 9) Poisson distribution (WHZ<-2). Assessment was made for overall and individual teams.

Apart from the daily spot-checking of data entry, all data were re-checked upon completion of data entry and before running the final analysis. Undernutrition rates were estimated using WHO 2006 growth reference data and presented in the result section.

SMART flags were set to exclude outliers from the anthropometric analysis. Boundaries for exclusion were set at +/- 3 standard deviations (SD) from the observed weight for height Z-score mean. The daily plausibility report review enabled re-checking of data entry for any children with a SMART flag.

3.11.1. Nutrition Indices and Classification

Table 5: Based on UNICEF standards nutritional indices and its definition used for analysis of anthropometry (children aged 6-59months)

Indicator	Definition Criteria	Cut off point
Acute Malnutrition by WHZ	Global Acute Malnutrition	WHZ<-2 and /or Oedema
	Moderate Acute Malnutrition	WHZ <-2 and >=-3
	Sever Acute Malnutrition	WHZ <-3 and/or Oedema
Stunting	Total Stunting	HAZ<-2
	Moderate Stunting	HAZ <-2 and >=-3
	Sever Stunting	HAZ<-3
Underweight	Total Underweight	HAZ<-2
	Moderate Underweight	HAZ <-2 and >=-3
	Sever Underweight	HAZ<-3
Acute Malnutrition by MUAC	Global Acute Malnutrition	<12.5CM and/or Oedema
	Moderate Acute Malnutrition	≥11.5 and <12.5
	Sever Acute Malnutrition	≤ 11.5 and/or Oedema

Classification of acute malnutrition among PLW and global recommendations (by MUAC)

The MUAC cut offs for women globally are: MUAC <230 mm for global acute malnutrition on, between 210 mm and 229 mm for moderate acute malnutrition and <210 mm for severe acute malnutrition.

Table 6: ***Based on UNICEF standards classification of acute malnutrition rates according to the public health significance for children aged 6-59 months***

Labels	Prevalence Threshold(%)		
	Wasting	Overweight	Stunting
Very Low	<2.5	<2.5	<2.5
Low	2.5-<5	2.5-<5	2.5-<10
Medium	5-<10	5-<10	10-<20
High	10-<15	10-<15	20-<30

Very High	≥15	≥15	≥30

3.11.2. Retrospective Mortality Rate

The Crude Death Rate (CDR) and the Under 5 Mortality Rate (U5MR) are defined respectively as the number of people within the total population and the number of under-five children within the under-five population who die over a specified period. These death rates are expressed in relation to 10,000 persons (or under-five children) per day and are computed by ENA software.

The CDR is calculated using the formula:

CDR = [Number of deaths / (Total population/10,000) x time interval]

The total population is the population present at the mid-point of the time interval. It is computed as the total number of people present at the time of the survey in the household (current household members) + ½ total deaths + ½ persons present at the beginning of the recall period but gone at the time of the survey – ½ persons arriving during the recall period and present at the moment of the survey – ½ the number of births during the recall period. The time interval referred to as the recall period is the length of time within which the interviewees were asked to state if any deaths have occurred.

The U5MR is calculated using the formula:

U5MR = Number of deaths of children under-5 / [(Population of under-5/10,000) x time interval]

The total population of children under five is equivalent to the total number of children aged under five year present at the time of the survey in the households + ½ total deaths of under-five children + ½ under-five children present at the beginning of the recall period but gone at the time of the survey – ½ under-five children arrived during the recall period and present at the time of the survey – ½ birth during the recall period. Stillbirths that occur during the recall period were not recorded so were not counted.

Table 7: Cut off point for U5MR and CM

U5MR	CM	Classification
≥ 2 deaths per 10,000 children per day	≥ 1 death per 10,000 persons per day	Alert Rate
≥ 4 deaths per 10,000 children per day	≥ 2 deaths per 10,000 persons per day	Emergency rate

3.11.3. Other Multi-Sectorial Indicators used in the survey

Apart from nutritional and mortality rates, other indicators on IYCF, morbidity, and access to health care were considered under this survey.

Key Infant and Young Child Feeding (IYCF) indicators

The core indicators of IYCF i.e. 3Es (Early initiation of breastfeeding, exclusive breastfeeding and extended breastfeeding) were assessed for children less than 24 months. Other indicators e.g. Introduction of

complementary foods (solid, semi-solids or soft foods), minimum dietary diversity, minimum meal frequency for both breasted and non-breastfed children, bottle-feeding and introduction of infant formula milk were assessed.

For minimum dietary diversity, proportion of children 6-23 months of age who received foods from four or more food groups were assessed. The seven food groups used for tabulation of this indicator were:

- Grains, roots and tubers
- Legumes and nuts
- Dairy products (milk, yogurt, cheese)
- Flesh foods (meat, fish, poultry and liver/organ meats)
- Eggs
- Vitamin-A rich fruits and vegetables
- Other fruits and vegetables
-

The cut off of at least 4 of the above food groups was selected because it is associated with better diet intake for both breastfed and non-breastfed children.

For minimum meal frequency, proportion of breasted and non-breasted children 6-23 months of age who receive solid, semi-solid or soft foods (also including milk feeds for non-breastfed children) ere measured. This indicator is intended as a proxy for energy intake from foods other than breast milk. Feeding frequency for breasted children includes only non-liquid feeds and for non-breastfed children it includes both milk feeds and solid/semi solid feeds.

Morbidity and health seeking behaviour indicators used in the survey

For all children under 6-59 months of age, with a recall period of 2 weeks, children suffering from different illness were assessed. The different illness were categorized as follows:

- Diarrhoea (more than 3 loose stools/day)
- Fever
- Measles
- Difficulty to breath/ARI
- Others (specify)

Also, for those children suffering from any illness, their health seeking behaviour was also assessed. The categories under health seeking practices were as follows:

1. No care/nothing (stayed at home)
2. Government health facilities/ Health Post/ Primary Health Care Centres
3. Health centres
4. Pharmacy
5. Private hospital/clinic
6. Religious/traditional healer
7. Others (specify)

[4]

4. ETHICAL CONSIDERATION

Verbal consent was taken from each survey participant before starting any procedure and data collection activities. Community leaders were consulted in each step of the data collection process and they were also allowed to discuss and ask any questions about the survey. Moreover, the following points were described to each survey respondent/caregiver.

- The team ensured affirmation from caregivers that their children will not be at risk of harm while being measured and ensured the confidentiality of the information that they provide to the team.
- The team clearly explained to the participants that they do not get any kind of benefit for being participating in the survey
- The participants were informed about their right to withdraw from the assessment at any moment during the process.

5. SURVEY RESULT

5.1. Survey Sample and Non-response

The survey covered all the 40 sampled clusters and covered 548 HHs with an overall response rate of 93%. Market day and the mobile livelihood nature of the pastoralist community were among the key factors that contributed to the observed non-response rate.

Table 8: Survey Sample and Non-response Rate, March 2022

[4] *fao_guidelines_for_measuring_dietary_diversity_2010_october*

Category	Target	Achievement
Household	592	548 (93%)
children 6-59 month age	517	458(89%)
Cluster	40	40(100%)

Anthropometric data was collected from 458 children in the age group 6 to 59 months. Regarding the sex of the children, 53.1% (243) and 46.9%(215) were boys and girls respectively. The overall ratio of boys to girls was 1:1 with a p-value of 0.191 indicating that both boys and girls are equally represented in the anthropometric survey. The age ratio of children 6-29 months to 30-59 months was 0.92 with a P-value of 0.370 which is close to the expected value (that must be 0.85), pointing out that both age groups are equally represented in this survey. The exact birth date was not possible to determine (through proper documents) for over 98% of the children; only 2% of the surveyed children had documentation evidence that shows their exact date of birth. The absence of a recorded date of birth evidence potentially affected the quality of the age determination and therefore may have impacted the estimation of the stunting and underweight prevalence.

Table 9: Distribution of age and sex of the sample

	Boys		Girls		Total		Ratio
AGE (mo)	**no.**	**%**	**no.**	**%**	**no.**	**%**	**Boy:girl**
6-17	63	60.6	41	39.4	104	22.7	1.5
18-29	54	46.6	62	53.4	116	25.3	0.9
30-41	60	52.2	55	47.8	115	25.1	1.1
42-53	55	55.0	45	45.0	100	21.8	1.2
54-59	11	47.8	12	52.2	23	5.0	0.9
Total	243	53.1	215	46.9	458	100.0	1.1

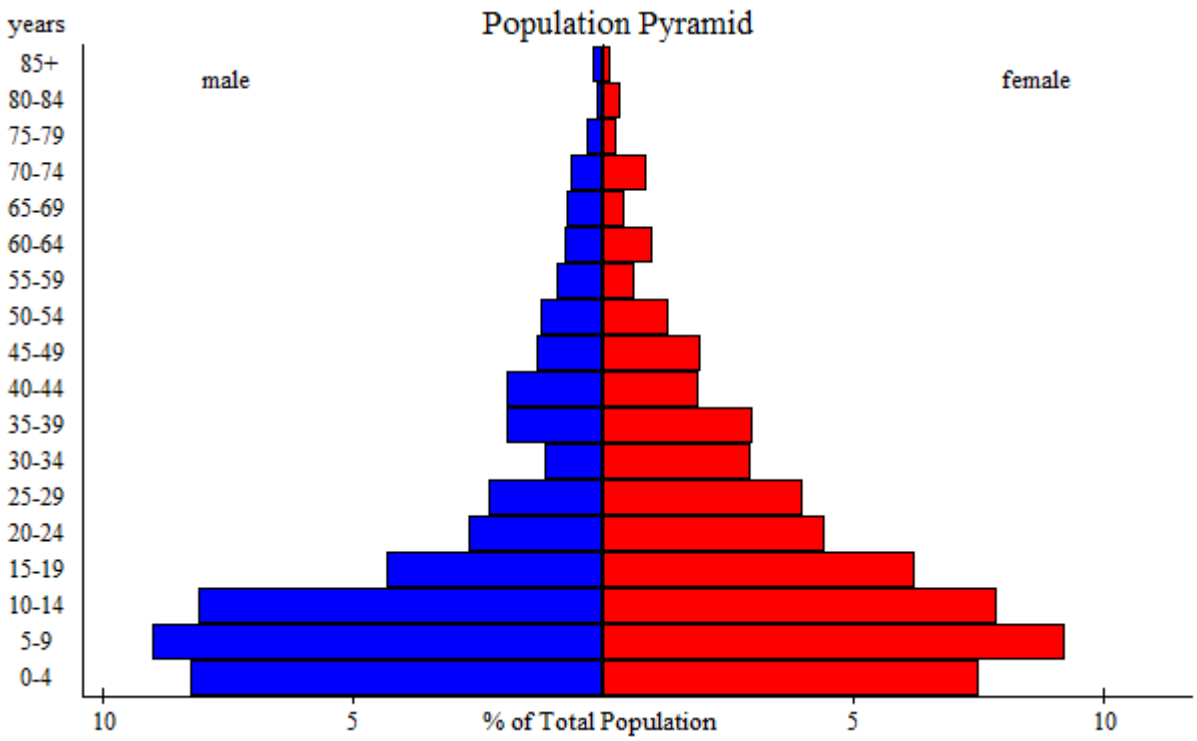


Figure 1: Population Age, and Sex Pyramide

A total of 548 households and 2998 populations were assessed across the 40 selected clusters. The figure above shows the population distribution of the total sample, disaggregated by sex and age of the surveyed population. All the sampled households with or without under-five children were asked about the members of the household and their details were recorded. The majority of the sampled population were children, followed by young adolescents and the proportion of the elderly population was found to be the lowest compared to the other age categories. The pyramid also indicates the equivalent proportion of males and females and is characterized by a typical developing country's population pyramid. The shape of the pyramid further highlights the presence of low life expectancy in the locality.

5.2. Anthropometric Results of Children 6 -59 Months (Based on WHO standards 2006)

Data were checked for outliers (values that lie between +/-3 SD from the observed mean) and outliers were flagged by the SMART software which are not considered plausible values (i.e. Indicate the incorrect value of either of the three measurements (weight, height, or age). The SMART flags were excluded from the analysis (WHZ, HAZ, and WAZ for 3, 0, and 6 children respectively).

The overall data quality of this survey was excellent based on the ENA for SMART software plausibility check result. The value of sex ratio, standard deviation, and kurtosis across all the surveyed clusters was also excellent. Anthropometric measurements (weight, height, and MUAC) had excellent scores across the surveyed clusters. The distribution of the data was symmetrical in all the surveyed clusters and the Poisson distribution indicated the uniform distribution of the wasted cases across the sampled clusters.

The overall data quality of the survey is 0% based on the plausibility report generated by ENA for SMART software which indicates the excellent quality of the data and is considered acceptable data to be used for further analysis and programmatic decisions.

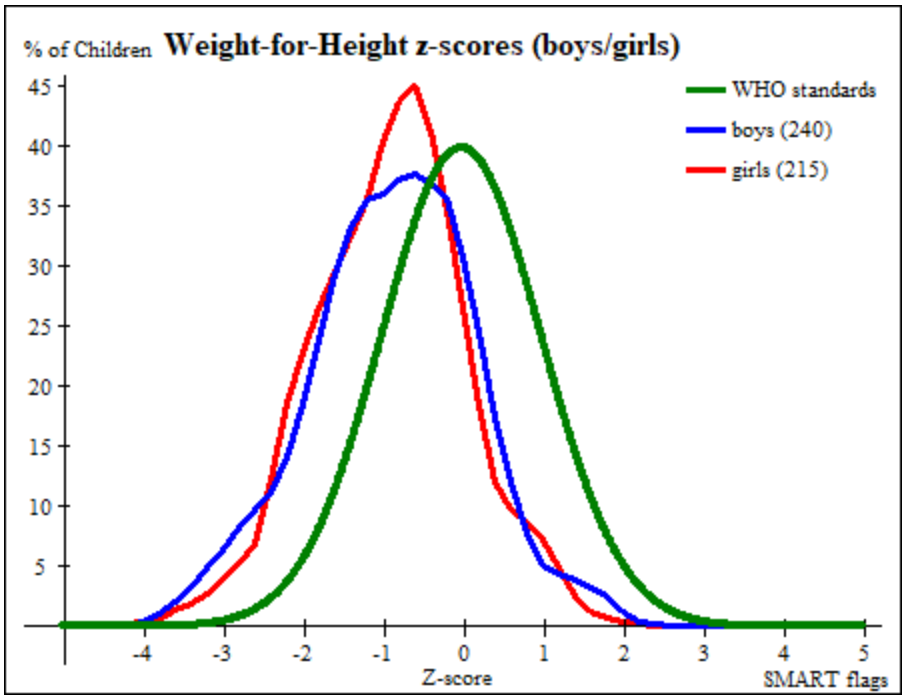


Figure 2: Gaussian distribution Curve for Sex of children (WFH).

All the prevalence rates considered in this survey were based on the exclusion of z-scores from observed mean SMART flags: WHZ -3 to 3; HAZ -3 to 3; and WAZ -3 to 3. The total surveyed children in the age group 6-59 months was 458 where 9 indices are found to be (3 WHZ and 6 HAZ but 0 WAZ) out of range. The above figure shows the normal distribution of the WFH z-score (in red and blue) which mimics the WHO standards normal curve (in green), with a mean of -0.89 and a standard deviation of 0.97, which implies that the survey population is affected by malnutrition compared to the reference population.

5.2.1. Prevalence of Acute Malnutrition Based on Weight-for-Height z-scores (and/or oedema) and by sex

Weight-for-Height (W/H**)** is the nutrition index that reflects short-term growth failure (acute malnutrition, wasting) and is defined by a child's weight (kg) and its height or length (cm) compared to a standard or reference population of the same height/length. Acute malnutrition prevalence is estimated from the weight for height (W/H) index values combined with the presence of oedema. The WFH indices are expressed in Z-scores according to WHO 2006 reference. Global Acute Malnutrition (GAM) is defined as <-2 z scores weight-for-height and/or oedema. While Severe Acute Malnutrition (SAM) is defined as <-3 z scores weight-for-height and/or oedema). WHZ prevalence analysis included 455 children in the age group 6- 59 months (3 children were excluded by the SMART flag).

Global Acute Malnutrition (GAM) prevalence in this survey based on Weight for height Z scores (WHZ<-2 and/or oedema) is 11.6 %(9.0 - 14.9 95% C.I.). Severe Acute Malnutrition (SAM) in this survey appeared to be 2.2 %(1.0 - 4.6 95% C.I.). No oedema cases were reported in this survey. The findings indicated the presence of high malnutrition situation (GAM rate of 10-<15%) in the area according to UNICEF's new threshold classification for the prevalence of malnutrition.

The SAM and MAM prevalence among boys was slightly higher than in girls while the chi-square test (P-value > 0.05) indicates that the difference is not statistically significant.

***Table 10*: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex, March 2022**

	All n = 455	**Boys** n = 240	**Girls** n = 215
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(53) 11.6 % (9.0 - 14.9 95% C.I.)	(32) 13.3 % (9.9 - 17.7 95% C.I.)	(21) 9.8 % (6.3 - 14.8 95% C.I.)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(43) 9.5 % (7.2 - 12.4 95% C.I.)	(26) 10.8 % (7.9 - 14.7 95% C.I.)	(17) 7.9 % (4.8 - 12.7 95% C.I.)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(10) 2.2 % (1.0 - 4.6 95% C.I.)	(6) 2.5 % (0.8 - 7.5 95% C.I.)	(4) 1.9 % (0.7 - 4.7 95% C.I.)

The prevalence of oedema is 0.0 %

Analysis of acute malnutrition by age group indicated that SAM prevalence was higher among children in the age group 54-59 months and followed by children in the age group 30-41 months. In addition, the MAM prevalence among children in the age groups of 6-17 and 54 -59 months was 16.3% and 13.0% respectively which is higher than the prevalence reported in the age group 18-29,30-41, and 42-53 months. The difference in the SAM and MAM prevalence across the different age groups implies the existing gaps in weaning and complementary feeding practices as well as it may also reflect the low level of IYCF practices in the area which might be due to the occurrence of recurrent infection coupled with poor vaccination coverage.

Table 11: Prevalence of acute malnutrition by age, based on weight-for-height z-scores and/or oedema, March 2022

Age (mo)	Total no.	Severe wasting (<-3 z-score)		Moderate wasting (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
		No.	%	**No.**	%	**No.**	%	**No.**	%
6-17	104	2	1.9	17	16.3	85	81.7	0	0.0
18-29	114	2	1.8	8	7.0	104	91.2	0	0.0
30-41	114	3	2.6	9	7.9	102	89.5	0	0.0
42-53	100	1	1.0	6	6.0	93	93.0	0	0.0
54-59	23	2	8.7	3	13.0	18	78.3	0	0.0
Total	455	10	2.2	43	9.5	402	88.4	0	0.0

5.2.2. Acute Malnutrition and Oedema based on Weight-for-Height z-scores

Table 12: Distribution of acute malnutrition and oedema based on weight-for-height z-scores, March 2022

	<-3 z-score	>=-3 z-score
Oedema present	Marasmic kwashiorkor. 0 (0.0 %)	Kwashiorkor. 0 (0.0 %)
Oedema absent	Marasmic	Not severely malnourished. 447

	No. 11 (2.4 %)	(97.6 %)

5.2.3. Prevalence of Acute Malnutrition based on MUAC cut off's (and/or oedema) and by Sex

The Mid-Upper Arm Circumference (MUAC) is an anthropometric measurement used to evaluate wasting in children aged 6 to 59 months. It is widely used in nutrition programs to determine child admission to feeding programs. It is also a good predictor of mortality among under-five children. The analysis was carried out using the standard MUAC cut-off points (i.e. < 115 mm for SAM and between 115 mm and 125 mm for MAM). The prevalence of acute malnutrition by MUAC did not use exclusion, so the analysis was performed for all 458 children.

GAM and SAM prevalence based on the MUAC cut-off point are 5.2 % (3.6 - 7.6 95% C.I.) and 4.8 %(3.2 - 7.1 95% C.I.)respectively as shown in Table 12. The GAM prevalence among girls was found to be 7.0 % (4.2 - 11.4 95% C.I.) which is slightly higher than the prevalence reported in boys (3.7 % (1.8 - 7.7 95% C.I.)). Likewise, SAM prevalence among girls was 0.8 % (0.2 - 3.4 95% C.I.) but the prevalence among boys was 0.0% (0.0-0.0 95%) ;however, the difference is not statistically significant (P= 0.182).

Table 13: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex, March 2022

Category	All n = 458	Boys n = 243	Girls n = 215
Prevalence of global malnutrition (< 125 mm and/or oedema)	(24) 5.2 % (3.6 - 7.6 95% C.I.)	(9) 3.7 % (1.8 - 7.7 95% C.I.)	(15) 7.0 % (4.2 - 11.4 95% C.I.)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(22) 4.8 % (3.2 - 7.1 95% C.I.)	(7) 2.9 % (1.3 - 6.3 95% C.I.)	(15) 7.0 % (4.2 - 11.4 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(2) 0.4 % (0.1 - 1.8 95% C.I.)	(2) 0.8 % (0.2 - 3.4 95% C.I.)	(0) 0.0 % (0.0 - 0.0 95% C.I.)

The GAM prevalence based on the MUAC cut-off point was zero among children in the age groups 30-41 and 54-59 months. The most affected children were found in the age group of 6-17 months (Table 13).

Table 14: Prevalence of acute malnutrition by age, based on MUAC cut off's and/or oedema, March 2022

Age (mo)	Total no.	Severe wasting (< 115 mm)		Moderate wasting (>= 115 mm and < 125 mm)		Normal (> = 125 mm)		Oedema	
		No.	%	No.	%	No.	%	No.	%
6-17	104	1	1.0	14	13.5	89	85.6	0	0.0
18-29	116	1	0.9	5	4.3	110	94.8	0	0.0
30-41	115	0	0.0	0	0.0	115	100.0	0	0.0
42-53	100	0	0.0	3	3.0	97	97.0	0	0.0
54-59	23	0	0.0	0	0.0	23	100.0	0	0.0
Total	458	2	0.4	22	4.8	434	94.8	0	0.0

5.2.4. Prevalence of combined GAM and SAM based on WHZ and MUAC cut off's (and/or oedema) and by sex

The prevalence of malnutrition based on combined GAM and SAM by WHZ and MUAC was 13.3 % (10.7 - 16.5 95% C.I.), and 2.4 % (1.2 - 4.7 95% C.I.) respectively. The GAM and SAM prevalence among girls were 12.6 %(8.8 - 17.6 95% C.I.) and 1.9 %(0.7 - 4.7 95% C.I.) respectively. The prevalence of GAM and SAM among boys is found to be 14.0 %(10.5 - 18.5 95% C.I.) and 2.9 %(1.0 - 7.7 95% C.I.) respectively. The prevalence of combined GAM and SAM rates was slightly higher in boys than in girls, but the difference is not statistically significant.

Table 15: Prevalence of combined GAM and SAM based on WHZ and MUAC cut off's (and/or oedema) and by sex*, March 2022

Category	All n = 458	Boys n = 243	Girls n = 215
Prevalence of combined GAM (WHZ <-2 and/or MUAC < 125 mm and/or oedema)	(61) 13.3 % (10.7 - 16.5 95% C.I.)	(34) 14.0 % (10.5 - 18.5 95% C.I.)	(27) 12.6 % (8.8 - 17.6 95% C.I.)
Prevalence of combined SAM (WHZ < -3 and/or MUAC < 115 mm and/or oedema	(11) 2.4 % (1.2 - 4.7 95% C.I.)	(7) 2.9 % (1.0 - 7.7 95% C.I.)	(4) 1.9 % (0.7 - 4.7 95% C.I.)

*With SMART or WHO flags a missing MUAC/WHZ or not plausible WHZ value is considered as normal when the other value is available

Table 16: Detailed numbers for combined GAM and SAM, March 2022

Category	GAM		SAM	
	no.	%	no.	%
MUAC	8	1.7	1	0.2
WHZ	37	8.1	9	2.0
Both	16	3.5	1	0.2
Edema	0	0.0	0	0.0
Total	61	13.3	11	2.4

Total population: 458

5.2.5. Prevalence of Underweight based on Weight-for-Age z-scores by sex

Underweight is defined as inadequate low weight relative to age (weight-for-age z-scores- WHO 2021) and Underweight status reflects current and past nutritional experience in the community. It is a good measure of both wasting and stunting and is quite useful in child growth monitoring. Underweight prevalence analysis included 458 children in the age group 6- 59 months (no children were excluded by the SMART flag).

The prevalence of underweight among 6-59 month children was 30.1 % (25.9 - 34.8 95% C.I.) and 6.6 % (4.2 - 10.1 95% C.I.) of them were severely underweight. The results on the underweight status of the children are classified as **very high** according to the UNICEF 2018 thresholds classification (i.e.>15%).

The underweight and severe underweight prevalence among boys was 34.0 % (28.1 – 40.4 95% C.I.) and 6.6 % (3.5 - 11.9 95% C.I.) respectively. Underweight and severe underweight among girls were 27.0 % (21.2 - 33.6 95% C.I.) and 6.5 % (3.4 - 12.0 95% C.I.) respectively. Both the underweight and severe underweight prevalence was slightly higher in boys than in girls but the difference is not statistically significant.

Table 17: Prevalence of underweight based on weight-for-age z-scores by sex

Category	All n = 458	Boys n = 243	Girls n = 215
Prevalence of underweight (<-2 z-score)	(138) 30.1 % (25.9 - 34.8 95% C.I.)	(80) 32.9 % (27.7 - 38.6 95% C.I.)	(58) 27.0 % (21.2 - 33.6 95% C.I.)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(108) 23.6 % (19.8 - 27.8 95% C.I.)	(64) 26.3 % (21.6 - 31.7 95% C.I.)	(44) 20.5 % (15.3 - 26.8 95% C.I.)
Prevalence of severe underweight (<-3 z-score)	(30) 6.6 % (4.2 - 10.1 95% C.I.)	(16) 6.6 % (3.5 - 11.9 95% C.I.)	(14) 6.5 % (3.4 - 12.0 95% C.I.)

The underweight prevalence was almost uniformly distributed across the different age groups but children in the age group 54-59 months were more affected by underweight (34.8%) and Sever underweight (8.7%) compared with the rest age group of the sampled children.

Table 18: Prevalence of underweight by age, based on weight-for-age z-scores

Age (mo)	Total no.	Severe underweight (<-3 z-score)		Moderate underweight (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
		No.	%	No.	%	No.	%	No.	%
6-17	104	7	6.7	22	21.2	75	72.1	0	0.0
18-29	116	7	6.0	28	24.1	81	69.8	0	0.0
30-41	115	8	7.0	24	20.9	83	72.2	0	0.0
42-53	100	6	6.0	26	26.0	68	68.0	0	0.0
54-59	23	2	8.7	8	34.8	13	56.5	0	0.0
Total	458	30	6.6	108	23.6	320	69.9	0	0.0

5.2.6. Prevalence of Stunting based on Height-for-Age z-scores and by Sex

Stunting is a height-for-age measurement that reflects chronic undernutrition. This indicator measures the percent of children 6-59 months who are stunted, as defined by a height-for-age Z score < -2. The analysis of stunting prevalence included 452 children (6 outlier values were excluded based on the SMART flags).

This locality-based smart survey shows overall stunting prevalence was 34.7 % (29.3 - 40.6 95% C.I.) which is very high (≥30) according to the UNICEF new threshold cut-offs while moderate and severe stunting was 23.9 % (19.9 - 28.4 95% C.I.) and 10.8 % (7.7 - 15.1 95% C.I.)respectively in Wadi-Saleh locality. The stunting result shows that boys were slightly stunted 14.1 % (9.6 - 20.3 95% C.I.) as illustrated in the following table.
The severe stunting prevalence among boys and girls was 12.1 % (8.1 - 17.8 95% C.I.) and 9.4 % (5.9 - 14.7 95% C.I.) respectively where the prevalence of severe stunting among boys seems much higher than girls, but the difference is not statistically significant (Chi-Square test P value= 0.400).

Table 19: Prevalence of stunting based on height-for-age z-scores and by sex

Category	All n = 452	Boys n = 239	Girls n = 213
Prevalence of stunting (<-2 z-score)	(157) 34.7 % (29.3 - 40.6 95% C.I.)	(89) 37.2 % (30.2 - 44.8 95% C.I.)	(68) 31.9 % (25.7 - 38.9 95% C.I.)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(108) 23.9 % (19.9 - 28.4 95% C.I.)	(60) 25.1 % (19.6 - 31.6 95% C.I.)	(48) 22.5 % (17.1 - 29.0 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(49) 10.8 % (7.7 - 15.1 95% C.I.)	(29) 12.1 % (8.1 - 17.8 95% C.I.)	(20) 9.4 % (5.9 - 14.7 95% C.I.)

The analysis of stunting by age group shows that the youngest age group of 18 to 29 months children has the highest severe stunting prevalence (14.0%) followed by age groups between 54-59 (13%) and 42-53 months (12%) of children, while Moderate underweight was uniformly distributed throughout all age groups but, the lowest prevalence was observed in 54-59 month age group (17.4%) of children as

illustrated in the table below.

***Table 20*: Prevalence of stunting by age based on height-for-age z-scores**

Age (mo)	Total no.	Severe stunting (<-3 z-score)		Moderate stunting (>= -3 and <-2 z-score)		Normal (> = -2 z score)	
		No.	%	**No.**	%	**No.**	%
6-17	103	7	6.8	23	22.3	73	70.9
18-29	114	16	14.0	28	24.6	70	61.4
30-41	112	11	9.8	27	24.1	74	66.1
42-53	100	12	12.0	26	26.0	62	62.0
54-59	23	3	13.0	4	17.4	16	69.6
Total	452	49	10.8	108	23.9	295	65.3

5

[5] *UNICEF Prevalence threshold for Acute malnutrition, Stunning and underweight 2018 (issue 24)*

5.2.7. Mean z-scores, Design Effects, and Excluded Subjects

The mean Z scores for wasting (WHZ), underweight (WAZ), and stunting (HAZ) were 0.89±0.97, -1.49±1.008, and -1.59±1.12 respectively, which indicate the poor nutritional status of the surveyed population compared to the WHO reference population. The standard deviations for WHZ, WAZ, and HAZ were within the acceptable range of 0.8-1.2. The values of the design effect for WHZ and HAZ were 1.00 and 1.06 respectively, which implies that, as there was no inter-cluster variability in the prevalence of wasting as well as underweight while the design effect of HAZ was 1.58 implies that there is moderate variability stunting prevalence among the cluster.

***Table 21*: Mean z-scores, Design Effects and excluded subjects**

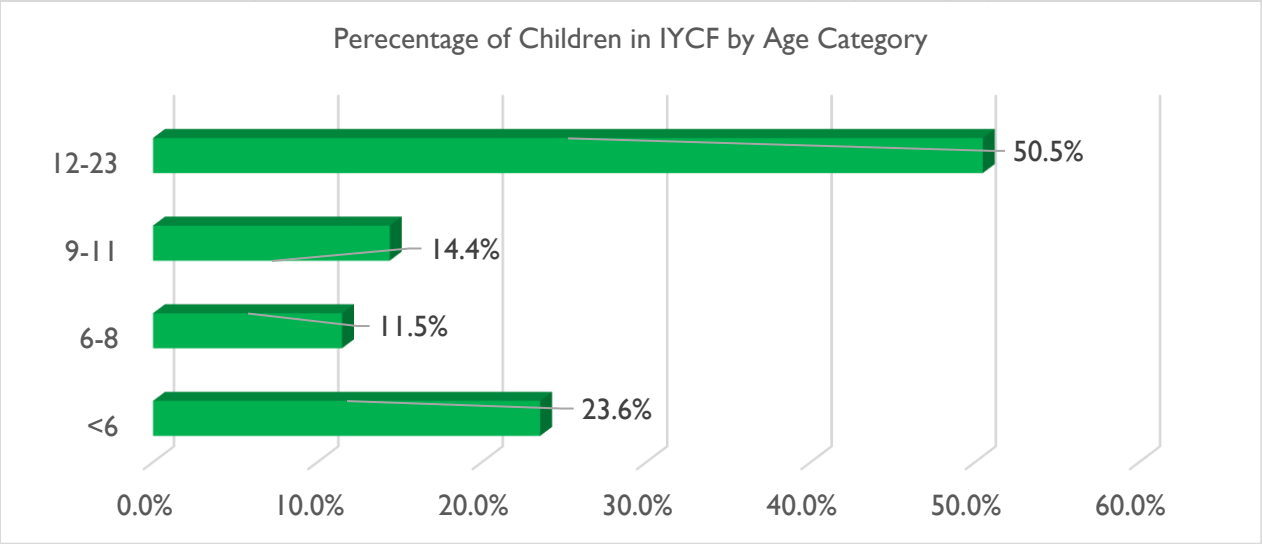
Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	455	-0.89±0.97	1.00	0	3
Weight-for-Age	458	-1.49±1.00	1.06	0	0
Height-for-Age	452	-1.59±1.12	1.58	0	6

* contains for WHZ and WAZ the children with edema.

5.3. INFANT AND YOUNG CHILD FEEDING (IYCF) PRACTICES RESULTS

Under Infant and Young Child Feeding (IYCF), practices related to exclusive breastfeeding, complementary feeding, and minimum dietary diversity were analyzed for children less than two years from the surveyed household. The analysis is based on the sampled population for anthropometric measurement. Due to low sample and methodology limits, results cannot be generalized for the overall population or district but are presented as indicative information.
A total of 208 children 0-23 months old were included for the IYCF indicator. The graph – below shows the percentage of children belonging to different age groups between 0-23 months Altogether 23.6% (49) of the children were below 6 months of age, 11.5% (24) were between 6-8months of age, 14.4% (30) of children were between 9-11 months and 50.5% (105) were between 12-23months of age.

Table 22: ***Percentage of children involved in IYCF assessment by age category***



5.3.1. Ever Breastfed (EvBF)

Breastfeeding is recommended for all infants worldwide except, in very few cases, for those with specific medical conditions. The survey result indicates that 99.5% (207) of children 6-23 months were reportedly having ever been breastfed in Wadi-Saleh Locality.

5.3.2. Early initiation of breastfeeding (EIBF):

In the Wadi-Saleh locality, 64.7%(58.5-71.0, 95% CI) of newborns were initiated breastfeeding in less than 1 hour after a birth while, 25.1%(19.3-30.9,95%, CI) and 8.7%(4.8-12.6,95% CI) of the newborns were initiated breastfeeding between 1-23 hrs and more than 24 hr respectively. As a result, the survey finding indicates, that majority of the newborn were initiated breastfeeding immediately after birth.

Table 23: ***Initiation of breastfeeding***

Initiation of breastfeeding	Frequency	Percent	95% CI	
			Lower	Upper
1 hour	134	64.7	58.5	71.0
1-23 hours	52	25.1	19.3	30.9
24 hour or more	18	8.7	4.8	12.6
DK	3	1.4	0.0	2.9
Total	207	100.0	100.0	100.0

5.3.3. Introduction of Complementary Feeding Practice

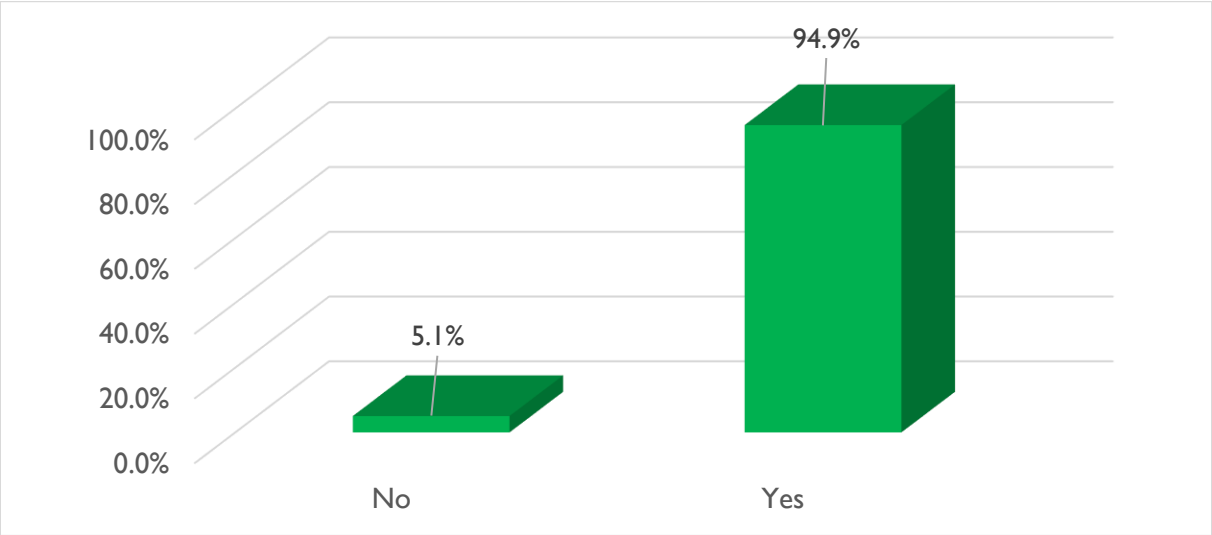


Figure 3: ***Introduction of complementary feeding on time (after 6 months of age)***

The majority of respondents with children aged 6-23 months i.e. 94.9% (150) were found to have introduced timely complementary foods while only 5.1% (8) of the population did not introduce complementary food in a timely manner.

5.3.4. Exclusive Breast-Feeding

Out of 208 children aged less than 23 months 49 children under 6 months old (0 -5 months) had been included in the survey, of the 92%(45) were breastfed in this time period but, 8% (4) were not breastfed. The majority of the children 53% (24) of them were solely breastfed and did not have any other foods or anything else (during the last 24 hours) while 47%(21) children had food like plane water, animal milk and Juice during the past 24hrs.

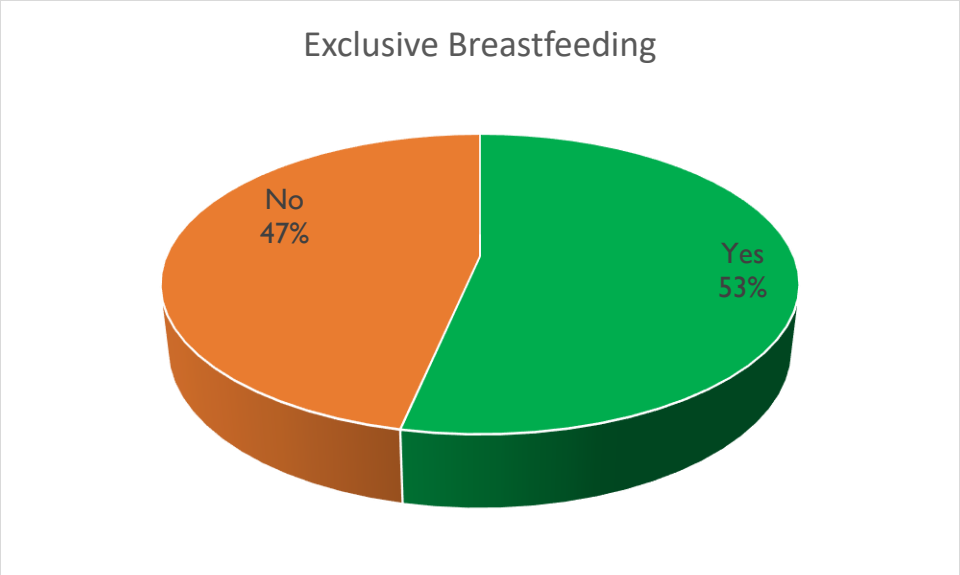


Figure 4: Exclusive Breast feeding

5.3.5. Continued Breastfeeding

5.3.5.1. Continued Breastfeeding at 1 year

The proportion of children 12–15 months of age who are fed breast milk compared to children 12–15 months of age who expected to receive breast milk during the previous day.

The survey result showed that out of 42 children aged between 12 – 15 months, 38 of them were breastfed during a 24-hour period, which means that the rate of continued breastfeeding at 1 year is 95.1%.

5.3.5.2. Continued Breastfeeding at 2 years

The proportion of children 20–23 months of age who are feed breast milk compared to children 20–23 months of age who expected to receive breast milk during the previous day

The survey result showed that 36 children from 20 – 23 months old were surveyed, of which 23 of them were still breastfed, which means that the continued breastfeeding at a 2-year rate is 63.9%.

Table 24: Continued breastfeeding

Continued Breast Feeding	Age category					Total
	6-8	9-11	12-15	16-19	20-23	
No	4.2%(1)	0.0%(0)	4.9%(2)	25.9%(7)	36.1%(13)	23

Yes	95.8%(23)	100.0%(30)	95.1%(39)	74.1%(20)	63.9%(23)	135
Total	100.0%(24)	100.0%(30)	100.0%(41)	100.0%(27)	100.0%(36)	158

5.3.6. Minimum Acceptable Meal Frequency

Among 24 children who were 6-8 months and were breastfed, 75.0 %(18) were found to have met the minimum required meal frequency (>= 2 times per day). Amongst children aged 9-11 months who responded to the meal frequency question, 40% (12) were found to have been fed minimum required meal frequency (i.e. >= 3 times per day) while 60%(18) were being fed less than the required frequency. Similarly, in the age groups, 12-23 months 56.7 %(59) were found adequate minimum required feeding frequency for their age while 43.3% (45) of children were being fed less than the required frequency.
Overall, 53.0% of the children 9-23 months old were receiving at least 3 meals per day while 47.0% of the children 9-23 months old were not received less than the required feeding frequency This suggests that infant and young child feeding practices need to be further promoted and strengthened.

Table 25: ***Cross-tabulation of age group and minimum dietary diversity score***

Minimum Acceptable diet	Age category	
	9-11	12-23
< 3 times: (inadequate feeding frequency for 9 - 23 months)	60%(18)	43.3%(45)
>= 3 times: (Adequate feeding frequency for 9 - 23 months)	40%(12)	56.7%(59)

The table below shows the cross-tabulation between different age groups of children aged between 6-23 months and their dietary diversity scores. A child consuming less than 4 food groups per day (in the past 24 hours including day and night) is said to have not met the minimum dietary diversity while children consuming 4 or more food groups are assumed to have met the minimum or adequate dietary diversity score.
From the table above it can be interpreted that, among those children aged 6-8 months, 9-11 months, and 12-23 months 91.7%, 96.7%, and 84.6% respectively were found to have inadequate dietary diversity scores.

5.3.7. Minimum Diet Diversity

Table 26: - 6-59 month children's dietary diversity score

Minimum Diet Diversity	Age Group		
	6-8	9-11	12-23
Inadequate dietary diversity (<4 food groups consumed)	91.7%(22)	96.7%(29)	84.6%(88)
Adequate dietary diversity (>=4 food groups consumed)	8.3%(2)	3.3%(1)	15.4%(16)
Total	100.0%(24)	100.0%(30)	100.0%(104)

5.3.8. Maternal Nutrition

Maternal malnutrition increases the risk of poor pregnancy outcomes including obstructed labour, premature or low-birth-weight babies and postpartum hemorrhage, and increased mortality at labour (World Health Organization, 2008).

The nutritional status of PLW by MUAC cut-off (<190mm) termed as acute malnourished was adopted based on WHO recommendation. The findings unveiled percentage of acute malnutrition based on MUAC (<190mm) in the Wadi-Saleh locality was 0.0%. The percentage of PLW at risk of acute malnutrition based on MUAC cut-off (>190-<230mm) was 18.3%. The percentage of PLW classified by MUAC cut-off was 81.7% (>230mm) as indicated in the table below.

Table 27 Maternal Malnutrition by MUAC cut-off.

MUAC	Frequency	Percent	95% CI	
			Lower	Upper
<23 cm	21	18.3	11.3	25.2
≥23 cm	94	81.7	74.8	88.7
Total	115	100.0	100.0	100.0

5.4. Mortality results (retrospective over x months/days prior to interview)

Retrospective mortality was assessed for the 93 days preceding the survey. In each household, the main respondent was requested to recall and list the current household members, those who joined or left the

household, and those who were born and died during the recall period including the cause and palace of death.

The crude death rate (CDR) was 0.56 deaths per 10,000 per day (0.29-1.05, 95% C.I), with an under 5 death rate (U5DR) of 0.71 (0.22-2.23, 95% C.I) as shown in Table 26. The mortality rates are well below the global emergency thresholds of 1 and 2, respectively.

Table 28: Mortality Rates

HOUSEHOLD INFORMATION			
Total population		Children 0-59 months	
Total number of HH residents	2998	Number 0-5 years	485
The total number of people who joined HH in the recall period	48	Number 0-5yrs joined HH during the recall period	14
The total number of people who left HH in the recall period	121	Number 0-5 years left HH during the recall period	28
Total number of births during the recall period			20
Total number deaths during recall period	15	Number 0-5 years deaths during recall period	3
Crude mortality rate (deaths/10,*000*/day)	0.56 (0.29-1.05)	Under-5 mortality rate (deaths/10,000/day)	0.71 (0.22-2.23)
Design effect	1.48	Design effect	1.00

5.5. Children's Morbidity

According to the UNICEF conceptual framework on causes of malnutrition, disease is an immediate cause of malnutrition. It also affects food intake, which is also categorized as an immediate cause. It is important therefore to assess morbidity to observe its effect on the nutritional status of the surveyed children.

To assess child morbidity mothers/caregivers of children aged 6 to 59 months were asked to recall whether their children have had any illness in the past 2 weeks prior to the survey. Those who gave a confirmatory answer to this question were asked a follow-up question on the type of illness that affected their children.

Overall, 58.3% (53.7-62.7, 95%C.I) of sampled children reported at least one of the three illnesses (Fever/undiagnosed malaria, cough/acute respiratory infection, and diarrhea), showing high morbidity prevalence is likely among the contributing factors, as current GAM is 11.6%.

Table 29: Prevalence of reported illness in children in the two weeks prior to interview (n=458)

Ilness	Frequency	Percent	95% CI	
			Lower	Upper
No	191	41.7	37.3	46.3

Yes	267	58.3	53.7	62.7
Total	458	100.0	100.0	100.0

Cough/Acute respiratory infection 60.7% (55.1-66.7, 95% CI) was the highest reported morbidity, followed by Fever/undiagosed malaria, with 59.2% (53.2-64.8, 95%C.I.) then Diharrea at 15.4 %(11.4%-19.8%).

Table 30: Symptom breakdown in the children in the two weeks prior to the interview (n=267)

Type of Illness	Frequency	Percent	95% CI	
			Lower	Upper
Fever	158	59.2	53.2	64.8
Cough	162	60.7	55.1	66.7
Diharrea	42	15.7	11.2	20.2
Other	16	6.0	3.4	9.0

Additionally, caregivers were also asked whether or not they sought any assistance to treat their children. Out of 272 children who have had some kind of illness in the past two weeks before the survey majority 67.0% (183) of the caregivers of the sick child sought assistance to treat their children.

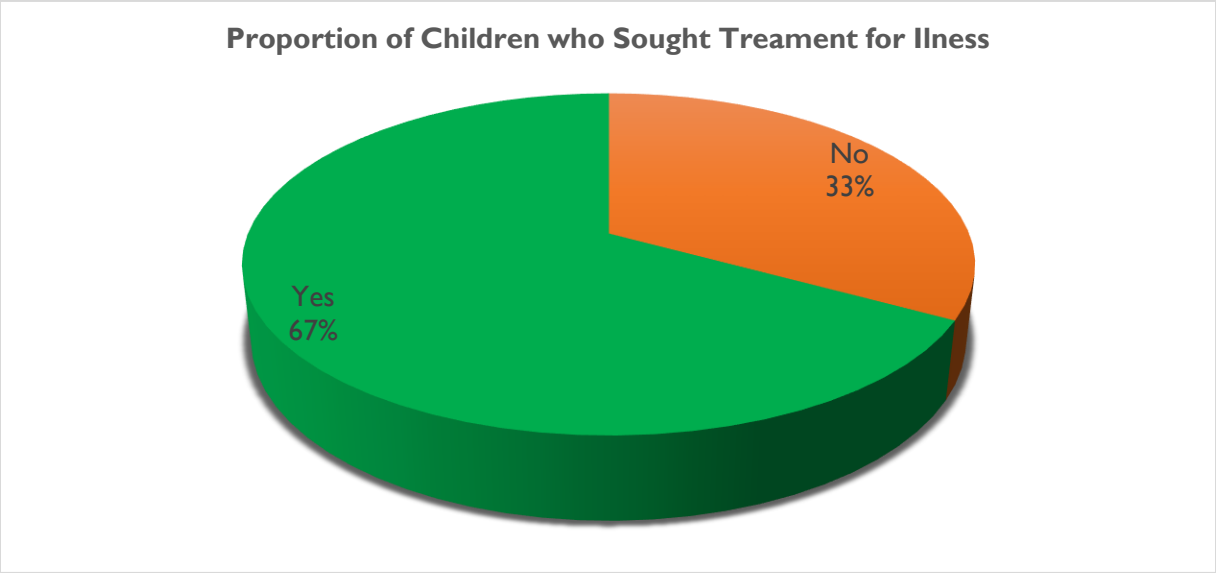


Figure 5 ***Proportion of children who sought treatment***

Of those who sought treatment, the highest proportion of children sought treatment from a government clinic/hospital (56.4%), with 23.5% seeking treatment from a pharmacy, and 13.7% from a private clinic while 6.7% of the caretaker seek treatment in traditional healer as well as provide home-based care (Figure

7)

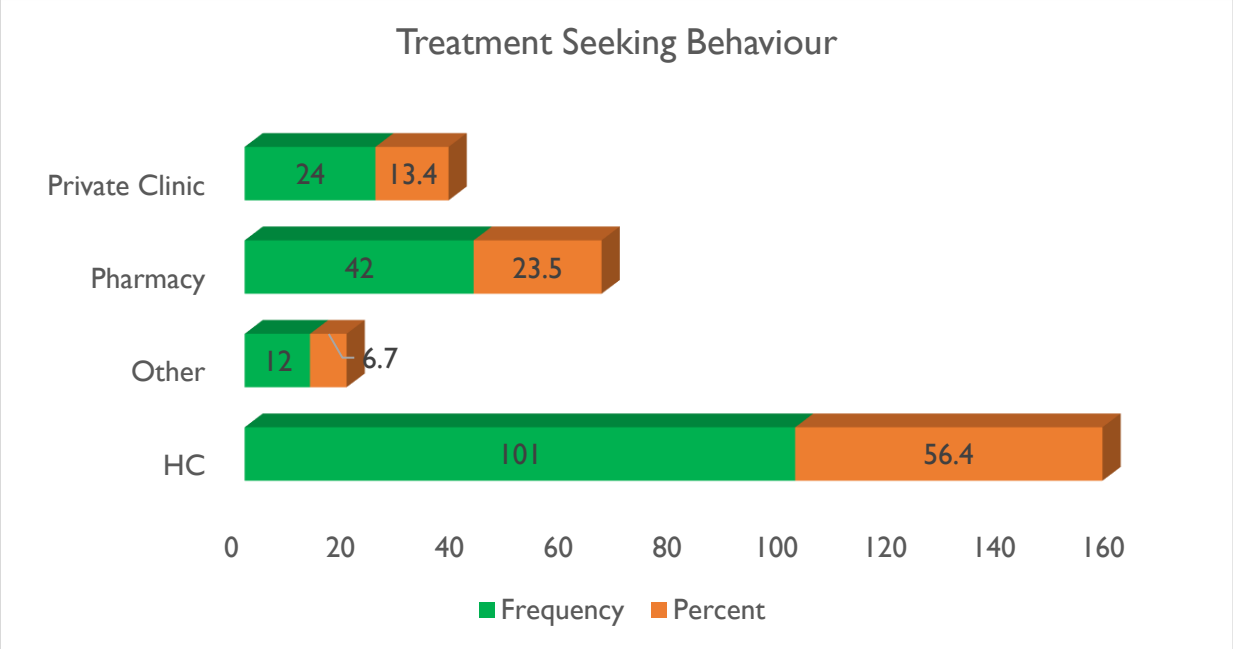


Figure 6 Health Seeking Behaviour of children

5.6. Vaccination Results

Based on vaccination card records, measles vaccination for children aged 9-59 months was only 34.4% (30.3-39.4, 95%CI). However, including recall, this increased to 56.6% (51.3-60.4, 95%CI) in which, the vaccination coverage is lower than the national target (>90%) (Table 24).

***Table 31*: Vaccination coverage: Measles for 9-59 months**

Measles	Frequency	Percent	95% CI	
			Lower	Upper
No	195	44.4	39.9	48.5
With EPI card	151	34.4	30.3	39.4
Both EPI card and recall	244	55.6	51.3	60.4

6. DISCUSSION

The survey covered all the 40 sampled clusters and 548HH with an overall response rate of 93%. Market day and the mobile livelihood nature of the pastoralist community were among the key factors that

contributed to the observed non-response rate. Anthropometric data was collected from 458 children in the age group 6 to 59 months. Regarding the sex of the children, 53.1% (243) and 46.9%(215) were boys and girls respectively.

The overall ratio of boys to girls was 1:1 with a p-value of 0.191 indicating that both boys and girls are equally represented in the anthropometric survey. The age ratio of children 6-29 months to 30-59 months was 0.92 with a P-value of 0.370 which is close to the expected value (that must be 0.85), pointing out that both age groups are equally represented in this survey. Overall age distribution was not equal and was significantly different in the sample ($p=0.001$). Similarly, a strong significance across different age categories was seen ($p<0.001$), although the distribution for girls and boys across different age groups was found significant difference ($p<0.05$). The exact birth date was not possible to determine (through proper documents) for over 98% of the children; only 2% of the surveyed children had documentation evidence of their exact date of birth. This may have compromised the quality of the age determination to some extent, and therefore may have impacted the estimation of the stunting and underweight prevalence as well.

Digit preference for weight, height and MUAC were excellent with estimates of 3, 6, and 4 respectively. Standard deviation (with SMART flags) for WHZ (0.97), HAZ (1.12), and WAZ (1.00) were within the expected range of 0.8-1.2 for the normally distributed population in the surveyed sample. Statistical test (Sapiro-wilk test) for all three indicators has shown that data is normally distributed with a p-value >0.05 for the surveyed children. Skewness results for WHZ, HAZ, and WAZ also confirmed the symmetrical distribution of data. While Kurtosis data for WHZ, WAZ has shown normal peaked distribution with 0.11, and 0.10 respectively while HAZ showed normal flat distribution with -0.09. Index of dispersion data has revealed that cases for wasting, underweight, and stunting children were randomly distributed across clusters.

The Wad-Saleh locality prevalence of Global Acute Malnutrition (GAM) among children aged 6-59 months using Weight for Height < -2 Z-score or Oedema was found to be **11.6% (9.0-14.9 95% CI).** The prevalence of Severe Acute Malnutrition (SAM) using Weight for Height < -3 Z-score or Oedema was **2.2% (1.0- 4.6 95% CI).** The combined GAM rate based on weight-for-height and MUAC was **13.3 % (10.7 - 16.5 95% C.I.).** The survey finding indicated shows that the acute malnutrition level of the locality is **critical and persistent high level** based on the UNICEF malnutrition threshold cut off (Dec 2018).

The overall stunting rate was found at **34.7 %(29.3 - 40.6 95% C.I**.), and underweight at **30.1 %(25.9 - 34.8 95% C.I.)**.The prevalence threshold for stunting and underweight based on the recently published (2018) UNICEF malnutrition threshold level cut-off states the situation to be **very high** for both the indicators.
The locality's high prevalence of stunting and underweight rates among older children (>29 months) can be interpreted as long-term nutritional stress potentially due to inadequate diet, poor complementary feeding practices, or infectious disease. This trend also indicates that children are not getting adequate nutrition from their regular diet following growing age. While Stunting was found, pick level at the 18-19 age group of the children than the rest of age group the surveyed children. Poor maternal nutrition status and inappropriate feeding practices were among the potential root factors for the observed high stunting rate in the surveyed population coupled with other multiple contributing factors such as low birth weight, the suboptimal practice of exclusive breastfeeding, and complementary feeding practices.

It is evident from the survey findings that WHZ and MUAC do not always detect the same children as malnourished. The combined acute malnutrition rate using WHZ, oedema, and MUAC criteria, being at 13.3% is higher than the acute malnutrition rate estimated by separated indicators (11.6% by WHZ and 5.2% by MUAC).
Considering the assessment of morbidity among children 6-59 months, 58.3% (53.7-62.7, 95%C.I) of

children under five were reported as sick over the last 2 weeks prior to the survey, which is high. Cough/Acute respiratory infection 60.7% (55.1-66.7, 95% CI) was the highest reported morbidity, followed by Fever (undiagnosed malaria), with 59.2% (53.2-64.8, 95%C.I.) then Diarrhea at 15.4 %(11.4%-19.8%). Any kind of illness, the part of respondents visiting government health facilities was the highest followed by those visiting private health care providers (private clinics and pharmacies).

The proportion of those not seeking care and staying back at home until recovery was high (41.7%). This can be attributed to various potential reasons, such as a poor economic condition (not allowing the caretakers to cover opportunistic costs or costs related to health care), low level of awareness about health care needs, or no appreciation of health services.

The primary objective of the national EPI program is to achieve the recommended Sphere coverage (>95%) and WHO (>80%) national coverage for all vaccines/antigens. The measles vaccination of the children confirmed by card was 34.4% and both by card and mother recall was 55.6% which is below the Sphere as well as WHO recommended standards. Therefore, the measles vaccine coverage seems to be performing poorly and far from the national target.

The mortality findings from a 93-day recall period indicated a low level with crude death rate CDR of 0.56 (0.29-1.05)/10,000/day and under-five death rate U5DR of 0.71 (0.22-2.23)/10,000/day which is below the WHO thresholds of 1 person/10,000/days and 2 person/10,000/day for CDR and U5DR respectively.

7. CONCLUSION

According to this SMART survey, the nutrition situation of the Wad-Saleh Locality is at high concern, with a combined rate of global acute malnutrition of **13.3 % (10.7 - 16.5 95% C.I.)** and a GAM rate based on WHZ at **11.6% (9.0-14.9 95% CI)**. These rates are close to the World Health Organizations' alarming threshold of emergency set at 10-<15%, thus indicating the state of emergency in regards to public health significance in which the children in the locality need acute nutritional support. Both the prevalence of underweight and stunting is at a very high level according to WHO & UNICEF's new threshold set.

6

[6] *Issued May 2021 Global Nutrition Report*

8. RECOMMENDATION

1. Continue the implementation of therapeutic feeding programme for severely acute malnourished children through health faciliti es/OTCCs. Strengthen SAM/MAM case management at facility and community levels.
2. Build the technical capacity of frontline health workers, including community health workers on CMAM/IMAM plus IYCF programs with a focus on preventing and treating acute malnutrition.
3. Reinforce the community case detection. Active screening by MUAC and WHZ should be considered to find the missing cases not detected by MUAC alone
4. Ensure universal access and coverage for nutrition screening among children under five using the existing community-level platform and through the implementation of innovative approaches, such as the Family MUAC approach whereby mothers or caretakers will take the MUAC measure of their children for early detection and referral of SAM and MAM cases.
5. Strengthen community mobilization and sensitization program for screening through capacity building training, review meeting, and create information exchange mechanisms.
6. Reinforce the nutrition surveillance system through regular nutrition surveys allowing to highlight malnutriti on trends based on seasonality and time;
7. Reinforce growth monitoring and promotion activities in health facilities focusing on identifying growth failure and promoti on of age appropriate IYCF practices;
8. Integrate active screening, growth monitoring and promoti on acti viti es with CB-IMNCI programme in health facilities
9. Strengthen the referral linkage between health facility and community by involving community members (Women, religious leaders, students, community, and local leaders) in nutrition care and support programs.
10. Intensify and scale-up program integration of health, WASH, and nutrition activities: growth monitoring, ANC/PNC, IYCF, Immunization, micronutrient supplementation, and CMAM (community mobilization/sensitization, SC, OTP, and TSFP).
11. Strengthen routine growth monitoring and promotion (GMP), Micronutrient supplementation, Immunization, and deworming programs.
12. Strengthen integrated and multisectoral programming approaches which comprise behavior change communication interventions with a focus on optimal IYCF practices and recommended hygiene and sanitation practices.
13. Conduct assessment of locally available foods to develop context specific IEC materials for IYCF practices for children aged 6-23 months and mothers;
14. Reinforce the continuum of care for pregnant women, with access to ANC, safe delivery and PNC;
15. Conduct a detailed IYCF surve.

9. REFERENCES

1. Sudan IPC Acute Food Security Analysis April 2021 – February 2022.
2. Simple Spatial Survey Method (S3M-II), 2018
3. *SMART Survey Methodology guiding note 2017.*

4. fao_guidelines_for_measuring_dietary_diversity_2010_october
5. *UNICEF Prevalence threshold for Acute malnutrition, Stunning and underweight 2018 (issue 24)*
6. Issued May 2021 Global Nutrition Report

10. APPENDIX

Appendix 1: - Plausibility Report

Plausibility check for: WAD-2022-AAH_Sudan_DC.as

Standard/Reference used for z-score calculation: WHO standards 2006
(If it is not mentioned, flagged data is included in the evaluation. Some parts of this plausibility report are more for advanced users and can be skipped for a standard evaluation)

Overall data quality

Criteria	Flags*	Unit	Excel.	Good	Accept	Problematic	**Score**
Flagged data	Incl	%	0-2.5	>2.5-5.0	>5.0-7.5	>7.5	
(% of out of range subjects)			0	5	10	20	**0** (0.7 %)
Overall Sex ratio	Incl	p	>0.1	>0.05	>0.001	<=0.001	
(Significant chi square)			0	2	4	10	**0** (p=0.191)
Age ratio(6-29 vs 30-59)	Incl	p	>0.1	>0.05	>0.001	<=0.001	
(Significant chi square)			0	2	4	10	**0** (p=0.370)
Dig pref score - weight	Incl	#	0-7	8-12	13-20	> 20	
			0	2	4	10	**0** (3)
Dig pref score - height	Incl	#	0-7	8-12	13-20	> 20	
			0	2	4	10	**0** (6)
Dig pref score - MUAC	Incl	#	0-7	8-12	13-20	> 20	
			0	2	4	10	**0** (4)
Standard Dev WHZ	Excl	SD	<1.1	<1.15	<1.20	>=1.20	
.			and	and	and	or	
.	Excl	SD	>0.9	>0.85	>0.80	<=0.80	
			0	5	10	20	**0** (0.97)
Skewness WHZ	Excl	#	<±0.2	<±0.4	<±0.6	>=±0.6	
			0	1	3	5	**0** (-0.09)
Kurtosis WHZ	Excl	#	<±0.2	<±0.4	<±0.6	>=±0.6	
			0	1	3	5	**0** (0.11)
Poisson dist WHZ-2	Excl	p	>0.05	>0.01	>0.001	<=0.001	
			0	1	3	5	**0** (p=0.363)
OVERALL SCORE WHZ =			0-9	10-14	15-24	>25	**0** %

The overall score of this survey is 0 %, this is excellent.

Appendix 2: - Assignment of Clusters

Assign Number of Clusters

Appendix 3: - Evaluation of Enumerators

Standardization Test Result

Appendix 4: Result Tables for NCHS growth reference 1977

Table 3.2: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex

	All n = 458	**Boys** n = 243	**Girls** n = 215
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(59) 12.9 % (10.1 - 16.3 95% C.I.)	(29) 11.9 % (8.1 - 17.2 95% C.I.)	(30) 14.0 % (9.7 - 19.6 95% C.I.)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(57) 12.4 % (9.6 - 15.9 95% C.I.)	(28) 11.5 % (7.7 - 16.8 95% C.I.)	(29) 13.5 % (9.4 - 19.0 95% C.I.)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(2) 0.4 % (0.1 - 1.8 95% C.I.)	(1) 0.4 % (0.1 - 3.2 95% C.I.)	(1) 0.5 % (0.1 - 3.5 95% C.I.)

The prevalence of oedema is 0.0 %

Table 3.3: Prevalence of acute malnutrition by age, based on weight-for-height z-scores and/or oedema

		Severe wasting (<-3 z-score)		Moderate wasting (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	104	0	0.0	16	15.4	88	84.6	0	0.0
18-29	116	1	0.9	19	16.4	96	82.8	0	0.0
30-41	115	1	0.9	10	8.7	104	90.4	0	0.0
42-53	100	0	0.0	7	7.0	93	93.0	0	0.0
54-59	23	0	0.0	5	21.7	18	78.3	0	0.0
Total	458	2	0.4	57	12.4	399	87.1	0	0.0

Table 3.4: Distribution of acute malnutrition and oedema based on weight-for-height z-scores

	<-3 z-score	**>=-3 z-score**
Oedema present	Marasmic kwashiorkor. 0 (0.0 %)	Kwashiorkor. 0 (0.0 %)
Oedema absent	Marasmic No. 2 (0.4 %)	Not severely malnourished. 456 (99.6 %)

Table 3.5: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex

	All n = 458	**Boys** n = 243	**Girls** n = 215
Prevalence of global malnutrition (< 125 mm and/or oedema)	(24) 5.2 % (3.6 - 7.6 95% C.I.)	(9) 3.7 % (1.8 - 7.7 95% C.I.)	(15) 7.0 % (4.2 - 11.4 95% C.I.)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(22) 4.8 % (3.2 - 7.1 95% C.I.)	(7) 2.9 % (1.3 - 6.3 95% C.I.)	(15) 7.0 % (4.2 - 11.4 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(2) 0.4 % (0.1 - 1.8 95% C.I.)	(2) 0.8 % (0.2 - 3.4 95% C.I.)	(0) 0.0 % (0.0 - 0.0 95% C.I.)

Table 3.6: Prevalence of acute malnutrition by age, based on MUAC cut off's and/or oedema

		Severe wasting (< 115 mm)		**Moderate wasting (>= 115 mm and < 125 mm)**		**Normal (> = 125 mm)**		**Oedema**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	104	1	1.0	14	13.5	89	85.6	0	0.0
18-29	116	1	0.9	5	4.3	110	94.8	0	0.0
30-41	115	0	0.0	0	0.0	115	100.0	0	0.0
42-53	100	0	0.0	3	3.0	97	97.0	0	0.0
54-59	23	0	0.0	0	0.0	23	100.0	0	0.0
Total	458	2	0.4	22	4.8	434	94.8	0	0.0

Table 3.7: Prevalence of combined GAM and SAM based on WHZ and MUAC cut off's (and/or oedema) and by sex*

	All n = 458	**Boys** n = 243	**Girls** n = 215
Prevalence of combined GAM (WHZ <-2 and/or MUAC < 125 mm and/or oedema)	(72) 15.7 % (12.6 - 19.4 95% C.I.)	(34) 14.0 % (10.0 - 19.3 95% C.I.)	(38) 17.7 % (13.0 - 23.5 95% C.I.)
Prevalence of combined SAM (WHZ < -3 and/or MUAC < 115 mm and/or oedema	(3) 0.7 % (0.2 - 2.0 95% C.I.)	(2) 0.8 % (0.2 - 3.4 95% C.I.)	(1) 0.5 % (0.1 - 3.5 95% C.I.)

*With SMART or WHO flags a missing MUAC/WHZ or not plausible WHZ value is considered as normal when the other value is available

3.8: Detailed numbers for combined GAM and SAM

	GAM		SAM	
	no.	%	no.	%
MUAC	13	2.8	1	0.2
WHZ	48	10.5	1	0.2
Both	11	2.4	1	0.2
Edema	0	0.0	0	0.0
Total	72	15.7	3	0.7

Total population: 458

Table 3.5: Prevalence of acute malnutrition based on the percentage of the median and/or oedema

	n = 458
Prevalence of global acute malnutrition (<80% and/or oedema)	(31) 6.8 % (4.8 - 9.5 95% C.I.)
Prevalence of moderate acute malnutrition (<80% and >= 70%, no oedema)	(30) 6.6 % (4.5 - 9.4 95% C.I.)
Prevalence of severe acute malnutrition (<70% and/or oedema)	(1) 0.2 % (0.0 - 1.6 95% C.I.)

Table 3.9: Prevalence of malnutrition by age, based on weight-for-height percentage of the median and oedema

		Severe wasting (<70% median)		Moderate wasting (>=70% and <80% median)		Normal (> =80% median)		Oedema	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	104	0	0.0	8	7.7	96	92.3	0	0.0
18-29	116	1	0.9	6	5.2	109	94.0	0	0.0
30-41	115	0	0.0	6	5.2	109	94.8	0	0.0
42-53	100	0	0.0	6	6.0	94	94.0	0	0.0
54-59	23	0	0.0	4	17.4	19	82.6	0	0.0
Total	458	1	0.2	30	6.6	427	93.2	0	0.0

Table 3.9: Prevalence of underweight based on weight-for-age z-scores by sex

	All n = 458	**Boys** n = 243	**Girls** n = 215

Prevalence of underweight (<-2 z-score)	(179) 39.1 % (34.2 - 44.2 95% C.I.)	(94) 38.7 % (32.1 - 45.7 95% C.I.)	(85) 39.5 % (32.7 - 46.8 95% C.I.)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(145) 31.7 % (27.2 - 36.5 95% C.I.)	(76) 31.3 % (24.7 - 38.7 95% C.I.)	(69) 32.1 % (25.6 - 39.4 95% C.I.)
Prevalence of severe underweight (<-3 z-score)	(34) 7.4 % (5.2 - 10.6 95% C.I.)	(18) 7.4 % (4.5 - 12.0 95% C.I.)	(16) 7.4 % (4.3 - 12.7 95% C.I.)

Table 3.10: Prevalence of underweight by age, based on weight-for-age z-scores

		Severe underweight (<-3 z-score)		**Moderate underweight (>= -3 and <-2 z-score)**		**Normal (> = -2 z score)**		**Oedema**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	104	10	9.6	32	30.8	62	59.6	0	0.0
18-29	116	10	8.6	42	36.2	64	55.2	0	0.0
30-41	115	6	5.2	36	31.3	73	63.5	0	0.0
42-53	100	6	6.0	27	27.0	67	67.0	0	0.0
54-59	23	2	8.7	8	34.8	13	56.5	0	0.0
Total	458	34	7.4	145	31.7	279	60.9	0	0.0

Table 3.11: Prevalence of stunting based on height-for-age z-scores and by sex

	All n = 454	**Boys** n = 240	**Girls** n = 214
Prevalence of stunting (<-2 z-score)	(124) 27.3 % (22.7 - 32.5 95% C.I.)	(68) 28.3 % (22.8 - 34.7 95% C.I.)	(56) 26.2 % (20.2 - 33.1 95% C.I.)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(82) 18.1 % (14.7 - 22.0 95% C.I.)	(42) 17.5 % (13.6 - 22.3 95% C.I.)	(40) 18.7 % (13.8 - 24.8 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(42) 9.3 % (6.5 - 12.9 95% C.I.)	(26) 10.8 % (7.3 - 15.7 95% C.I.)	(16) 7.5 % (4.3 - 12.7 95% C.I.)

Table 3.12: Prevalence of stunting by age based on height-for-age z-scores

		Severe stunting (<-3 z-score)		**Moderate stunting (>= -3 and <-2 z-score)**		**Normal (> = -2 z score)**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	104	6	5.8	21	20.2	77	74.0
18-29	115	15	13.0	18	15.7	82	71.3
30-41	112	8	7.1	15	13.4	89	79.5
42-53	100	10	10.0	24	24.0	66	66.0
54-59	23	3	13.0	4	17.4	16	69.6
Total	454	42	9.3	82	18.1	330	72.7

Table 3.13: Prevalence of overweight based on weight for height cut off's and by sex (no oedema)

	All n = 458	**Boys** n = 243	**Girls** n = 215
Prevalence of overweight (WHZ > 2)	(0) 0.0 % (0.0 - 0.0 95% C.I.)	(0) 0.0 % (0.0 - 0.0 95% C.I.)	(0) 0.0 % (0.0 - 0.0 95% C.I.)
Prevalence of severe overweight (WHZ > 3)	(0) 0.0 % (0.0 - 0.0 95% C.I.)	(0) 0.0 % (0.0 - 0.0 95% C.I.)	(0) 0.0 % (0.0 - 0.0 95% C.I.)

Table 3.14: Prevalence of overweight by age, based on weight for height (no oedema)

		Overweight (WHZ > 2)		Severe Overweight (WHZ > 3)	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**
6-17	104	0	0.0	0	0.0
18-29	116	0	0.0	0	0.0
30-41	115	0	0.0	0	0.0
42-53	100	0	0.0	0	0.0
54-59	23	0	0.0	0	0.0
Total	458	0	0.0	0	0.0

Table 3.15: Mean z-scores, Design Effects and excluded subjects

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	458	-1.07±0.84	1.00	0	0
Weight-for-Age	458	-1.70±0.93	1.20	0	0
Height-for-Age	454	-1.39±1.11	1.34	0	4

* contains for WHZ and WAZ the children with edema.

Appendix 5: Anthropometric and Health Qustionarries

ANTHROPOMETRIC & HEALTH QUESTIONNAIRE													
(To be conducted in EVERY HH with children 6-59 months - from the random starting point onwards)													
Date (D/M/Y): ……/……/…….. Cluster No: …… Team No: ……… State: …… Locality: …… Village:													
1.1	**1.2**	**1.3**	**1.4**	**1.5**	**1.6**	**1.7**	**1.8**	**1.9**	**1.10**	**1.11**	**1.12**	**1.13**	**1.14**
Child no.	HH no. (number in order of visit)	Sex ------ --- m = male f = female	Age in months (use calendar of events)	Weight in Kg To nearest 0.1kg	Height in CM.	Oedema -------- --- n = No y = Yes	MUAC in mm **To nearest 0.1cm**	BCG scar 0= No 1= Yes	Measles Vaccine (9-59 months) -------- -------- ----- 0 = No 1 =	Illness in past 2 weeks? ---------- ---------- 0 = No 1 = Yes If no, skip questions (1.12,1.	Type of Illness only if 1.10 is Yes ---------- -------- 1 = Fever* 2 = Cough** 3 = Diarrhoea	Treatment sought only if 1.11 is Yes ---------- --- 0 = None sought 1 = Hospital 2 = PHCC/PHCU 3 = Mobile /outreach clinic 4 = CBD	Maternal MUAC PLWs (Pregnant and Lactating Mothers) MUAC in
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
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20													

Appendix 6:- Mortality Questionarries

DEMOGRAPHY & MORTALITY QUESTIONNAIRE

DATE OF INTERVIEW: [ ][ ]/[ ][ ]/ [ ][ ]

01	02	03	04	05	06	07	08	09	10
No.	Name	Sex (M/F)	Age (years)	Joined on or after:	Left on or after:	Born on or after:	Died on or after:	Cause of death (optional)	Location of death (optional)
				_____ (Start date of the recall period - ex. Jan. 1, 1900)					
				WRITE 'Y' for YES. Leave BLANK if NO.					
a) List all the household members that are **currently living** in this household.									
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
b) List all the household members that have **left this household** (out migrants) **since the start** of the recall period.									
1					Y				
2					Y				
3					Y				
4					Y				
5					Y				
c) List all the household members who **died** since the start of the recall period.									
1							Y		
2							Y		
3							Y		
4							Y		
5							Y		

[7] Insert the household definition used in the survey in footnote here.

Was anyone in the household pregnant at the start of the recall period? No [ ] Yes [ ] If yes, how many? _____

Appendix 7:- IYCF Questionaries

1.0	INFANT AND YOUNG CHILD FEEDING 0-23 MONTHS	Response and code	Skip
	BREASTFEEFING MODULE (ALL CHILDREN 0-23 MONTHS) PART 1		
1.1	Was [NAME] ever breastfed?	1= Yes 2= No 98= DNK	If "no" or DK, skip to question 1.5
1.2	How long after birth was [NAME] first put to the breast? If immediately, circle "000" If less than one hour, record "00" hours If less than 24 hours, record hours Otherwise, record days	Immediately = 000 Hours: 1 |___|___| Days: 2 |___|___|	
1.3	In the first two days after delivery, was [NAME] given anything other than breast milk to eat or drink – anything at all like water, infant formula, or *[insert common drinks and foods, including ritual feeds, that may be given to newborn infants]?*	1= Yes 2= No	
1.4	Was [NAME] breastfed yesterday during the day or at night?	1= Yes 2= No 98= DNK	
1.5	Did [NAME] drink anything from a bottle with a nipple yesterday during the day or at night?	1= Yes 2= No 98= DNK	
1.6	Now I would like to ask you about liquids that [NAME] had yesterday during the day or at night. Please tell me about all drinks, whether [NAME] had them at home, or somewhere else. Yesterday during the day or at night, did [NAME] have…?		
	A. Plain water?	1=Yes, 2=No, 98=Don't know	
	B. Infant formula, such as [insert local names of common formula]?	1=Yes, 2=No, 98=Don't know	
	C. Milk from animals, such as fresh, tinned, or powdered milk?	1=Yes, 2=No, 98=Don't know	
	D. Yogurt drinks such as [insert local names of common types of yogurt drinks]?	1=Yes, 2=No, 98=Don't know	
	E. Chocolate-flavored drinks including those made from syrups or powders?	1=Yes, 2=No, 98=Don't know	
	F. Fruit juice or fruit-flavored drinks including those made from syrups or powders?	1=Yes, 2=No, 98=Don't know	

	G. Sodas, malt drinks, sports drinks, or energy drinks?	1=Yes, 2=No, 98=Don't know	
	H. Tea, coffee, or herbal drinks?	1=Yes, 2=No, 98=Don't know	
	I. Clear broth or clear soup?	1=Yes, 2=No, 98=Don't know	
	J. Any other liquids? If "yes": what was the liquid or what were the liquids?	1=Yes, 2=No, 98=Don't know	
1.7	Now I would like to ask you about foods that [NAME] had yesterday during the day or at night. I am interested in foods your child ate whether at home or somewhere else. Please think about snacks and small meals as well as main meals. I will ask you about different types of foods, and I would like to know whether your child ate the food even if it was combined with other foods in a mixed dish like [list common local examples of mixed dishes] Please do not answer "yes" for any food or ingredient used in a small amount to add flavor to a dish. Yesterday during the day or at night, did [NAME] eat:		
	A. Yogurt, other than yogurt drinks?	1=Yes, 2=No, 98=Don't know	
	B. Porridge, bread, rice, noodles, pasta or [insert other commonly consumed grains, including foods made from grains like rice dishes, noodle dishes, etc.]?	1=Yes, 2=No, 98=Don't know	
	C. Pumpkin, carrots, sweet red peppers, squash or sweet potatoes that are yellow or orange inside? [any additions to this list should meet "Criteria for defining foods and liquids as 'sources' of vitamin A"]	1=Yes, 2=No, 98=Don't know	
	D. Plantains, white potatoes, white yams, manioc, cassava or [insert other commonly consumed starchy tubers or starchy tuberous roots that are white or pale inside]?	1=Yes, 2=No, 98=Don't know	
	E. Dark green leafy vegetables, such as [insert commonly consumed vitamin A-rich dark green leafy vegetables]?	1=Yes, 2=No, 98=Don't know	
	F. Any other vegetables, such as [insert commonly consumed vegetables]?	1=Yes, 2=No, 98=Don't know	
	G. Ripe mangoes, ripe papayas or [insert other commonly consumed vitamin A-rich fruits]?	1=Yes, 2=No, 98=Don't know	
	H. Any other fruits, such as [insert commonly consumed fruits]?	1=Yes, 2=No, 98=Don't know	
	I. Liver, kidney, heart or [insert other commonly consumed organ meats]?	1=Yes, 2=No, 98=Don't know	

	J. Sausages, hot dogs/frankfurters, ham, bacon, salami, canned meat or [insert other commonly consumed processed meats]?	1=Yes, 2=No, 98=Don't know	
	K. Any other meat, such as beef, pork, lamb, goat, chicken, duck or [insert other commonly consumed meat]?	1=Yes, 2=No, 98=Don't know	
	L. Eggs?	1=Yes, 2=No, 98=Don't know	
	M. Fresh fish, dried fish, or shellfish?	1=Yes, 2=No, 98=Don't know	
	N. Beans, peas, lentils, nuts, seeds or [insert commonly consumed foods made from beans, peas, lentils, nuts, or seeds]?	1=Yes, 2=No, 98=Don't know	
	O. Hard or soft cheese such as [insert commonly consumed types of cheese]?	1=Yes, 2=No, 98=Don't know	
	P. Sweet foods such as chocolates, candies, pastries, cakes, biscuits, or frozen treats like ice cream and popsicles, or [insert other commonly consumed sentinel sweet foods]?	1=Yes, 2=No, 98=Don't know	
	Q. Chips, crisps, puffs, French fries, fried dough, instant noodles or [insert other commonly consumed sentinel fried and salty foods]?	1=Yes, 2=No, 98=Don't know	
	R. Any other solid, semi-solid or soft food? If "yes": What was the food? _____ [mark food group if it is not yet coded "yes"]_____	1=Yes, 2=No, 98=Don't know	
	S. Did [NAME] eat any solid, semi-solid or soft food yesterday during the day or at night? If "yes" probe: What kind of solid, semi-solid or soft foods did [NAME] eat? [mark food group]	Yes .....1 [if "yes" record in 1.7A – 1.7R] No 2	If "no", **ENTER "0" for 1.8**
1.8	How many times did [NAME] eat any solid, semi-solid or soft foods yesterday during the day or night? If 7 or more times, record "7". If number of times not known, record "9"	|___|	