FIGHT HUNGER FOUNDATION

SMART Survey in Govandi

Assessment of Nutrition and Mortality within the slum pockets of Sathe Nagar, Transit Camp and Umerkhadi in Govandi - Mumbai

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EXECUTIVE SUMMARY

Introduction:

M East Ward is an extension of M ward located between Mankhurd and Govandi area of Mumbai. Around 77% of the ward population lives in slum. As per NFHS[1] 3, the prevalence of Global Acute Malnutrition (GAM) is 16.2% whereas Severe Acute Malnutrition (SAM) is 4% of Mumbai city. There are many studies published since then on the subject of prevalence of acute malnutrition among children within the Mumbai city and suburban area. Tata Institute of Social Sciences (TISS) conducted a nutritional survey in 2012 in the Govandi. As per the TISS classification, Umerkhadi lies in Baiganwadi area where as Sathe Nagar and Transit camp belong to Mankhurd area of Mumbai. The prevalence of GAM in Baiganwadi and Mankhurd area was 18.6% and 25.5% respectively and SAM prevalence was 8.5% and 12.9% in these areas.

To create a baseline of these three areas in order to design future intervention Fight Hunger Foundation together with their technical partner Action Contre la Faim (ACF) conducted a SMART survey in June 2015. The local NGO called Apnalaya was field partners of the survey. Fight Huger Foundation is an Indian NGO established in 2011. Fight Hunger Foundation currently working to decrease acute malnutrition in Maharashtra and Madhya Pradesh with ACF India.

Survey purpose:

- To assess the nutrition status of children between 6 and 59 months of age in Sathe Nagar, Transit Camp and Umerkhadi slum pockets of Govandi, Mumbai during the pre-monsoon season.
- To assess the retrospective crude death and under 5 mortality rates in Sathe Nagar, Transit Camp and Umerkhadi slum pockets of Govandi, Mumbai during the pre-monsoon period.
- To assess the prevalence of diseases like diarrhea and malaria among children between age group of 6-59 months in Sathe Nagar, Transit Camp and Umerkhadi slum pockets of Govandi, Mumbai.

Methodology:

The survey was based on the SMART (Standardized Monitoring and Assessment of Relief and Transition) methodology. The total sample size for this survey was 304 children between 6 to 59 months of age from 868 households. These households were selected from a universe of 12089 HHs[2] with the help of Simple Random Sampling method.

Results:

- According to WHO criteria, prevalence of **Global Acute Malnutrition (GAM) is 18.8 %** (15.1-23.3, 95% C.I.[3]) and prevalence of **Severe Acute Malnutrition (SAM) is 2.6 %** (1.4 – 4.9 95% C.I.).
- The analysis by MUAC[4] showed a prevalence of GAM of 9.8% (7.1 – 13.3, 95% CI) and SAM of 1.4 % (0.6 – 3.3, 95% CI).
- The prevalence of stunting is 51.0 % (45.7-56.3 95% C.I) and 20.5 % (16.5-25.1, 95% C.I) were severely stunted.
- The underweight prevalence is 44.8% (39.6-50.1, 95% C.I), with 14.2% (10.9-18.3, 95% C.I) severely underweight.
- The Crude Mortality Rate (CMR) is 0.34 (0.17-0.66, 95% C.I) deaths per 10,000 per day, with an Under 5 mortality rate (U5MR) of 0.78 (0.21-2.79, 95% CI) deaths per 10,000 per day.

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[1] NFHS= National Family Health Survey

[2] HH= Household

[3] C.I. = Confidence Interval

[4] MUAC= Mid Upper Arm Circumference

1. INTRODUCTION

Mumbai is the capital city for the state of Maharashtra in India. It is a metropolitan city with a population of 13.4 million (as per BMC dataset 2010). Despite being an economic capital of India, Mumbai is home to some of the biggest slums of India[5].The cost of living is very high in Mumbai which integrates in increasing poverty and has led to an increase in the number of slums and squatters within the city. Almost 80% of the population within the city of Mumbai lives in overcrowded and unhygienic slums. These factors are one of the most important causes contributing to a high prevalence of malnutrition within the city. As per UNDP`s report of Maharashtra, Mumbai ranked 8th among the cities of Maharashtra. Cities like Thane, Nasik, Panvel and Kalyan fared much well and were ahead of Mumbai[6]. This report suggests that Mumbai performed well for indicators like income and literacy but faced a downfall for indicators related to health and nutrition.

M-East Ward: M East Ward is an extension of M ward located between Mankhurd and Govandi area of Mumbai. Around 77% of the ward population lives in slum[7]. The slum area is further divided into 12 slum pockets which includes the three slum pockets of Sathe Nagar, Transit Camp and Umerkhadi where the survey was conducted

Figure 1 shows aerial view of three slum pockets of Govandi slum, Mumbai

As per the Human Development Rank (HDR) report of 2009, M-East ward has lowest ranking among all wards[8] of Mumbai. The ward has a population of more than 5 lakhs[9] with a majority residing in slum[10]. M Ward is also home to one of the largest dumping grounds in the country, the Deonar dumping ground. The project areas are in the close proximity to dumping ground. People live here in shanties measuring about 10X15 feet. Besides these shanties are in the immediate vicinity of 9.2 million tons of garbage dumps and a number of chemical factories and refineries.

In terms of water, Tata Institute study shows that around 28% of the population either collects water from tankers, private bottles or other sources like shared tap or water mafia. In Umerkhadi and Transit camp, more than 43 percent of the population uses private sources of water such as tankers, bottled water and private pipes (water mafia) while the rest of the population uses taps and bore wells to get water[11].

The SMART survey was conducted in three slum pockets of Govandi which are considered to be the most vulnerable from May to June 2015 (capturing the pre monsoon season). The slum pockets selected were Umerkhadi, Transit camp and Sathe Nagar. All households in these three areas were enumerated in order to have the exact number of households by Fight hunger Foundation in collaboration with a local NGO named Apnalaya.

Issues related to malnutrition:

As per NFHS 3, the prevalence of Global Acute Malnutrition (GAM) is 16.2% whereas Severe Acute Malnutrition (SAM) within 4%.of Mumbai city. There are many studies published since then on the subject of prevalence of acute malnutrition among children within the Mumbai city and suburban area[12].

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[5] 2014 global cities index and emerging outlook, Global cities, present and future; A.T. Kearney, 2014

[6] 31st October 2013, Mumbai`s Human Development Index Shameful, DNA exclusive.

[7] M-east ward initiative, TISS

[8] Administrative zones of Mumbai are divided into various wards

[9] Lakh: It is defined as 100,000 units. In this context one lakh population represents 100,000 (one hundred thousand) population.

[10] 2009 HDR Report of Mumbai wards, 2009

[11] 2013, TISS M(East) ward report, 201, pg. 12

[12] NFHS 3 Report, 2005-06

Table 1 shows area wise prevalence of malnutrition in Govandi slum area.

Area	Stunting (%)		Wasting (%)		Underweight (%)	
	Global	Severe	Global	Severe	Global	Severe
Baiganwadi (Umerkhadi)	49.2	28.6	18.6	8.5	38.8	16.0
Mankhurd (Sathe Nagar and Transit Camp)	46.4	26.9	25.5	12.9	40.0	15.8
Overall total for M East Ward (all slum pockets)	41.7	24.9	19.8	9.6	35.1	14.1

Source: TISS Report, 2013[13].

To create a baseline of these three areas in order to design future interventions, Fight Hunger Foundation together with their technical partner Action Contre la Faim (ACF) conducted a SMART survey in June 2015. The local NGO called Apnalaya were their field partners for the survey.

Fight Huger Foundation is an Indian NGO established in 2011. Fight Hunger Foundation currently working to decrease acute malnutrition in Maharashtra and Madhya Pradesh and is technically supported by ACF India. In Mumbai, this organization in involved in capacity building of medical doctors for management of acute malnutrition and stabilization of Medical Nutrition Therapy (MNT) by providing food technologist who is upgrading MNT product in order to match WHO standards.

Action Against Hunger is an International NGO based in France. This NGO is working globally since three decades saving millions of children in more than 45 countries. ACF International is considered to be technical leader for management of SAM. Also, ACF is project convenor for SMART methodology globally. ACF India is leading the SMART methodology in India and has so far conducted 6 SMART surveys in four states of India.

Apnalaya: Is a local NGO working in M-East ward on various issues such as education, nutrition, disability, and employment etc. since last three decades. This NGO is working with Anganwadi workers and other government staff in order to provide care and support to the whole slum of this ward. This NGO supported Fight Hunger Foundation and ACF India in order to create baseline for the survey area.

1.1 General Objectives

The purpose of this survey is to:

- To assess the nutrition status of children between 6 and 59 months of age in Sathe Nagar, Transit Camp and Umerkhadi slum pockets of Govandi, Mumbai during the pre-monsoon season.
- To assess the retrospective crude death and under 5 mortality rates in Sathe Nagar, Transit Camp and Umerkhadi slum pockets of Govandi, Mumbai during the pre-monsoon period.
- To assess the prevalence of diseases like diarrhea and malaria among children between age group of 6-59 months in Sathe Nagar, Transit Camp and Umerkhadi slum pockets of Govandi, Mumbai.

1.2 Specific Objectives

- To measure the prevalence of acute malnutrition in children aged 6-59 months.
- To measure the prevalence of chronic malnutrition in children aged 6-59 months.
- To determine the level of retrospective crude death and under 5 mortality rates in the community.
- To assess the prevalence of diarrhoea and malaria among the children aged between 6-59 months

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[13]2013, TISS M(East) ward report

2. METHODOLOGY

This nutrition survey was based on the SMART (Standardized Monitoring and Assessment of Relief and Transition) methodology. Nutrition surveys based on the SMART methodology are simple, rapid, and transparent to provide nutrition data for immediate action. The standardized procedures and recommendations are given in order to collect timely and reliable data from the field.

2.1 Target population

This survey aims to estimate the current nutritional status of children from the Sathe Nagar, Transit Camp and Umerkhadi slum pockets of Govandi, Mumbai. In sampled households, all eligible children were measured. Prevalence of infections (diarrhoea and malaria) was assessed only for children 6 to 59 months of age. For mortality and infections caregiver or head of the households was interviewed.

2.2 Enumeration:

The three study areas were covered by slum that had a mix of Pucca[14] and semi-pucca[15] houses. There was no organization or pattern in the way households were arranged. The households were arranged very close to each other hence it was very difficult to create a clusters based on geographic or natural boundaries. The secondary data on the number of households was highly variable ranging from 10,000 to 18,000 households therefore it was not possible to make decisions on these highly variable estimates. Therefore it was decided to undertake a complete enumeration of the study area with help of the survey team. Each household was enumerated with the help of permanent colour paint keeping in mind the possibility to conduct future program interventions. **A household was defined as "a person or group of persons, related or unrelated, who live together and cook in the same pot and sleep under same roof."** Before numbering the household, each surveyor cross checked information with the head of the household as per the definition mentioned above to avoid duplication or under-estimation in the number of households.

To ease the enumeration process of these slum pockets and avoid errors and confusion among surveyors, each slum pocket was sub-divided into various 'zones'. Zones were identified with the help of using local boundaries such as temples, mosques, lanes, public toilets, schools, shops, etc. Each zone was coded with alpha numerical codes. The meaning of each alpha numeric code is as follows:

Table 2 showing all codes used to create alpha-numeric household marking for SMART survey

Code	Meaning of code	Code	Meaning of code
A	'Apnalaya': This NGO was a field partner for the survey	S	Sathe Nagar (for data entry purpose)
F	Fight Hunger Foundation : Implementing NGO	U	Umerkhadi (for data entry purpose)
Z	Zone	T	Transit Camp (for data entry purpose)
A-Z	Code of Zone		
xx	Number given to each household ranging from 1 to 1200 in one zone		

Each household in all the three slum pockets was enumerated using codes such as AFZA17 meaning Apnalaya Fight Hunger Foundation Zone A Household number 17. During data entry, one more alphabet was added to signify the slum pocket in which enumeration was conducted. e.g. SAFZA17 meaning Sathe Nagar Apnalaya Fight Hunger Foundation Zone 'A' Household number 17.

Overall, in first three weeks of the survey a total of 12,089 households from these three slum pockets were enumerated. These slums were divided into 44 zones. A detailed map of each zone was created by surveyors to spot each and every household. The following table shows the number of zones and the number of households within each of these three slum pockets.

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[14] Pucca: It is strong houses. They are made up of wood, bricks, cement, iron rods and steel. Flats and bungalows. Such houses are called permanent houses.

[15] Semi pucca: These are tenements which are generally constructed of katcha or **semi-pucca** materials like mud, bamboo, grass, leaves, reeds, thatch, unburnt bricks etc. and are inhabited by a large number of households.

Area Name	Zones	Number of Households
Transit Camp (T)	Total (7)	658
Sathe Nagar (S)	Total (20)	6472
Umerkhadi (U)	Total (17)	4959
Total	44	12089

Excluded Households:

From these three slum pockets, a total of 1322 households were excluded from the survey right at the beginning of the enumeration phase. From Umerkhadi, a total of 1300 household were excluded due to an ongoing randomised controlled trial of SNEHA (local NGO) on CMAM treatment models to avoid conflict of interest between SNEHA, Apnalaya and Fight Hunger Foundation. The remaining 22 households that were excluded were from Sathe Nagar due to extreme resistance to paint HH number with permanent colour.

2.3 Sampling

As the survey was conducted in slum pockets of Mumbai, the Nutrition Survey used a simple random sampling methodology. The households were geographically concentrated in a small area, but not in a systematic manner. As a list of households was available through enumeration exercise, it was much easier to undertake a simple random sampling method to select the households. The sampling details are further elaborated in section 2.6 below.

Sample size was calculated for anthropometry as well as mortality indicators. For prevalence of diarrhoea and malaria, the sample size of anthropometric indicators was used.

2.4 Sample Size Calculation

The sample size for the nutrition survey was calculated using the ENA[16] 2011 (version - April 21st, 2015). The following assumptions based on the given context were used to obtain the number of children to survey:

Sample size estimation for Acute Malnutrition and Mortality:

The SMART methodology recommends converting the number of children into number of households (fixed household method) for numerous reasons: it is easier to create lists of households than lists of children in the field; sample sizes calculated in number of children can encourage teams to skip households without any children (thus introducing a bias for household-level indicators); and households can provide a common metric for comparing sample size of many indicators. In order to do the conversion of number of children into number of households, the following assumptions were made:

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[16] ENA= Emergency Nutrition Assesment

Parameters	Value
Acute Malnutrition	
Estimated Prevalence of GAM (%)	20%
± Desired precision	4.5%
Design Effect	1
Children to be included for anthropometric measurements	**304**
Average HH Size	5.2
% Children under-5	8.3%
% Non-response Households	10%
HHs to cover for anthropometry	**868**
Mortality	
Crude Death rate	0.25
± Desired precision	± 0.3
Design Effect	1
Recall period (days)	100
Average HH Size	5.2
Non-response rate	10%
Sample to be included for Mortality	**1067**
HH to cover for mortality	**228**
Chronic Malnutrition	
Estimated prevalence of Chronic Malnutrition	45%
Precision %	7%
Design Effect	1
Average HH Size	5.2
% Children under-5	8.3%
% Non-response Households	10
Sample (Children)to be included for Chronic Malnutrition	**194**
HH to be included for data collection for chronic malnutrition	**555**

2.5 Sample Selection

Using the ENA software, 868 households were randomly drawn from the 44 zones (12089 HHs) of the three slum pockets of Govandi and divided into 5 teams. For mortality every alternate household was interviewed.

2.6 Household Selection Techniques

The whole study area was enumerated with permanent paint. The master list with all enumerated household was created and serial number was given to each household as ENA does not accept alphanumeric codes. Then 868 households were selected randomly with the help of ENA 2011 software by putting range from 1 to 12089. 868 numbers were randomly generated through the random number table. The final households list was created as per assigned serial numbers. The selected households were then visited by field teams to collect data. Annex 11 at the end of the document represents the list of 868 HHs selected via the random number table.

2.7 Survey Teams

The nutrition survey was conducted by 5 teams. Each team consisted of 3 members (one team leader and two measurers). The team leader was responsible for coordination of fieldwork. Survey manager was responsible for daily data entry of the data collected into ENA software and allotting randomly selected households to the teams, ensuring a high level of data quality.

Three field supervisors were deputed by Apnalaya, ACF[17] India and Fight Hunger Foundation (one by each partner) for overall supervision and support to the SMART Survey Manager. Field supervisors were responsible for inspecting all activities of the teams including calibration of equipment's, measurements taken by teams, interview of participants and selection of households. For double data entry, an additional data entry operator

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[17] ACF= Action Conte la Faim

was hired. Data analysis was conducted by SMART Manager with support from ACF Advisor in HQ Paris, HQ Canada and HoD Fight Hunger Foundation. For the data analysis ENA, ENA-Epi info was used.

2.8 Questionnaire:

The questionnaire was designed using a standard questionnaire from ENA software for anthropometry and mortality. The standard questionnaire from SMART methodology was adapted to include additional variables such as malaria and diarrhoea. The questionnaire was translated to Hindi language and then back translated to English. After training the surveyors on the questionnaire, the tool was pre-tested by survey manager to see its application on the field (non-survey area).

2.9 Training of surveyors:

A seven days training was conducted by Survey Manager with support from 2 Deputy Program Managers, one from ACF India and one from Fight Hunger Foundation. The training was conducted for 16 surveyors and one field supervisor. The seven days training included 4 days of presentations, two days for standardization tests (as first one failed to gather 10 children) and one day of field practicum to pilot questionnaire as well as skills of surveyors. The training was also supported by HoD Nutrition & Health, Fight Hunger Foundation. The standardization test was conducted on fifth day of the training where 10 children were invited for the test also the same test was repeated on day 7th of the training. The surveyors were asked to measure each child twice by each surveyor. Based on outcome of the test, main and assistant measurer was selected.

2.10 Data Collection Schedule

The data collection took place for duration of 2 weeks in June 2015, starting on the 8th of June. Based on the geographical locations of the zones across three slums of M-East ward of Mumbai, a schedule was devised

2.11 Anthropometric Measurements

Anthropometric measurements were taken on children 6-59 months. The height was measured (to the nearest 1 mm) using a standard height board. In case of a child below 2 years or less than 87 cm, height of the children was measured by laying the child on height board i.e. length. In case of a child above 2 years or between 87cm to 110 cm, height was measured while standing on the height board i.e. height. Age was considered main criteria for selection of children for height or length. The team leaders were asked to mention in the questionnaire whether height or length was measured by noting H or L. Weight was measured (to the nearest 100 g) by using a baby digital weighing scale. Weight-for-height z-score were then determined by using the WHO Weight-for-Height tables. In case there was no official documentation about birth date or if the mother did not know the exact birthdate of her child, age was estimated using an events calendar. MUAC was measured on the left arm using a MUAC tape. Also, oedema was measured by pressing thumbs on both feet for minimum of 3 seconds.

2.12 Data analysis

The data entry was done with the help of Emergency Nutrition Assessment (ENA) software. The data was entered by survey manager every day in ENA (April 21st 2015) in order to check the quality of anthropometry as well as collected data on daily basis. In case if any outliers were identified by survey manager then measurements were repeated on those children to cross-check errors. Also, double data was done by data entry person (hired separately) to validate the entered data. The data was analysed with the help of ENA and Epi-ENA. The data quality was checked with the help of plausibility test to understand errors in the data.

2.13 Type of Anthropometric Equipment

- Weighing Scale: Digital baby weighing scale. Brand Name- Phoenix (ISI certified)
- Length/height measuring boards: Wooden Height boards for measuring children
- MUAC Tapes: MUAC for children made by Fight Hunger Foundation and ACF India.

2.14 Ethical considerations:

It is very important to maintain dignity of the respondents in research. At the time of data collection verbal administration of informed consent was done. The personal identifiers were kept anonymous by using certain codes. The consent enclosed with following points:
   1. Introduction of surveyor and information about the implementing organizations.
   2. Brief information about the study
   3. Assurance of confidentiality
   4. Empower respondents so as to draw back their participation at any point of data collection.

3. RESULTS

3.1 Demographic information:

The SMART survey methodology recommends using data with "SMART Flags" unless it is a national survey. This survey covers three slum pockets of M-East ward hence SMART flags were used for analysis of the data. The sample for the distribution of age and gender was 347 children, including 180 males (52.2%) and 167 females (48.1%). The global sex ratio was 1.1. The sample consisted of 48.7% of children aged 6 to 29 months and 51.3% of children aged 30-59 months.

3.2 Prevalence of Acute Malnutrition:

In total, 351 children were measured. From 351 children, 4 children were excluded from the analysis as they were younger than 6 months; height of one child was not measured and therefore not counted in the analysis and lastly one child was excluded when the SMART flags criteria was applied. The nutritional analysis was therefore based on a total of 345 children (for WHZ) and was analysed against the WHO 2006 standards. For MUAC, data of 347 children was analysed as SMART flags do not apply to MUAC.

Figure 2 showing WHO classification of GAM with WHZ, MUAC and both criteria
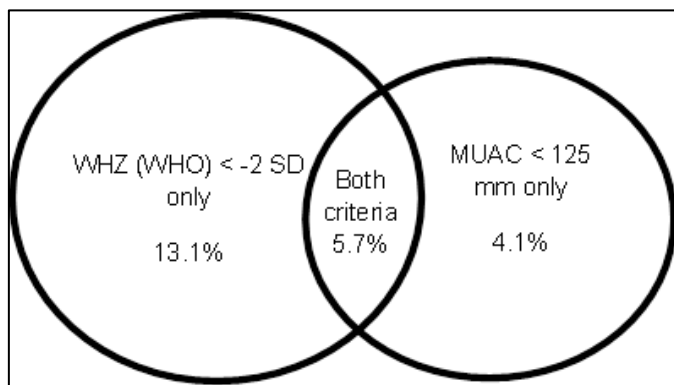
Prevalence of Global Acute Malnutrition (GAM) is 18.8 % (15.1 – 23.3 95% C.I.) and prevalence of Severe Acute Malnutrition (SAM) is 2.6 % (1.4 – 4.9 95% C.I.). With MUAC the prevalence of GAM was 9.8% (7.1 – 13.4 95% CI) and SAM is 1.4% (0.6 – 3.3 95% CI). To understand the actual burden of GAM in the study area, we combined the cases based on WHZ and MUAC cuts offs (i.e. WHZ <-2SD and MUAC <125 mm). The analysis was done with help of Epi ENA and the findings are illustrated in figure 2:

The above figure suggests that the prevalence of GAM as per only WHZ criteria was 13.1% (excluding the cases that were also identified as GAM by MUAC) while with MUAC it was 4.1%. The prevalence of GAM with both criteria was found to be 5.7%. If we sum all the cases together then we get a total GAM of 22.9%.

Table 5 showing prevalence of GAM and SAM

Criteria	GAM Prevalence (95% CI)	Number of cases	SAM Prevalence	Number of cases
WHZ as only criteria	18.8% (15.1-23.3)	65	2.6% (1.4-4.8)	9
MUAC as only criteria	9.8% (7.1-13.4)	34	1.4% (0.6-3.3)	5
Both criteria	5.7% (3.7-8.9)	20	0.6% (0.1-2.3)	1
Combined prevalence	22.9% (18.6- 27.8)	79	3.4% (2.1-6.5)	13

3.3 Prevalence of Underweight:

In total, 351 children were measured. From 351 children, 4 children were excluded from the analysis as they were younger than 6 months; height of one child was not measured and therefore not counted in the analysis and lastly two children were excluded when the SMART flags criteria was applied. The nutritional analysis was therefore based on a total of 344 children (for WAZ). Prevalence of global underweight was 44.8% (39.6 – 50.1 95% CI) and severe underweight (SUW) was 14.2 % (10.9 – 18.3 95% CI).

3.4 Prevalence of Chronic Malnutrition:

In total, 351 children were measured. From 351 children, 4 children were excluded from the analysis as they were younger than 6 months and ten children were excluded when the SMART flags criteria was applied. The nutritional analysis was therefore based on a total of 337 children (for HAZ).

Table 6 shows prevalence of underweight, acute and chronic malnutrition in survey area

Criteria		Acute Malnutrition (As per WHZ criteria)	Acute Malnutrition (As per MUAC cut-offs)	Stunting or Chronic Malnutrition (As per HAZ criteria)	Underweight (As per WAZ criteria)
Overall prevalence	**Global**	(65) 18.8 % (15.1 - 23.3 95% C.I.)	(34) 9.8 % (7.1 - 13.4 95% C.I.)	(172) 51.0 % (45.7 - 56.3 95% C.I.)	(154) 44.8 % (39.6 - 50.1 95% C.I.)
	Severe	(9) 2.6 % (1.4 - 4.9 95% C.I.)	(5) 1.4 % (0.6 - 3.3 95% C.I.)	(69) 20.5 % (16.5 - 25.1 95% C.I.)	(49) 14.2 % (10.9 - 18.3 95% C.I.)
Prevalence among boys	**Global**	(43) 23.9 % (18.2 - 30.6 95% C.I.)	(14) 7.8 % (4.7 - 12.6 95% C.I.)	(91) 52.6 % (45.2 - 59.9 95% C.I.)	(81) 45.0 % (37.9 - 52.3 95% C.I.)
	Severe	(5) 2.8 % (1.2 - 6.3 95% C.I.)	(0) 0.0 % (0.0 - 2.1 95% C.I.)	(41) 23.7 % (18.0 - 30.6 95% C.I.)	(30) 16.7 % (11.9 - 22.8 95% C.I.)
Prevalence among girls	**Global**	(22) 13.3 % (9.0 - 19.4 95% C.I.)	(20) 12.0 % (7.9 - 17.8 95% C.I.)	(81) 49.4 % (41.8 - 57.0 95% C.I.)	(73) 44.5 % (37.1 - 52.2 95% C.I.)
	Severe	(4) 2.4 % (0.9 - 6.1 95% C.I.)	(5) 3.0 % (1.3 - 6.8 95% C.I.)	(28) 17.1 % (12.1 - 23.6 95% C.I.)	(19) 11.6 % (7.5 - 17.4 95% C.I.)

According to the WHO classification of severity, the rates of GAM, stunting and underweight found in the survey falls within the critical category.

Table 7 shows WHO Classification of severity of malnutrition along with level of severity of survey area

Severity of malnutrition	Prevalence of wasting (<-2 z-scores WFH[18])		Prevalence of stunting (<-2 z-scores HFA)		Prevalence of underweight (<-2 z-scores WFA)	
	WHO	**Actual**	**WHO**	**Actual**	**WHO**	**Actual**
Acceptable	<5%		<20%		<10%	
Poor	5-9%		20-29%		10-19%	
Serious	10-14%		30-39%		20-29%	
Critical	>=15%	**18.8%** (15.1-23.3 95% CI)	>=40%	**51.0%** (45.7 - 56.3 95% CI	>=30%	**44.8%** (39.6 - 50.1 95% CI)

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[18] WFH= Weight for Height

3.5 Mortality rate:

In total, 467 households were interviewed, representing 2370 people with 257 children less than five years. As per the analysis, 11.4% children in survey area are under five years of age. Among these 467 surveyed households, 42.4% (198) HHs had at least one child less than five years of age. The average household size is 5.1 people per house. The birth rate of the sampled population was 0.25 per 10000 people per day i.e. one child is born in every four days per 10000 population of the survey area. 0.67/10000/day is an in-migration rate whereas 5.53/10000/day is an out-migration rate for the survey population. Based on average household size (5.1), around 4.1 people join the community every day where as 34.1 people leave the area every day. The age of the population ranges between 2 months to 100 years with half of the population being in the reproductive age group of 18 to 49 years.

Table 8 showing percentages of crude death rate and under5 mortality rate in survey area.

	Total	No. of Deaths	Death rate
Crude mortality rate	2370.5	8	0.34 (0.17-0.66) (95% CI)
Under 5 mortality rate	257	2	0.78 (0.21-2.79) (95% CI)

The crude death rate and U5MR is 0.34 and 0.78 per 10000 per day respectively. This data suggests that 2.1 people may die every day in these three slum pockets whereas one child under 5 could die every two days. However, as per IPC classification cut-offs, these figures are lower than emergency threshold.

3.6 Children Morbidity

Diarrhoea and Malaria

The caretakers were also interviewed for the prevalence of diarrhoea and malaria in the sampled population with a recall period of the last 15 days from the date of interview.

Table 9 Prevalence of diarrhoea and malaria amongst children aged 6-59 months

Diseases	Prevalence	95% Confidence Interval
Diarrhoea	8.5%	2.3 – 12.5
Malaria	0.3%	0.0 – 1.9

The data suggests that 8.5% children from Sathe Nagar, Umerkhadi and Transit camp suffered from Diarrhoea and 0.3 % from Malaria since 15 days prior to interview. It is assumed that the prevalence of both these diseases would be high during monsoon season.

4. DISCUSSION AND CONCLUSION

The SMART survey methodology has one unique feature called 'Plausibility test'. This test is automatically executed by ENA software 2011 (April 15, 2015 version) in the data entry anthropometry tab. This test is conducted to understand quality of data. The plausibility test gives penalty points to the data by categorising them into excellent, good, acceptable and problematic categories. The plausibility test assesses the data based on 10 different indicators. This survey received 4% penalty score which is "Excellent" as per the category. The data received all 4% penalty score for digit preference in height measurement.

The NFHS-3 survey was conducted in 2005-06 and presented key findings on the nutritional status of children, women and men across India including Mumbai. The SMART survey supplements information published in the NFHS-3 national and state reports and provides important information and in-depth analyses on nutrition data of slum pockets of Govandi, Mumbai. The comparative results of SMART survey data shows that, the prevalence of global acute malnutrition is higher in Govandi slum area than the results from NFHS- 3 i.e. 18.8% by SMART and 16.2% by NFHS-3. The prevalence of GAM is therefore considered 'critical' as per the WHO emergency threshold i.e. more than 15%.

The survey also helped to understand the prevalence of chronic malnutrition in Govandi -Mankhurd slum area of Mumbai city. The prevalence of global chronic stunting is 51% in the SMART survey, which is more or less similar to TISS, report (46.4%). The prevalence of acute malnutrition is significantly different among boys and girls (p=0.0169).

The analysis presented that the CMR and U5MR are not alarming as they fall below 1 death/10000/ day and 2/10000/ day respectively as per the CDC standards[19].

There is variation seen in the prevalence of GAM as well as in SAM when it was assessed with the help of WHZ and MUAC which is obvious as these two indicators do not classify same children as malnourished[20]. The results suggests that prevalence becomes 5.7% (3.7 to 8.9 95% CI) for GAM and SAM 0.6% (0.1 to 2.3 95% CI) when both the criteria (WHZ and MUAC) are considered, whereas GAM becomes 22.9% (18.6 to 27.8 95% CI) and SAM 3.4% (2.1 to 6.2 95% CI) when all WHO criteria (WHZ/MUAC and/ or oedema) are considered for classification of acute malnutrition. The ACF technical report and ACF technical report suggests that only 23% of the cases would be classified with both criteria[21]. This seems approximately similar to the result of this survey as 24.6% of the children detected satisfy both criteria.

[19] Checchi& Roberts 2005, Interpreting and using mortality data in humanitarian emergencies: A primer for non- epidemiologists; Humanitarian Practice Networks at ODI. World Health Organization. WHO child growth standards and the identification of severe acute malnutrition in infants and children: A joint statement by the WHO and the United Nations Children's Fund [Accessed 20 January 2012]. http://www.who.int/nutrition/publications/severemalnutrition/9789241598163_eng.pdf

[20] ACF Technical note: The different anthropometry indicators used for the detection of acute malnutrition; 2013.

[21]Ibid 18

5. RECOMMENDATIONS

1. Promote organizations in collaboration with municipality corporation or government to implement a CMAM program in the targeted areas

2. Raising awareness about malnutrition and it`s hazards to mothers and pregnant women of the community.

3. Raise awareness among people from slum area about hand washing and sanitation as diarrhoea rates are higher.

4. Support community based programs to provide information and counselling on optimal and appropriate complementary feeding practices.

5. Promote regular growth monitoring activities and include measurement of height/ length (not just weight) in current nutrition programs.

6. Advocate for opening of more NRCs (Nutrition Rehabilitation Centre) or paediatric facilities for treatment of children with Severe Acute Malnutrition (SAM) along with use of adapted therapeutic products i.e. Medical Nutrition Therapy (MNT) for treatment of non-complicated SAM children within the community.

7. Promote an intervention strategy for children with SAM and children with severe underweight.

8. Sensitize by providing information and communication via campaigns like 'sulabh' programs to curb the open defecation by promoting use of toilets and awareness regarding toilet hygiene at Slum level.

9. Raise awareness on the use of soap for proper hand-washing techniques to prevent water-borne diseases like diarrhoea and malaria within schools and communities residing in slum areas.

10. Undertake new studies to understand causal relationship between acute malnutrition and its causal factors such as morbidity, food diversity, hygiene practices, etc.
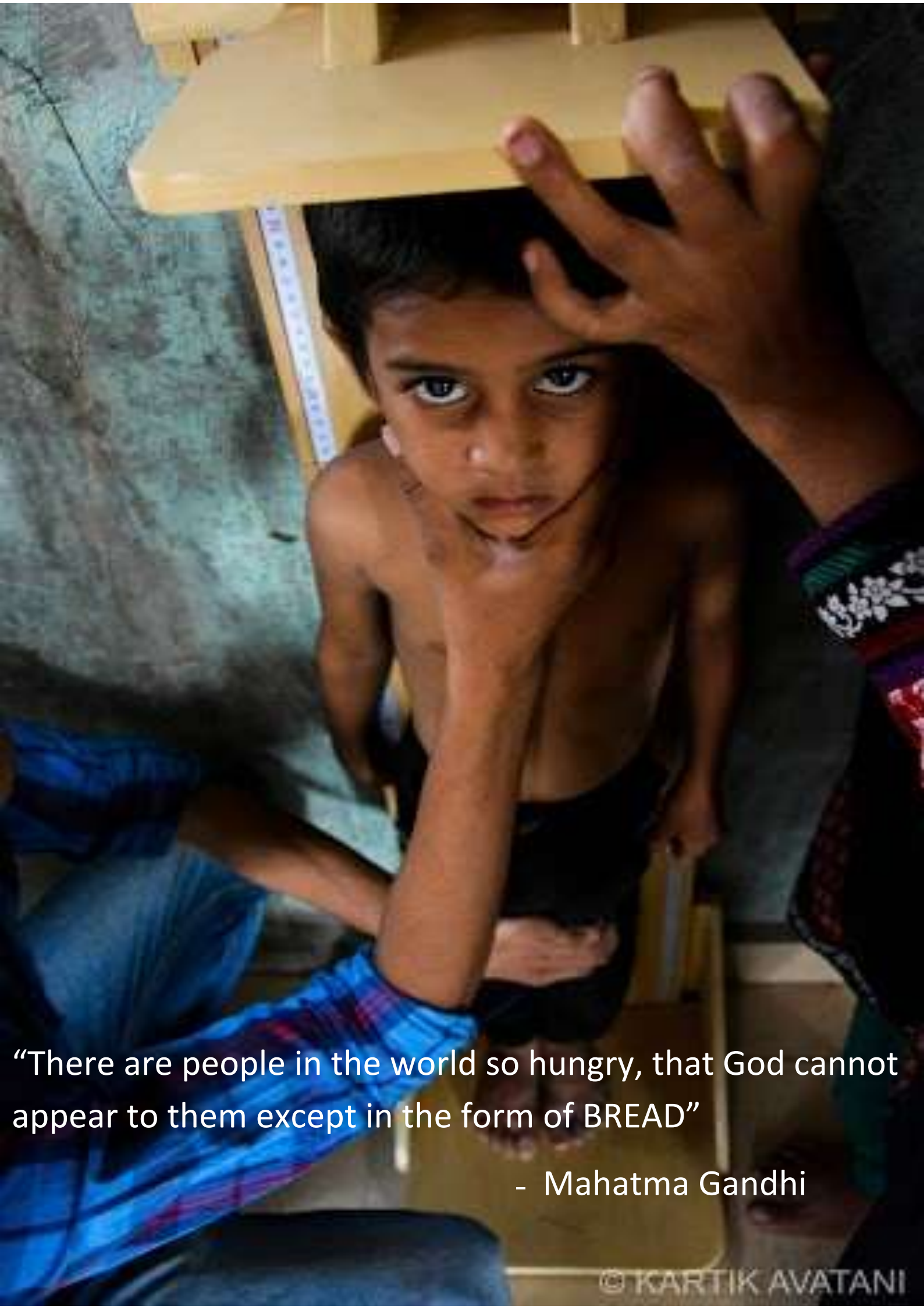
"There are people in the world so hungry, that God cannot appear to them except in the form of BREAD"

- Mahatma Gandhi