

LISHE

TANZANIA FOOD AND NUTRITION JOURNAL

Special Issue

TFNC  20 YEARS

1973 - 1993

LISHE

TANZANIA FOOD AND NUTRITION JOURNAL

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TFNC ANNOUNCES:

- National Exhibition 5-8 December 1993 at the National Museum, Dar es Salaam, Tanzania
- National Conference on Nutrition 6 - 8 December 1993, at the Kilimanjaro Hotel, Dar es Salaam, Tanzania.

**THEME: MEETING THE NUTRITION CHALLENGES
OF THE 1990's**

IN COMMEMORATION OF 20 YEARS OF TFNC

FACTS ABOUT.....

Lishe: Tanzania Food and Nutrition Journal

1. Lishe production had stopped since 1985.
2. The Publication is now revived and will be produced twice every year.
3. The first issue after revival is the December 1993 issue.
4. The journal targets professionals in Nutrition all over the world.
5. Content coverage is wide both in terms of variety and depth. Major issues to be considered include nutrition programme planning and management, research in nutrition, nutrition education approaches, food science and technology and biochemical and chemical laboratory methods in nutrition research and surveillance.
6. The journal welcomes concise reports or original research and reviews relevant to the content coverage, short articles presenting view points on current issues and controversies and letters expressing responsible criticism of or reaction to material published in the journal.
7. Information for contributors is published in the first issue of each volume of the journal.

TANZANIA FOOD AND NUTRITION JOURNAL

Vol. 6 Number 1

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Pauline Kinyaga
Director, Nutrition Education and Training Department

EDITORIAL

The revival of original Lishe Journal as a new scientific journal marks the 20th Anniversary of Tanzania Food and Nutrition Centre. TFNC was created by an Act of Parliament passed on the 21st November 1973 and assented to by Mwalimu Julius Kambarage Nyerere, the then President of United Republic of Tanzania on the 6th December 1973.

TFNC was given the mandate to advise the government and relevant ministries and institutions on matters relating to improvement of the nutritional status of the population, undertake relevant research on the subject of nutrition, assist with food quality issues, ensure control of nutritional deficiencies and coordinate planning and strategy development for nutrition improvement, and undertake formal and public education on nutrition.

Among the activities to fulfil the last mandate, Lishe, the quarterly journal of TFNC was first published in 1975. The journal was intended for extension workers, policy makers and the general public.

Then in 1985, 10 years following its inauguration, the Journal was discontinued owing to financial constraints. Already, 20 issues in 5 volumes were produced on quarterly basis. The journal being bilingual (English and Swahili), was a valuable resource for all those working or interested in food and nutrition activities in Tanzania.

The journal as it comes back 8 years later, has several changes: Firstly, it will address the professional and scientific communities. Secondly, it will be published only in English and thirdly, it will be produced twice a year instead of 4 times.

It will comprise scientific research reports and reviews on topics related to food nutrition and health.

This journal is your journal. The Editorial Board will have the responsibility for maintaining the standard and ensuring adequate flow of suitable articles. It is hoped that this journal will develop as TFNC nutrition journal and will facilitate close links between TFNC and its allies. This will, in no doubt, be only possible with inputs from all the professionals, particularly those interested/ working in nutrition in developing countries.

This first issue of Lishe is dedicated to TFNC's 20th Anniversary.

Pauline Kisanga
Director, Nutrition Education and Training Department

TFNC



YEARS

ANNIVERSARY

6th December 1993

Calendar of Events

Nutrition Night - 27th November 1993

**TFNC 20 years
anniversary exhibition - 5 - 8th December 1993**

**National Conference
on Nutrition - 6 - 8th December 1993**

1973 - 1993

Congratulations to TFNC

on its 20th Anniversary 6 December 1993

"UMATI, The Family Planning Association of Tanzania wishes to congratulate TFNC on its 20th Anniversary. The Association has enjoyed close collaboration with the Institution in various aspects related to Nutrition especially as TFNC is a member of IP National Steering Committee. UMATI appreciates TFNC initiatives especially in promoting the health of mother and children which is also the interest of UMATI".

**UMATI, The Family Planning Association
of Tanzania**

"On the occasion of the 20th Anniversary of TFNC, it is a privilege for PAMM to extend its best wishes to the Centre and, indeed, the entire Tanzanian nation for a very successful future. PAMM is extremely honoured with a continuing, close collaboration with TFNC".

P A M M

"Having had a long and intimate relationship with Tanzania and TFNC, I feel proud to have been associated with TFNC which is now one of Tanzania's treasures. May TFNC continue to flourish and in the next 10 years to reach its goals of virtually eliminating some micronutrient deficiencies and in the next 20 years to largely control other forms of malnutrition."

**Dr. Michael C. Latham
Professor of International Nutrition
Director, Program in International Nutrition
Cornell University.**

TEACHING OF NUTRITION AND DIETETICS, KNOWLEDGE AND ATTITUDES TO NUTRITION AND DIETARY THERAPY OF JUNIOR MEDICAL STAFF AND STUDENTS AT THE FACULTY OF MEDICINE, MUHIMBILI UNIVERSITY COLLEGE OF HEALTH SCIENCES-DAR ES SALAAM.

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***Tanzania Food and Nutrition Centre, Dar es Salaam**

Institute of Public Health, Muhimbili University College of Health Sciences, Dar es Salaam

Summary

Knowledge of nutrition and dietetics and attitudes to nutrition and dietary therapy of a group of clinical medical students and junior hospital doctors were examined by questionnaire. Almost 75% of the respondents felt competent in advising/prescribing nutritional support for protein energy malnutrition. 92% would have liked to learn more about the practical application of nutrition support. Most of them would have preferred the teaching of nutrition to be during their final three years of clinical curriculum. Almost 5% felt that nutrition/dietetics should have been taught by a qualified dietitian/nutritionist.

Introduction

At the country's only medical school - ①Muhimbili University College of Health Sciences (MUCHS), nutrition is taught mainly within the block of community health during the third year by medical nutritionists and public health specialists. A total of 200 hours allocated for both the course work and field work focus mainly on protein energy malnutrition (PEM) in underfives and desirably very public health biased. Some principles of dietary management for PEM and some micro-nutrient deficiencies are taught in the paediatrics block by paediatricians as well. Students are also made aware of some aspects of dietary management of diseases like diabetes mellitus as part of the overall treatment in the block of internal medicine by physicians.

It is not known how adequately these subjects are covered. There is no planned syllabus or programme for teaching dietetics/nutrition particularly for the management and prevention of diet related chronic diseases such as high blood pressure, diabetes mellitus, dental caries, gout and peptic ulcers. Diabetes mellitus and high blood pressure are among the top 10 causes of admission at MUCH and Kilimanjaro Christian Medical Centre (annual reports).

Whether or not, the current dietetics/nutrition education, which the medical students get, prepares them to prescribe/supervise adequately the nutrition support required for these diseases, is not certain. Information or studies pertaining to these issues are lacking. Hence, this study was undertaken to determine the knowledge of nutrition and dietetics and attitudes to nutrition and dietary therapy of a group of clinical students and junior hospital doctors. This information would be used to advocate changes needed to improve dietetics and nutrition teaching for medical students.

Methods

The study was carried out in 2 phases. The first phase involved informal discussions with selected lecturers on dietetics and nutrition they taught to the medical students. One or two lecturers interviewed were from each of the departments of internal medicine, surgery, paediatrics, ② community health, psychiatry and obstetrics/gynaecology. Basically 3 questions were addressed during the discussions and these were: How relevant was the teaching of nutrition and dietetics in relation to the subjects one taught? What aspects was one able to cover and what was the mode of teaching in terms of formal lectures, teaching ward rounds and so on?

The 2nd phase consisted of interviews with all 27 fifth year medical students, eight of 10 post-graduate public health students, and all 14 junior house-officers (interns) using a pre-tested structured questionnaire (appendix). All postgraduate students and junior house officers had graduated at the Faculty of Medicine - MUCH. The structured questionnaire was based on the currently available teaching module and the information obtained through the discussions with the teachers. A few questions were adapted from a study carried out in UK by Brett et al (1986).

① Incorporates Faculties of Medicine, Nursing, Pharmacy and Dentistry and Institutes of Public Health, Primary Health Care, Development Studies, Traditional Medicine and Allied Health Sciences.

② Department of Community Health has been under the Institute of Public Health since August 1991. Other departments are under the Faculty of Medicine.

A total of 49 subjects were interviewed using the structured questionnaire. The response rate for the fifth year medical students and interns was 100% and for the post-graduate students 80%. Thus, the overall response rate was 96%.

Results

All the lecturers except the ones from obstetrics/gynaecology considered the teaching of dietetics and nutrition in the medical school important. However, the department of obstetrics/gynaecology considered whatever nutrition and, dietetics, being taught to students during paediatrics training, as adequate.

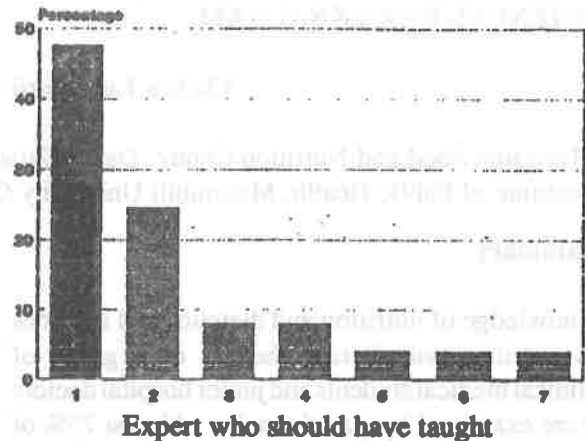
According to the available teaching schedule, the subject should be fully covered during the blocks of paediatrics and community health. But, it seemed that the department of the community health could not always adequately cover all the components of the planned course within the given time owing to the shortage of staff. In paediatrics, only those aspects related mainly to protein energy malnutrition and deficiency of vitamins such as vitamin A and minerals such as iron and iodine were taught.

As for the other departments, the teaching of the subject was fragmented and minimal due to lack of time and/or expertise. Some consultant physicians discussed some aspects of dietary therapy for related diseases during the major ward rounds which the medical students always attended.

Students' attitudes

49% of the subjects interviewed considered that the teaching in nutrition was adequate and 75% felt competent in advising/prescribing any nutrition support for protein energy malnutrition, iodine deficiency disorders, and vitamin A deficiency. However, 92% of the subjects would have favoured instructions in nutrition/dietetics during their final 3 years of clinical curriculum and almost half of them would have liked the involvement of a qualified dietitian/nutritionist (fig 1). While opinions varied, over 30% of the group suggested that instructions in nutrition should have been included with teaching of all major specialities such as diabetes mellitus, malabsorption syndrome, nephrotic syndrome and heart disease among others.

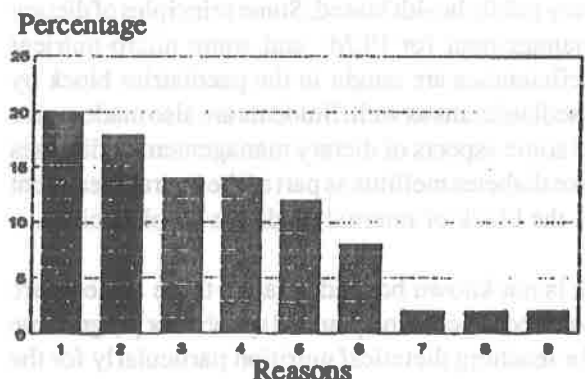
Fig. 1: Who should have taught



1 = Nutritionist/Dietitian; 2 = Paediatrician;
3 = Any Physician; 4 = No Response;
5 = Public Health Physician;
6 = Food Technologist; 7 = Don't Know

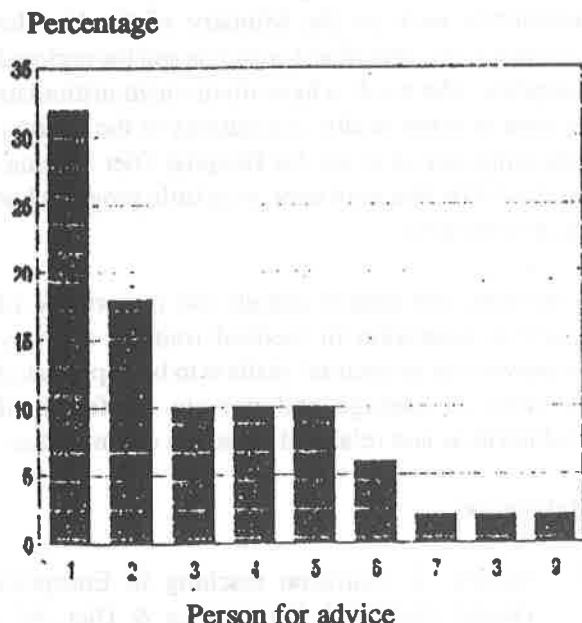
All the subjects indicated that adequate nutrition support of hospitalized patients was necessary and over 90% felt that someone specialized was needed to provide advice on patients needs for various reasons (fig 2). When asked, who they would turn to for dietetics/nutrition advice, again, opinions varied. Over 30% of them mentioned nutritionist/dietitian while 18% and 10% of them would ask a paediatrician and a public health nurse respectively (fig 3).

Fig. 2: Why expert needed
Reasons for having an expert to attend to patients needs



1 = Inadequate attention by doctors; 2 = Students inadequately taught.
3 = Nutn. important treatment; 4 = Malnutrition in inpatients common.
5 = An expert has more knowledge; 6 = Patients needs not met at present.
7 = Increase efficiency for management of malnutrition.
8 = reduce workload of nurses & doctors; 9 = No response.

Fig. 3: Who can advice
Who would you turn to for advice on patients nutrition needs



1 = Nutritionist/Dietitian; 2 = Paediatrician;
3 = Public Health Nurse;
4 = No Expert Available; 5 = No Response;
6 = Senior Colleague;
7 = Text Books; 8 = Patients/Relatives

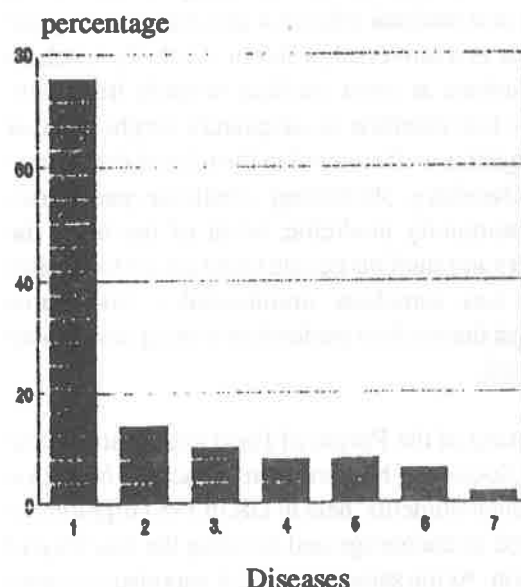
Factual Knowledge

Almost 75% of the subjects interviewed felt that they had adequate knowledge to nutritionally manage the problems of protein energy malnutrition, 14% could treat iodine deficiency disorders and 10% could render nutrition support for childhood diseases such as measles and diarrhoea. A few felt confident to tackle vitamin deficiency disorders, heart diseases, diabetes mellitus and pellagra (fig 4). One (2%) felt confident to tackle almost all the diseases while 3 (6%) could cope with none.

In view of the multiple choice questions to assess knowledge, knowledge was assumed to be adequate if 3 or more options were correctly specified. All the questions asked were based on what was being taught at the time.

Sixty percent were observed to have adequate knowledge regarding the consequences of IDD, 64% pointed out the right options on the causes of corneal ulceration in children with measles and 78% knew why weaning was the critical stage among children in developing countries.

Fig. 4: Diseases confident to tackle



1 = PEM; 2 = Communicable Diseases,
3 = Micronutrients Deficiency;
4 = Heart Diseases;
5 = Diabetes Mellitus; 6 = None; 7 = Almost All

Discussion

The study clearly demonstrates that the nutrition knowledge among most of the medical students and staff interviewed focused in the area of protein energy malnutrition (PEM). Almost 75% of them felt confident to treat patients with PEM, but what aspects this might have implied is not certain as 90% of them wanted to learn more. Most of them would have liked to be taught nutrition during their last three clinical years which would ensure the practical application of nutritional principles to meet patients needs.

They advocated improved teaching covering major diseases and involvement of a qualified dietitian/nutritionist in both teaching and providing advice on patients needs. As indicated by the available teaching schedule, there was no dietetics taught. However, with the increasing problem of chronic diseases in Tanzania, it is important that the students are well oriented with the principles of dietary management for these diseases during their medical training. The fact that nutritional factors are important in the pathogenesis of a variety of medical conditions cannot be disputed. Hence, if nutrition continues to be seen as an unimportant subject or the interest of a particular medical cadre, then there is a danger that there will not be wider recognition

of its importance (Brett et al, 1986). As (Lundman et al, 1991) observed, the teaching of nutrition in dental and medical school is generally inadequate and this is a universal problem. Both the teachers and students at most medical schools frequently believe that nutrition is adequately taught and that the subject is well covered in the related disciplines of biochemistry, physiology, medicine, paediatrics and community medicine. Most of the time, the teachers and students equate nutrition with dietetics which has somehow maintained a low status amongst the medical profession in most developing countries.

A meeting of the Forum of Food and Health of the Royal Society of Medicine on 'Teaching Nutrition to Medical Students' held in UK in 1987 highlighted the need to encourage and develop the teaching of nutrition. At the same meeting, it was also accepted that the subject needs to be given more recognition in medical schools (Beeley, 1991). But, as (Judd, 1988) expressed, some changes could be achieved by enthusiastic individuals in the absence of appropriate guidance from professional bodies such as the General Medical Council - UK. Lack of appropriate nutrition education was also noted in the dental schools in the UK. In recent years, the importance of integrating this discipline into the curricula of medical and dental schools has been recognized, but it still fails to receive the priority it deserves. However, in 1989, both the Committee of Medical Aspects on Food Policy within the Department of Health - UK and the General Dental Council emphasized the inclusion of nutrition among the subjects related to basic medical and dental sciences (General Dental Council, 1990).

Owing to the shortage of dietetic expertise in Tanzania, patients have to rely on doctors and nurses for nutrition/dietary advice. However, as shown by previous studies, there is hardly any provision of appropriate nutrition/dietary management and patient education in any of the health institutions in the country (Lukmanji, 1983). Often, lack of funds is stated as the main reason for such a situation. This might partly be true but it may also be attributed to poor budgeting due to lack of expertise (Lukmanji, 1983). Even if more funds were available for food, things might not be any better without appropriate trained personnel. Catering departments in most hospitals in the country are still manned by untrained personnel (Lukmanji, 1979, 1983). Furthermore, paediatricians, public health specialists and nurses are considered to be experts in the field, (at institutional and

community levels), despite their lack of appropriate skills. Consequently, the need to strengthen the dietetic/nutrition component in teaching curricula and in the management and prevention of diseases has not been given enough attention by the relevant authorities such as the Ministry of Health, the university, the consultant hospitals and the regional hospitals. The need to have dietitians/nutritionists at least in some health institutions in the country was emphasized in the 1st Hospital Diet Seminar held in 1979. But until now, very little progress has been witnessed.

Therefore, one cannot dispute the importance of nutrition education in medical training and any improvement in doctors' skills is to be appreciated in order to manage and prevent all forms of malnutrition and related diseases in communities.

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Appendix: Questionnaire to Medical Students/Doctors

Attitude

1. Did you feel you were adequately taught in nutrition? Yes/ No
2. Do you feel competent in prescribing/advising on nutrition support of nutrition related diseases. Yes / No
3. Would you have liked to be taught more on the practical application of nutrition support? Yes/ No
4. Within the hospital, who would you turn to for advice on patient nutritional requirements?
5. Which year or years of your study do you think nutrition teaching is best included?
6. Among the profession, who do you think should have taught you?
7. During your training, to which subjects did you think nutrition was closely related?
8. Do you feel, there should be someone specialized around to deal with patients nutrition needs? Yes/No. If yes or no, why
9. In hospitals do you think it matters if patients get

(a) adequate nutrition support?

Yes/No

Why

(b) adequate nutrition advice at discharge?

Yes/No

Why

10. Indicate diseases for which you would like to be taught more Nutrition in their prevention/ cure.

Knowledge

1. Indicate diseases you feel confident to tackle nutrition problems.
2. Health and nutrition related consequences of iodine deficiency disorders in human beings include:
 - Abortions (True/False)
 - Still Births (True/False)
 - Neurologic Disorders (True/False)
 - Deaf Mutism (True/False)
 - Goitre (True/False)
3. The reason children with measles develop corneal ulceration are:
 - Vitamin A is not well absorbed (True/False)
 - Vitamin A requirements are increased (True/False).
 - Measles virus antagonizes the action of Vitamin A (True/False)
4. Weaning is a critical stage in a child's life and notably so in developing countries due to:
 1. Child is new to foods other than breast milk (True/False)
 2. Appropriate foods are in short supply (True/False)
 3. Conditions are unhygienic with increased risk of contamination (True/False)
 4. The kids in these societies are uncivilized as compared to their counterparts in developed countries (True/False)

Table 1: Prevalence of EBF by infants age

AGE IN MONTHS	EBF		TOTAL No (%)
	YES No (%)	NO No (%)	
0 - <1	24 (82.8)	5 (17.2)	29 (8.2)
1 - <2	24 (39.3)	37 (60.7)	61 (17.2)
2 - <3	13 (18.8)	56 (81.2)	69 (19.5)
3 - <4	3 (6.8)	41 (93.2)	44 (12.4)
4 - <5	2 (4.2)	46 (95.8)	48 (13.6)
5 - <6	3 (6.0)	47 (94.0)	50 (14.1)
6 - <7	1 (1.9)	52 (98.1)	53 (15.0)
TOTAL	70 (19.8)	284 (80.2)	354 (100.0)

The prevalence of EBF for the study population was 19.8% which was significantly lower than that of mothers who did not practice EBF

$$(X^2 = 116, p = 0.000)$$

Table 2: EBF rates by age groups (cumulative) (n = 70)

Age in Months	No	% total	Cumulative % of Total
0 - <1	24	34.3	34.3
1 - <2	24	34.3	68.6
2 - <3	13	18.6	87.2
3 - <4	3	4.3	91.5
4 - <5	2	2.8	94.3
5 - <6	3	4.3	98.6
6 - <7	1	1.4	100.0

87.2% of children exclusively breast-fed were below 3 months of age, and 12.8% between 3 month and less than 7 months.

Table 3: Exclusive breastfeeding rates by use/disuse of colostrum

Colostrum Given	EBF		TOTAL No (%)
	YES No (%)	NO No (%)	
YES	58 (20.2)	229 (79.8)	287 (81.3)
NO	12 (18.2)	54 (81.8)	66 (18.7)
TOTAL	70 (19.8)	283 (80.2)	353*(100.0)

* One mother died immediately after delivery

81.3% of the study population gave their infants colostrum and 18.7% did not. Twenty percent of the mothers who EBF gave their infants colostrum while 18.2% did not. The difference in rates of EBF between those who were given colostrum and those who were not is not statistically significant.

$$(X^2 = 0.139 \text{ at } p = 0.737)$$

Table 4: EBF by the source of advice concerning breast-feeding.

Advice given by	EBF		TOTAL No (%)
	YES No (%)	NO No (%)	
No advice given	63 (20.8)	240 (79.2)	303 (85.3)
Health personnel	7 (14.3)	42 (85.7)	49 (13.9)
Non-health personnel	-	101 (100.0)	1(0.3)
n	70 (19.8)	283 (80.2)	353 (100.0)

($X^2 = 1.371$ at P.value 0.503) not significant

Those mothers who practiced EBF, 20.8% did not receive any advice, 14.3% got advice from health personnel.

Table 5: Frequency table for the type of advice given to the mothers before delivery (n = 50)

Advice Given	Total No. of Responses	%
Cleanness before BF	19	38
BF for more than 2 years	10	20
Increase frequency of BF	8	16
Don't remember	7	14
EBF for 4 months	3	6
BF when baby crying	3	6
Start BF immediately after delivery	2	4
Give enough milk	2	4
EBF for 2 months	1	2
EBF for 3 months	1	2
Bottle feeding use	1	2
Remove gas after BF	1	2
BF is important	1	2
Preparation for BF before delivery	1	2

Approximately 14.2% of the study population were given advice concerning breast-feeding (table 4) but only 6% of the 14.2% practiced EBF for 4 months.

Table 6: Practice of EBF by problems encountered by mothers during delivery

Got problems	EBF		TOTAL
	YES	NO	
	No (%)	No (%)	No (%)
YES	6 (19.4)	25 (80.6)	31 (8.8)
NO	64 (19.8)	259 (80.2)	323 (91.2)
TOTAL	70 (19.8)	284 (80.2)	354 (100.0)

A little over 8% of the study population had problems during delivery. Of these 19.4% practiced EBF, the remaining population (91.2%) had no problems during delivery of whom 19.8 practiced EBF ($X^2 = 0.376$ at P value 1.000 - not significant).

Table 7: Distribution of mothers problems during/and after delivery: (n = 31).

Problem	No	%
Malpresentation	7	22.6
Twin delivery	4	12.9
Postpartum haemorrhage	4	12.9
Retained placenta	3	9.7
Eclampsia	3	9.7
Severe abdominal pain	2	6.5
Fetal distress	2	6.5
Previous caesarean section	1	3.2
Footling	1	3.2
Mate mal death	1	3.2
Breech delivery	1	3.2
Dreughture delivery	1	3.2
Draining	1	3.2

On reason for supplementing foods other than breast-feeding; many mothers (69.0%) said their infants were crying excessively because of hunger, while other reasons given were no enough breastmilk (3.9%), advised by the clinic because of failure to gain weight (3.9%), breast abscess (1.8%) and some had no reasons to give (14.4%).

Table 8: Rates age of supplementing (n = 284)

Months	No.	% of Total	Cumulative % of Total
0 - <1	78	27.5	27.5
1 - <2	70	24.6	52.1
2 - <3	53	18.7	70.8
3 - <4	54	19.0	89.8
4 - <5	19	6.7	96.5
5 - <6	10	3.5	100.0
6 - <7	-	-	-

Of those who did not practice EBF, 27.5% started supplementing before 1 month of age.

About 71% started supplementing before 3 months of age.

At 6 months no one was practicing EBF.

Discussion:

The results of this study show that there is low EBF, the prevalence being 19.8% for the study population. Thirty four percent of the infants exclusively breast-fed were below 1 month of age and 87.2% were below 3 months. As indicated earlier, the studies done in southern Tanzania showed that about 40% of mothers started supplementing their infants as early as one month of age while studies done in Dar es Salaam in 1980 showed 77-80% of mothers started at three months of age. This shows how difficult it is for the mother to abide to exclusive BF as the baby grows older.

Regarding the practice of withholding colostrum to the newly born infant, it was found that the mothers who had given colostrum to their babies had higher prevalence of EBF practices (20.2%) in comparison to those who did not (18.2%). Colostrum which is the first milk to be produced is secreted from the breast in greater amounts in the first 3 to 5 days and thereafter decreases slowly. Those mothers who did not give colostrum to their babies had to substitute with other supplementary foods for those 2 to 3 days before they started breast feeding.

Concerning advice given on breast-feeding to the mothers before delivery, 14.2% got some advice and 85.8% did not. The practice of EBF was 20.8% among those who did not get any advice and 14.3% among those who had advice on breast-feeding. The low prevalence (although not statistically different to those who had advice) may be obvious as many responses concerning the type of advice given were irrelevant to the practice of EBF (table 5). Only 6.0% responded with EBF for 4 months. Delivery problems experienced by the mothers during and/or after delivery (table 6 and 7) was another factor thought to influence the practice

of EBF where the mother could delay in starting BF and therefore start on other foods. In this study it was observed that only 8.8% of mothers had encountered problems during delivery. The practice of EBF among this group was 19.4% as compared to those who did not have any problem (19.8%).

Mothers who did not practise EBF (80.2%) had various reasons as to why they did not. Majority (69.0%) attributed the problem to excessive crying of the baby due to hunger as a major reason.

Conclusion and recommendations

Exclusive breastfeeding is important especially when considering its benefits. Breast milk is sufficient to provide the infant with all the necessary nutritional requirements for the first 4 to 6 months of life. Early supplementation has many disadvantages: introduction of infections like diarrhoeal diseases and the baby suckles less frequently at the breast thereby reducing milk production. Nutrient supplementation is also likely to be inadequate and hence more predisposition to avitaminosis, mineral deficiencies and other forms of malnutrition.

This study showed that only few mothers practiced EBF (19.8%), and some of the observed factors that showed some differences were not statistically significant. Another study with a bigger sample size need to be done in order to find out what factors do influence the practice of EBF for the first 4 to 6 months.

Given the importance of EBF in the first four months of life of the infant, health worker education should emphasize this so that health personnel can transfer this knowledge to mothers.

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DEVELOPMENT OF SIMPLE SOLAR DRIERS FOR VITAMIN A RICH FOODS

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ABSTRACT

Simple solar driers for drying vitamin A rich foods were constructed with a black lining underneath a transparent cover. The black cover was used to provide a screening effect against ultraviolet rays thereby reducing the undesirable effects of photooxidation and protecting photosensitive pigments of the product which was being dried. The performance indices of these driers were evaluated.

Nine vegetable species were subjected to this simple solar dehydration technology with photoprotection and photo exposed. The beta-carotene and moisture content in the fresh and resulting dried products were analysed by HPLC and oven drying method respectively.

The results available on nine vegetable species indicated that the beta-carotene content in the photoprotected solar dehydration was higher than in the ambient temperature dehydration (photo exposed).

The moisture content attained in the nine products dried using solar driers was appreciably lower than in the products that were subjected to ambient temperature solar dehydration.

INTRODUCTION

Solar drying technology, as a method of food preservation seems to be an adequate method under most conditions in developing economies. The facilities can be locally manufactured and maintained from materials that are locally available and within economic reach of the people (ILO, 1978).

Solar dehydration technology can be employed as one of the measures in alleviating a number of micronutrients deficiency problems, notably vitamin A and C, calcium and iron (Gomez, 1981). In the absence of adequate animal protein intake, vegetables and fruits are the cheapest and most available source of these micronutrients. Green leafy vegetables (GLV) are good sources of beta-carotene, vitamin C, folic acid, riboflavin, calcium,

and iron. Fruits are also a good source of beta-carotene vitamin C and minerals (Ihekoronye & Ngoddy, 1985).

However, the availability of fruits and vegetables is seasonal, and they are particularly scarce during the long periods of drought. The application of simple solar-dehydration technologies at rural level would not only ensure a year-round supply of these foods but would reduce waste of these highly perishable foods during the seasonal overabundance (Gomez, 1981), subsequently curbing seasonal scarcity and their entire disappearance from diet in the dry season. Because fruits and vegetables are a valuable micronutrient resource dehydration technologies should also ensure maximum nutrient retention in the dehydrated products. Although the mineral content of fruits and vegetables is stable to dehydration, vitamins are highly labile and are destroyed through enzymes and oxidative and photodegradative mechanisms (Schultz, 1960).

The potential of solar-dehydration preservation of food in a developing country such as Tanzania is not significantly recognized, but the conservation of nutrient quality is an important consideration in relation to prevalent micronutrient deficiency problems. Therefore, solar dehydration of some green leafy vegetables, fruits and yellow sweet potatoes is studied in relation with beta-carotene and quality changes in dehydration and storage.

Methodology and Materials

A conventional rectangular box-type solar drier was used in dehydration and consisted of a shallow wooden box with a cover and vents at the base and sides. The wooden frame lid was covered with a double layer (double glazed) of heavy gauge clear polyethylene and black polyethylene sheet. The performance indices of this solar drier are presented in appendix 1.

Six species of green leafy vegetables and 3 species of tubers were harvested from garden plots (Ukonga prison - Dar es Salaam) in the same area. Samples were identified at time of collection by the local vernacular/swahili names, common names and scientific names (table 1).

Pre- and post-processed products were submitted to laboratory for beta-carotene and moisture content analysis (tables 2 and 3).

RESULTS AND DISCUSSION

The results of the tests are illustrated in tables 2, 3 and 4. The levels of beta-carotene content indicate that with photo-protected solar drier using black plastic sheet the amount of beta-carotene in the final product was appreciably higher than in conventionally dried and photo-protected solar drier using black cloth. The results are in good agreement with those of (Gomez, 1981) who found out that lightprotected drying resulted in higher carotene retention than light exposed drying.

Data on percent moisture reduction indicate that with solar dehydration technology it is feasible to attain a moisture content of below 10% in most products whereas in conventionally dried products none of the samples attained a moisture content of below 13.6%. Hence conventionally dried products are more susceptible to bio-deterioration due to high moisture content which creates favourable environment for microbial proliferation (Jay, 1986).

The constructed driers proved to be of advantage since the drying process was hastened. The contributing factors could be the concentration of solar heat in the air supplied. i.e. temperature differential of 18°C (between hot air in plenum chamber and ambient air was recorded (appendix I) and partly due to the better air circulation through the products as compared to ambient temperature product which was exposed directly to sun to simulate the conventional method of drying process.

The following are some distinct advantages of solar driers over conventional drying :

- i. The drier is rainproof and can be left in continuous operation without attention and without the necessity for covering up drying material or removing it into shelter during showers.
- ii. The higher temperatures possible with this type of drier greatly speed up the drying process not only giving a much greater output than open method but also eliminating the possibility of mold or microbial spoilage which is common with open drying methods.

- iii. Besides protecting the drying material from rewetting by rain, the covered drier does also give protection from dust and dirt, from attack by birds and rodents, and from insect infestation.

CONCLUSION

Solar driers, therefore, produce a well-dried, clean and pest free product which will be in excellent condition for prolonged storage or for immediate use. In view of that, further field testing of applicability of the solar driers involving the community in question is vital.

Table 1: Some green leafy vegetables (GLV) and tubers assayed for Beta-carotene content

Common Name	Swahili Name	Plant Scientific Name
1. Nightshade	Mnafu	Solanum nigrum
2. Pumpkin leaves	Majani ya maboga	Cucurbita pepo
3. Cowpea leaves	Majani ya kunde	Vigna unguiculata
4. East African Spinach	Mchicha	Amaranthus spinosus
5. Cassava leaves	Kisamvu	Manihot utilisima
6. Sweet potato (leaves)	Matembere	Ipomea batatas
7. Sweet Potato (tubers) (Orange colour)	Viazi vitamu (Rangi machungwa)	Ipomea batatas
8. Carrots (Tuber)	Karoti	Daucus carota
9. Sweet potato (tuber) (Creamy colour)	Viazi vitamu (Rangi maziwa)	Ipomea batatas

Table 2: Beta-carotene (fresh weight) and moisture content of 6 varieties of GLV and 3 varieties of tubers.

Sample	Initial Moisture Content (%) per 10g.	Beta-carotene (ugm/100gm)	RE
1. Solanum nigrum pumpkin	64.3	2387	398
2. Cucurbita pepo cowpea	50.9	2464	411
3. Vigna unguiculata (cowpea)	80.4	2864	478
4. Amaranthus spinosus	86.5	4578	763
5. Manihot utilisima (leaves)	53.9	2670	445
6. Ipomea batatas (leaves)	90.1	2195	366
7. Ipomea batatas (tuber orange colour)	71.3	2649	442
8. Daucus carota	85.9	3860	643
9. Ipomea batatas (tuber creamy colour)	88.4	1263	211

R.E. = Retinol Equivalent.

Table 3: Moisture content of vegetables and tubers after solar dehydration

Sample	Final Moisture Content (%) per 10g.		
	P.E.	PP/PBS	PP/BC
<i>Vigna unguiculata</i>	23.9	8.8	9.1
<i>Amaranthus spinosus</i>	22.1	3.8	7.4
<i>Ipomea batatas</i> (tuber) (Orange colour)	23.5	5.6	5.2
<i>Cucurbita pepo</i>	20.0	7.8	8.1
<i>Manihot utilisima</i>	19.1	3.1	8.8
<i>Ipomea batatas</i> (tuber) (Creamy colour)	17.9	6.3	7.2
<i>Solanum nigrum</i>	19.9	6.0	6.3
<i>Daucus carota</i>	13.7	9.5	9.8
<i>Ipomea batatas</i> (leaves)	18.3	2.0	7.4

Legend

P.E. = Photo exposed (conventional drying)
 PP/BPS = Photo protected using black plastic sheet
 PP/BC = Photo protected using black cloth.

Table 4: Beta carotene content (ug/100g) of vegetables and tubers after solar dehydration

Sample	Beta Carotene	Content (ug/100gm)	
	P/E	PP/PBS	PP/BC
<i>Vigna unguiculata</i>	3870	11262	8644
<i>Amaranthus spinosus</i>	5462	13057	9872
<i>Ipomea batatas</i> (tuber) (Orange colour)	4160	10682	8346
<i>Cucurbita pepo</i>	2418	9632	7562
<i>Manihot utilisima</i>	5934	11977	10608
<i>Ipomea batatas</i> (tuber) (creamy colour)	2160	6495	8150
<i>Solanum nigrum</i>	3540	10820	12018
<i>Daucus carota</i>	6210	10255	7787
<i>Ipomea batatas</i> (leaves)	3147	9036	8645

Legend

P/E = Photo exposed (conventional drying)
 PP/BPS = Photo protected using black plastic sheet
 PP/BC = Photo protected using black cloth.

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Appendix 1: Technical information in solar driers constructed and tested at 7°S, 39°E**1. Design**

- a. Major materials for construction:
 - i. Drying cabinet - soft wood.
 - ii. Sheet for cover - clear heavy gauge plastic sheet.
 - iii. Photo - protector/screening material - black plastic sheet/black cloth.
 - iv. Drying tray/rack - reeds/bamboos splits.
 - v. Paint - the inside was lined with black plastic sheet.
- b. Mode of air heating:
Natural convection mode.
- c. Air flow rate:
Air flow rate is variable due to natural convection mode.
- d. Manner of drying: Batch or continuous?
Batch type - no heat storage.
- e. (i) Dimension - 1.2m x 0.4m x 0.23m
(1 x w x h) - (Back)
1.2 x 0.4 x 0.35m (1xwxh) - (Front)
(ii) Angle of inclination, $x = 6^\circ$
- f. Capacity - 3kg.
- g. Commodity to be dried: Fruits and Vegetables.

2. Performance**a. Temperature**

- i. Ambient air temperature:
 $28^\circ - 30^\circ\text{C}$, $x = 29^\circ\text{C}$
- ii. Plenum/drying chamber temperature:
 $44^\circ - 50^\circ\text{C}$, $x = 47^\circ\text{C}$

iii. Temperature differential:

$$47^\circ - 29^\circ\text{C} = 18^\circ\text{C}$$

b. Rate of Moisture Removal

- i. Drying time: 1 day - for vegetable (GLV)
2 days @ 7 hours for tubers assuming no overcast/cloudyness condition
- ii. Moisture reduction: <10%

iii. Energy used: Only solar energy

$$\text{c. Relative efficiency} = \frac{\text{increase in air temperature}}{\text{amount of solar radiation}} \times 100$$

This parameter was not established.

- d. Quality of dried product: Good (no mold growth and infestation)

3. Field experience:

- i. Actual field experience - Limited
- ii. Social acceptance - highly accepted in areas where introduced.

4. Limitation of the system: Tearing of polyethylene if carelessly handled.

AN OVERVIEW OF FOOD SECURITY IN COMMUNITY NUTRITION

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INTRODUCTION

Interest in "food security" as an issue was particularly stimulated by the world food crisis in 1972-4 and the African famines of 1984-5 (1). Food security, although initially analyzed in national and international contexts, has also been examined at the level of the household and the individual.

DEFINITION OF FOOD SECURITY

For the purposes of this paper we will accept the World Bank definition of food security which is as follows:

"Access by all people at all times to enough food for an active healthy life. Its essential elements are the availability of food and the ability to acquire it. Food insecurity, in turn, is the lack of access to enough food. There are two kinds of food insecurity: chronic and transitory. Chronic food insecurity is a continuously inadequate diet caused by the inability to acquire food... Transitory food insecurity is a temporary decline in a household's access to enough food." (2:1).

There are other definitions being used by other agencies and individuals. They all have a number of features in common:

1. There is emphasis on access to food rather than just food production or food supply.
2. Maintenance of food security at all times is another common theme. This draws attention to the variability of access to food with season or with natural or man-made disasters.
3. Definitions are very broad and lead to different emphases including production, distribution and consumption as well as nutritional status.

However, there are also issues about which there is less consensus.

1. There are differences over the unit of analysis. Some definitions refer to the national or regional level. Others refer to the household regarding that as the primary unit of concern, and sometimes to the "poor and vulnerable" in particular. Finally, other definitions refer to the

individual and then to the location of that individual within households.

2. There are also differences between the reports on the issue of time dimensions. The distinction between chronic and transitory food insecurity is related to this issue.
3. Others make a distinction between mild and severe food insecurity. The severity of the food insecurity will depend on the "vulnerability or the resilience of the household to factors affecting access to, and availability to food (3).

CONCEPTUAL FRAMEWORK

The issue of food security belongs within the overall context of food and nutrition systems (FNS). This is a theme which has been used within the Masters in Community Nutrition (MCN) for several years now and has proved useful. Thus, we intend to look at food security using the food and nutrition systems approach (see attached figure).

In the FNS approach there is a distinction between food and nutrition systems which are primarily subsistence, those which are primarily reliant on the market and those which are a mixture of the two. Each of these will be considered briefly below.

1. In a subsistence system almost all food consumed is produced by the household. There is little participation in the market economy and very little food is derived from that source.

Thus, the primary determinants of food available for consumption are those which affect production. Consumption failure can occur as a result of failed production. The factors which might cause this to occur include drought, flood and diseases of plants and animals, decreased land productivity, decreased access to land, deforestation, decreased labour for food production (as in war) or inappropriate government policies (as in encouragement of cash cropping without maintaining food production). In the subsistence system there is a very tight connection between production and consumption.

2. If food supply is almost totally dependent on

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markets, the situation is quite different. There will usually be a variety of different sources of food in the market which include surplus production from the "subsistence producers", as well as commercial production of animals and crops, and food imports. These foods are all available through the market and the means of access is regulated by market mechanisms (and access to income or means of exchange) Thus, if the exchange or market mechanism fails (i.e. people are short of sufficient income to meet commodity prices) people will be short of food even though there may be adequate amounts of food available in the market.

3. The mixed system is one in which both subsistence production and the market are significant sources of the food available to the household.

Food acquisition, exchange and assets

Systems which are dependent in whole or in part on the market have a complex marketing and distribution subsystem. This subsystem must facilitate the exchange of food produced and harvested by farmers, and possibly preserved, stored and even prepared or processed before transport to markets and/or acquisition by households. A failure of the marketing and distribution mechanism will jeopardize the food security and nutritional status of the population involved.

In the household food and nutrition system, food is acquired through subsistence or via a market structure for use within a household. Household members may have different responsibilities in the acquisition of food. In some cases men may be responsible for ensuring sufficient supplies of farm food, while women may be involved in small business and the use of cash for food purchases. In other cases, the roles may be reversed. Within the household the food is then stored (if necessary), prepared, cooked and distributed to individual members of the household. Intra-household allocation and consumption by individual household members is then one of the factors of interest as a proximal determinant of nutritional status (4), and as one of the means of assessing household food security.

Within a system which is dependent in whole or in part on the market, the ability and desire of a

household to acquire food will determine food security. The ability to acquire food is determined by access to an exchange which, in most economies, depends to some extent, on money. Other social exchange linkages, for example societal obligations to members of extended family, may also act as a "safety net" for exchange of food. Failure in the exchange mechanism is an important cause of food insecurity. Sources of exchange are wage labour and the sale of plant and animal commodities in the market. If the amount of exchange obtained through wage labour or the sale of commodities falls, households may become food insecure because they cannot afford to buy or exchange food.

In summary, the ways in which households can become vulnerable to food insecurity are through failure of exchange mechanisms which include: failures of labour markets or markets or agricultural commodities; failures of marketing and distribution systems; and the weakening of social exchange linkages.

In addition to the means for exchange, households also obtain and hold assets which include three different types of items.

1. Production assets include investments which range from assets such as land, trees, equipment and animals, owned by individuals to those which are held in common such as irrigation systems and other general community owned resources. Assets also include those which are invested in people themselves, such as education and health facilities.
2. Capital assets are those which represent stores. Examples include stores of food, stores of real value such as jewellery and gold and money held in bank accounts.
3. Debt or obligation assets are available to households as claims which might be made on other households within the community for food or other resources. Claims which might be made on other communities or on patrons and chiefs, claims on government, and claims on the international community are all included here.

Assets are created when production leads to a surplus beyond the immediate consumption needs. The surplus is then invested in one way or another

and leads to creation of an asset. Households can build up their assets when people are food secure.

Some of the assets can be used under various circumstances for the production purposes. For example, grain held in the foodstore could be used as planting material for the next season. Some of these assets could also be used to assist with improving the amount of exchange available. Jewellery could be sold, stored planting material could be consumed and so on.

Thus, there is a close connection between assets and exchange on the one hand and production and consumption on the other. However, other factors which may not be related directly to food security can cause malnutrition - such as burden of disease, inadequate water supplies, education, sanitation, education and so on. Clearly, a range of decisions have to be made on a continuing basis to determine the mix of assets, exchange and production which will be used to fund the purchase of food, and, therefore, consumption at any point in time. This means that the unit of society in which these decisions are made becomes very important. For many societies it is at the household level where these various resources are integrated and the decisions concerning their ultimate use are made.

It is also clear that at times of transitory food insecurity households may need to, or may be forced to, liquidate their assets in order to maintain production and consumption, either directly or indirectly, by exchange. Following a particular crisis and the liquidation of assets, households may not be able to regain equivalent assets and thus become totally dependent on exchange for their consumption needs. Under these circumstances their flexibility in any given situation is clearly much less because assets are an insurance against food insecurity. A transitory food security crisis which results in liquidation of assets reduces the flexibility to respond to subsequent crises. Thus, a series of transitory food security crises may result eventually in chronic food insecurity and a situation in which no assets remain.

ASSESSMENT OF FOOD SECURITY

From the discussion so far, we have seen that food insecurity arises out of failure of access to, and availability of, food. Consequently, assessment of food security has taken several different approaches.

1. Assessment of the level of intervening or predictor variables will give some estimate of the risk of food insecurity for a household. This risk of food insecurity is determined by the availability of food produced and of the exchanges and the assets of the household. Assessment of the levels of food produced, of assets and of the availability of exchange, either from wage labour or sale of commodities will give an estimate of the vulnerability of the household. The particular variables which are the best indicators of risk depend on the situation. Thus, in each situation it is important to understand what are the main sources of exchange, in what ways the most important assets of individual and households are held, and how much food is produced for household consumption.
2. A second approach is to determine the food intake for individuals and assess whether this is at a level sufficient to ensure that deficiencies for individuals do not occur.
3. Within the overall notion of the food and nutrition system, the outcome of food insecurity is malnutrition. Thus, assessment of food security in one sense may involve measurement of nutritional status.

Overall, to assess food security at the household level, it is the first approach which has the greatest validity.

ISSUES

Households

It is important that greater attention is given to the way households interact both internally, and also informally with other households in the community, as we attempt to understand food security. This means that more attention must be paid to the production, consumption, reproduction, socialization, decision making and transmission of assets and resources which occurs within and between households. A most important activity is decision making. This is affected by the economic relationships within the household and family.

Decision Making

While the household is the place in which many of the decisions about integration of assets, exchange, labour and land are made, these decisions are not always made on a joint basis. While many

household members may have shared interests this does not mean that they make joint decisions. Young members of the household may not participate directly in production decisions. Often consumption decisions are made for them by their parents. For many decisions males may have greater bargaining power than females. In some areas males may have little interest and all the decisions are left to the females. Income control, from whatever source, is one of the most important aspects of decision making. The pattern of decision making, and of resultant resource allocation, are important in determining the level of food security, the responses to episodes of food insecurity and the types of interventions which are most likely to be successful.

The role of women

Whilst households are an important unit in society through which integration of resources and decisions about their allocation occurs, one of the main players in these households is usually a woman. The roles of women are various and include the following. First, women are almost always involved in the production, preparation and allocation of consumption of food. Their efforts run right through the food chain and it is usually a very significant part of their total workload. Women are also very important providers of health care and usually have the central role in training and socializing young children. The central nature of these roles that women play in the food and nutrition system mean that they also have a very important role with respect to household food security.

It is likely that in many food systems, especially rural, there will be distinct seasonal patterns in the risk of food insecurity. In some systems this may vary from times of clear food surplus through to times when there is a clearly inadequate food supply and for that reason restricted availability. In other systems there may be a generally mild level of food insecurity all the time on which there is, at various seasons, superimposed acute phases of food insecurity. Seasonability may be found in changes in food production, changes in the labour market and wages, changes in prices of commodities and food, and even changes in household size. These different situations need to be conceptualized clearly as there may be very different implications for government programs.

Sustainability

Sustainability refers to proper management of all

resources and assets - including those of the environment. To be successful, food and nutrition systems must be sustained over decades and even centuries. However, in many cases today degradation of the environment, for example, is leading to deterioration of food systems and their inability to produce adequate supplies of food over the long term. In some cases, the interventions which result from episodes of food insecurity may be more oriented towards relieving the acute situation than to finding longer term solutions which are more sustainable. Thus, the time horizons of governments and funding agencies become important in determining the effectiveness of interventions in promoting sustainability of the food and nutrition system.

Government Policies

As indicated above, one of the assets that individuals, households and communities have is their claim on the government for assistance at various times. In some situations where the population is "asset poor" their only recourse at times of food insecurity may be to make claims on the government. They no longer have assets which can be converted to exchange to promote consumption. Once exchange is limited they are then totally dependent upon government for both national and international assistance. The time horizons of these government policies will not only determine the adequacies of their response but also their ability to sustain any improvement which occurs.

Urban versus Rural

Most of the analysis of food security/insecurity to date has been oriented toward rural populations. However, the rapid increase in urban populations in many countries means that these must now become a higher priority than in the past. Many people living in urban situations have liquidated their assets (e.g. sold their land) in rural areas and moved to the city. Whilst these assets may be sufficient for a short period of time, once they are exhausted the household becomes totally dependent upon exchange to allow them to meet their consumption needs as the means of production have been sold. Thus, the problems of the urban poor with respect to food security are often related to wage rates, the availability of work and their ability to obtain income by other means such as participation in the private sector, production of crafts and so on. There may be a dichotomy with the issues of food security at urban household level being completely different from those of food security at the national level.

CONCLUSION

This paper is not, and cannot be, definitive. Its aim is to raise some of the important issues related to food security. In approaching this question, it is essential to clarify the definitions, conceptual framework, means of assessment and which issues are of most importance to each individual situation.

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The role of women

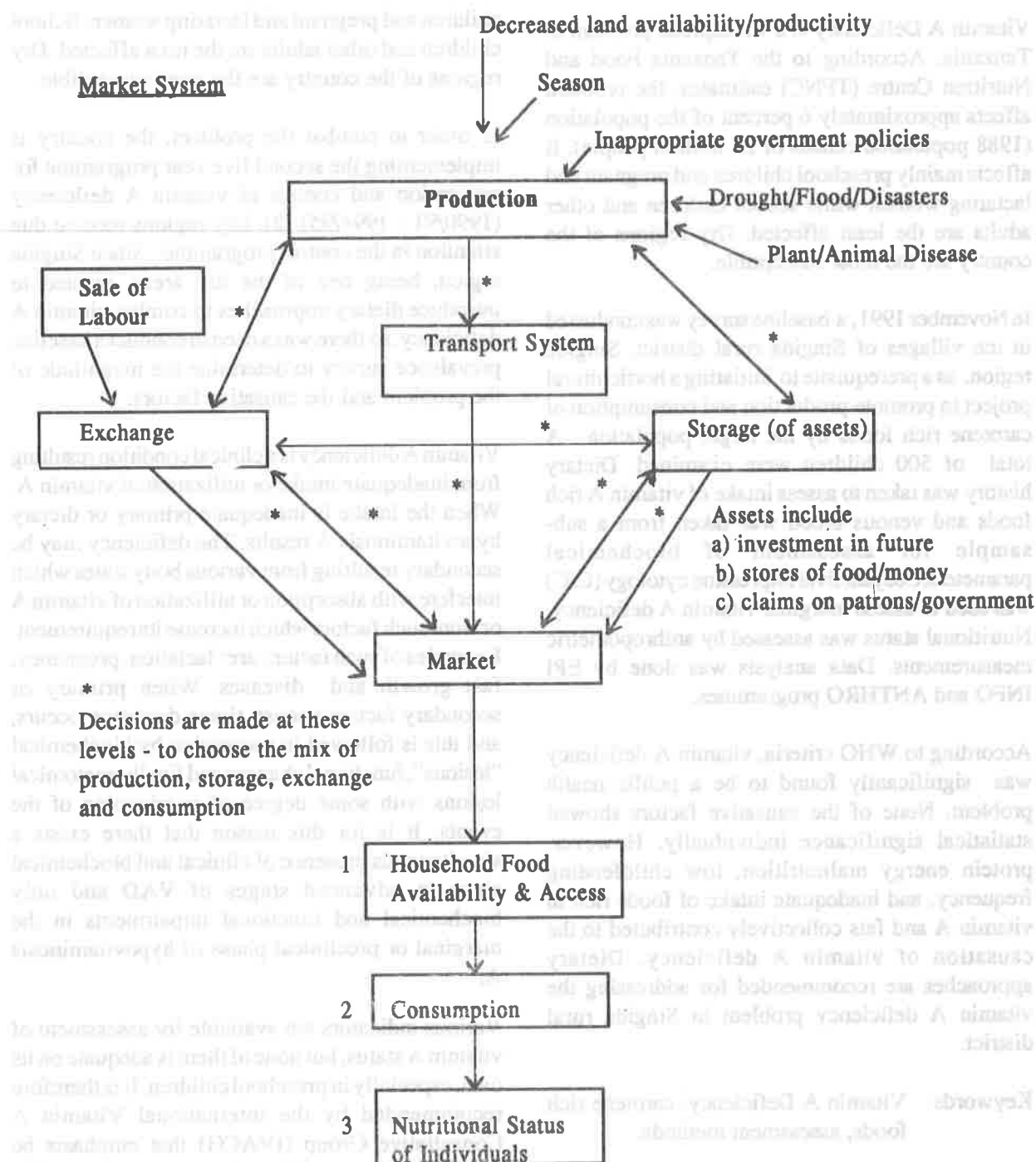
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Appendix 1: Household Food Security in the Food and Nutrition System



VITAMIN A DEFICIENCY IN SINGIDA RURAL DISTRICT, TANZANIA PREVALENCE AND CAUSATIVE FACTORS

L. Mselle and C. R. Temalilwa

Vitamin A Deficiency is a widespread problem in Tanzania. According to the Tanzania Food and Nutrition Centre (TFNC) estimates, the problem affects approximately 6 percent of the population (1988 population census of 25 million people). It affects mainly preschool children and pregnant and lactating women while school children and other adults are the least affected. Dry regions of the country are the most susceptible.

In November 1991, a baseline survey was conducted in ten villages of Singida rural district, Singida region, as a prerequisite to initiating a horticultural project to promote production and consumption of carotene rich foods by the target population. A total of 500 children were examined. Dietary history was taken to assess intake of vitamin A rich foods and venous blood was taken from a sub-sample for assessment of biochemical parameters. Conjunctival impression cytology (CIC) was used to assess marginal vitamin A deficiency. Nutritional status was assessed by anthropometric measurements. Data analysis was done by EPI INFO and ANTHRO programmes.

According to WHO criteria, vitamin A deficiency was significantly found to be a public health problem. None of the causative factors showed statistical significance individually. However, protein energy malnutrition, low childfeeding frequency, and inadequate intake of foods rich in vitamin A and fats collectively contributed to the causation of vitamin A deficiency. Dietary approaches are recommended for addressing the vitamin A deficiency problem in Singida rural district.

Keywords: Vitamin A Deficiency, carotene rich foods, assessment methods.

INTRODUCTION

Vitamin A deficiency (VAD) is a widespread problem in Tanzania. According to the Tanzania Food and Nutrition Centre (TFNC) estimates, the problem affects approximately six percent of the population according to the 1988 population census of 25 million people (1). It affects mainly preschool

children and pregnant and lactating women. School children and other adults are the least affected. Dry regions of the country are the most susceptible.

In order to combat the problem, the country is implementing the second five year programme for prevention and control of vitamin A deficiency (1990/91 - 1994/95) (2). Dry regions receive due attention in the control programme. Since Singida region, being one of the dry areas, wanted to introduce dietary approaches to combat vitamin A deficiency, so there was a need to conduct a baseline prevalence survey to determine the magnitude of the problem and the causative factors.

Vitamin A deficiency is a clinical condition resulting from inadequate intake or utilization of vitamin A. When the intake is inadequate primary or dietary hypovitaminosis A results. The deficiency may be secondary resulting from various body states which interfere with absorption or utilization of vitamin A or from such factors which increase its requirement. Examples of such factors are: lactation, pregnancy, fast growth and diseases. When primary or secondary factors persist, tissue depletion occurs, and this is followed in succession by biochemical "lesions", functional changes and finally anatomical lesions with some degree of overlapping of the events. It is for this reason that there exists a simultaneous presence of clinical and biochemical signs in advanced stages of VAD and only biochemical and functional impairments in the marginal or preclinical phase of hypovitaminosis A.

Various indicators are available for assessment of vitamin A status, but none of them is adequate on its own, especially in preschool children. It is therefore recommended by the International Vitamin A Consultative Group (IVACG) that emphasis be placed on the use of multiple indicators including dietary, biochemical (liver and plasma levels) and clinical signs to assess vitamin A status of a given population group (3). Emphasis should be given to the assessment of overall nutritional status and other public health information to provide supportive evidence for accurate diagnosis of VAD in a given community.

For this particular study, only 500 children were

For this particular study, only 500 children were examined and clinical investigation could not be used because of a small sample size. Hence CIC for marginal vitamin A deficiency and serum retinol were selected as suitable indicators, and they were complemented by dietary information and anthropometric measurements.

The objectives of this study were to assess the prevalence of vitamin A deficiency in Singida rural district as a basis for initiating a horticultural project there to determine factors contributing to the causation of vitamin A deficiency in this area and to recommend appropriate interventions to alleviate the problem.

SUBJECTS AND METHODS

Selection of Subjects

In Tanzania, administratively, regions are divided into districts and districts are subdivided into divisions. Divisions are further divided into wards which are made up of villages. In a village every ten households form a cell under one leader.

Stratified sampling was used to get two divisions representing two major ecological zones in Singida rural district characterized by red fertile dry land, (Ilongero) and less fertile and less dry land (Ihanja). The ecological zones are such that while Ihanja is better in terms of water sources for gardening, Ilongero is more productive due to the soil fertility factor. Rainfall is basically the same (750mm per annum).

Ten villages were selected randomly in every ward. The ten villages had a population of 4,741 children of whom 4,011 were brought to the interviewing stations, making the response to be about 80 percent.

The ten cell leaders distributed cards randomly to children aged 6 - 7 months in their cell. Fifty of these cards for every village had a special mark known to the researchers only. The bearer of such a card was taken as the sampled child, making the composite sample of 500 children for the ten villages.

Methods

A precoded questionnaire was administered to 500 mothers or guardians of sampled children. Mothers/guardians went through four substations for interview and for assessment of nutritional status

and other related factors (vitamin A status, food intake, anthropometry and diseases) of their children.

i. Assessment of vitamin A status

Two methods were used for assessing prevalence of vitamin A deficiency. These were serum retinol levels and conjunctival impression cytology.

Serum Retinol

Serum retinol determination was done by taking 3 - 5 ml of venous blood from children. A trained technician performed this using 5 ml sterile syringes. The blood was left to clot and then centrifuged to obtain serum.

The sera were collected in vials and stored in cool boxes in the field. Back to the field survey station the sera were stored in a deep freezer at -20C.

After the survey was completed, the sera were freighted to the TFNC laboratory in Dar es Salaam for determination of retinol. Analysis commenced a week after the survey.

A fast and sensitive high performance liquid chromatographic method for the determination of serum retinol (all trans retinol) was employed (4). After dilution of the serum with 95 ml saline the solution was deproteinized with ethanol and extracted with n-hexane. The retinol in the n-hexane layer was separated on silica column eluted with a mixture of n-hexane, methylene chloride and n-propanol (90:10:1) and detected fluorometrically (333 - 470nm). A single analysis was completed in 12 minutes.

Conjunctival Impression Cytology (CIC)

A cellulose acetate filter paper impression of the bulbar surface of the eye was taken. This was done for a subsample of the children obtained by selecting every fifth child in line from the big sample. The impressions were later examined by a light microscope to observe a number of goblet cells and enlarged epithelial cells as recommended by ICEPO (5).

ii. Food intake

Information on diet was collected using 24 hour recall method, whereby mothers were asked to recall food given to the index child during the past twenty four hours. This information was supplemented by responses to a food consumption frequency check list on feeding practices during the dry and wet seasons. Consumption information was sought on selected vitamin A rich foods.

iii. Anthropometry

Anthropometric measurements were taken using standard equipment and technique. Children under five years of age were weighed using a salter scale. Weight was recorded to the nearest 0.1 kg. A bathroom scale was used for children above five years of age. A length board was used for measuring height and this was recorded to the nearest 0.1 cm. Age was recorded in completed months. The National Centre for Health Statistics, U.S.A reference values and Waterlow classification were used for assessment of wasting and stunting. Harvard reference values (Welcome classification) were used for weight for age.

Data Analysis

Data was analysed by a computer using EPI INFO & ANTHRO programmes.

RESULTS AND DISCUSSION

Prevalence of vitamin A deficiency

Vitamin A deficiency is a problem of public health significance if more than 5% of children have retinol levels less than 10 ug/dl or 15 of the children have less than 20 ug/dl (6).

Results showed that vitamin A deficiency was a public health problem in Singida rural district according to WHO criteria. Table 1 shows percentages of children by village for the WHO cutoff points for assessment of vitamin A deficiency.

Table 1: Percentage of children by village for the WHO cut-off points for assessment of severity of vitamin A deficiency

Division	Village	Number Screened	<10ug/dl (Deficiency)	<20ug/dl (low)	>20ug/dl (normal)
ILONGERO	Mdilu	14	14.3	64.3	35.7
	Ghata	32	12.5	50.0	25.0
	Mvae	19	6.5	63.2	36.8
	Mwakiti	18	22.2	66.6	33.3
	Ntonge	14	7.1	64.2	35.7
	Total	97	12.4	59.8	31.9
IHANJA	Mnyange	21	42.9	47.6	9.5
	Msambu	23	21.7	60.9	17.4
	Chungu	33	9.1	39.4	51.5
	Puma	41	7.3	39.0	53.6
	Minyuge	11	9.1	36.4	54.5
	Total	129	16.3	60.5	39.5
Gr. Total		226	14.6	60.2	36.3
WHO CRITERIA		-	5	15	-

Conjunctival impression cytology, a technique used to detect marginal vitamin A status before clinical eye signs are manifested, indicated that 52.2 per cent of the children had abnormal imprints, indicating that the children were vitamin A deficient (Table 2).

The two divisions studied were equally affected, although Ihanja which is less productive was slightly more affected. Of all the villages, Mwakiti village in Ilongero was the most affected with 22.2 per cent children with less than 10ug/dl and 66.6 per cent children with less than 20ug/dl retinol levels.

Based on serum retinol levels of 226 children, vitamin A deficiency was found to be a problem. The problem is twice the WHO cut off point of 5% for severe as 14.6% were severely affected. This is supported by CIC results which show that 52.2 per cent of the children had abnormal imprints indicating marginal vitamin A deficiency.

A similar survey conducted in 1988 in Shinyanga, a neighbouring region with similar climate showed similar results (7).

Table 2: Conjunctival impression cytology (CIC) results

Division	Village	Sample Size	Number Abnormal	%
ILONGERO	Mdilu	9	4	44.4
	Ghata	11	8	54.5
	Mvae	9	2	22.2
	Mwakiti	9	5	55.5
	Ntonge	8	8	75.0
	Total	46	23	50.0
IHANJA	Mnyange	7	5	71.3
	Msambu	9	6	66.6
	Chungu	8	3	37.5
	Puma	9	6	66.6
	Minyuge	9	3	33.3
	Total			
	Grand Total	88	46	52.2

Anthropometric data indicated that Protein Energy Malnutrition (PEM) was common, but its contribution to vitamin A deficiency was not statistically significant.

Table 3: Prevalence of Malnutrition by village using weight for age

SAMPLE SIZE		60-80% MODERATE NUMBER	%	<60% SEVERE NUMBER	%
LONGERO					
Mdilu	53	17	32.1	4	7.6
Ghata	61	19	31.1	4	6.6
Mvae	44	16	36.4	3	6.8
Mwakiti	50	15	30.0	2	4.0
Ntonge	44	17	38.6	2	4.5
Total	252	84	33.3	15	5.9
IHANJA					
Mnyange	45	10	22.2	2	4.4
Msambu	56	19	33.9	4	7.1
Chungu	47	19	40.4	2	4.2
Puma	53	19	35.8	0	0.0
Minyuge	47	14	29.7	2	4.2
Total	248	81	32.7	10	4.0
Grand total	500	165	33.0	25	5.0

Causative factors

The results suggest that vitamin A deficiency in Singida rural district is a function of many factors. However the dietary factor, specifically low meal frequency and inadequate intake of vitamin A rich foods per meal had a leading influence ($p = 0.053$ and $p = 0.052$ respectively). On the average children are given 3 meals per day instead of recommended 5 - 6

per day. The majority of small children (72.4 per cent) were fed less than 4 times a day and the most common weaning food was thin porridge made of sorghum or millet. This resulted into protein energy malnutrition which in turn precipitates vitamin A deficiency. For instance, among 169 malnourished children, 113 (66.8 percent) were also deficient in vitamin A as shown in Table 4.

Table 4: Malnourished children with serum retinol level less than 20 ug/dl.

Age (Months)	Malnourished Children	
	Number	Percentage
6 - 11	36	21.3
12 - 23	32	18.9
24 - 35	22	13.0
36 - 47	15	8.8
48 - 59	6	3.5
60 - 71	2	1.1
Total	113	66.8

Robert and Mark, found similar results when doing detailed household study in the same area (8). They attributed vitamin A deficiency to small serving sizes per meal and low meal frequency.

Other factors which contributed to vitamin A deficiency include poor weaning foods, low fat intake and Protein Energy Malnutrition. The amount of fat eaten with vitamin A containing food of plant origin is important for efficient absorption of vitamin A (9). The low fat intake which was reported to be less than 5g per day will markedly limit carotenoid absorption. The recommended intake is 15g per day. Twenty six children (19.3 per cent of the sample) were reported not to have eaten any fat on the day before the interview and 44 (35.6 per cent) had breast milk as sole source of fat. The major source of vitamin A in this area is the traditional (wild) vegetable, mlenda (*Corchorus* spp), which is normally not cooked with oil/fat (Table 5). This suggests that the observed poor child feeding practices were caused by both unavailability of adequate nutritious foods and inadequate nutrition knowledge. For instance production of betacarotene rich fruits and vegetables was very low.

About 48 per cent of the mothers interviewed had no fruit trees in their gardens, majority of them (45 per cent) mentioned water unavailability, and 15 per cent mentioned unavailability of seedlings as a major constraint.

Table 5: Vitamin A rich food production and consumption in Singida Rural District

Fruit/vegetable	Proportion of household cultivating (%)	Proportion of household consuming at least thrice a week (%)
Sweet potato leaves (<i>Ipomea batatas</i>)	28.8	60.0
Pumpkins leaves (<i>Curcubita</i> spp)	18.2	6.4
Mchicha (<i>Amaranthus</i> spp)	16.0	26.5
Mlanda (<i>Corchorus</i> spp)	collected from fallow land	85.0
Pawpaw (<i>Carica papaya</i>)	38.8	15.0
Guava (<i>Psidium guajava</i>)	28.7	15.1

Vegetable production is a seasonal operation and it is quite inadequate during dry season. Traditionally, some of the vegetables produced during the wet season are sundried for use during the dry season. Preserved vegetable is not only inadequate but also of poor quality resulting from the direct sundrying.

Breast feeding was not a problem. Majority of mothers (74.4 percent) breastfed their children for more than 18 months as shown in table 6.

Table 6: Duration of breastfeeding

Time at Which Breast-feeding was stopped (Months)	Mothers		Percent Breastfeeding *
	Stopping breastfeeding No.	%	
2	0.6	(0.6)	99.4
3	0.2	(0.8)	99.2
4	0.6	(1.4)	98.6
9	1.6	(3.0)	97.0
12	7.3	(10.3)	89.7
18	15.5	(25.8)	74.2
24	39.6	(65.4)	34.6
36	34.6	(100.0)	0.0
N = 389			

* Cumulative percentage

Assessment of disease incidence and prevalence was done. The diseases included measles, fever, cough and diarrhoea. Results showed that disease factors were not as serious as dietary factors. Information on immunization coverage showed that about 70 percent of the children

examined were already vaccinated against measles, a disease closely associated with vitamin A deficiency. The good immunization coverage has succeeded in lowering the incidence and prevalence of measles (0.2 percent and 11 percent respectively). Table 7 shows incidence and prevalence of common diseases.

Table 7: Morbidity (diseases incidence on the day of the study and prevalence in the previous two weeks)

SYMPTOMS	INCIDENCE	PREVALENCE IN THE PREVIOUS TWO WEEKS %
Fever	17.1	30.1
Cough	12.9	15.4
Diarrhoea	14.7	19.0
Measles	0.2	1.1

Table 7 shows common diseases prevalence and incidence. It suggests that disease factors were not as serious as dietary factors.

CONCLUSION

Vitamin A deficiency is a public health problem in Singida rural district and hence call for immediate intervention. Dietary factors including inadequate intake of carotene rich foods had a great influence on the observed deficiency. Severe protein Energy Undernutrition caused largely by low meal frequency and small serving size per meal had some influence in precipitating vitamin A deficiency in Singida.

Important aspects to be considered if one is to intervene include promotion of production and consumption of fruits, green leafy vegetables, fat and protein sources. Improved method of vegetable preservation and improved child feeding practices are necessary if the problem is to be eliminated.

It is therefore recommended for this particular area, to make carotene rich fruits, vegetables, fats and protein more available and to promote their consumption.

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TFNC AT THE XV INTERNATIONAL CONGRESS OF NUTRITION, ADELAIDE, AUSTRALIA, SEPTEMBER 26 TO OCTOBER 1, 1993

Abstracts of TFNC Paper and Poster Presentations

LACTIC FERMENTATION OF CEREAL WEANING GRUELS AND IMPROVED NUTRITIONAL QUALITY

Svanberg, U., Lorri, W. Dept of Food Science, Chalmers University of Technology, Goteborg, Sweden and Tanzania Food and Nutrition Centre, Dar-es-Salaam, Tanzania.

In less developed countries, cereal weaning gruels have a low energy density, which combined with infrequent feeding, results in low energy and nutrient intakes for young children. In addition, the availability of nutrients, especially protein and iron, may be severely impaired in cereal-based diets due to the presence of nutritional inhibitors such as polyphenols (tannins) and phytate. Lactic acid fermentation is a traditional household technique that can be applied to improve the nutritional quality of cereal weaning foods, either by decreasing inhibitors or by releasing nutrients for absorption. By using a lactic fermentation technique combined with flour of germinated seeds, the energy density in cereal weaning gruels is significantly increased. The in vitro protein digestibility of tannin-rich cereal gruels increased from values below 40% to about 60% after lactic fermentation by using different starters. The protein digestibility in gruels of low-tannin cereals was about 60%, which after lactic fermentation increased to about 70%, and further up to 80% if the grain had previously been germinated. The in vitro iron availability in low-tannin cereals increased 3 to 4 times after lactic fermentation, partly due to the hydrolysis of phytate into lower inositol phosphates. High-tannin cereals were, however, more resistant to phytate hydrolysis and the iron availability was less increased after lactic fermentation. The polyphenols *per se* seemed also to have a strong inhibitory effect on the iron availability.

AN ANALYSIS OF THE STATE OF THE ART OF NUTRITION EDUCATION: ITS RELEVANCE TO THE CONTROL OF MICRONUTRIENT MALNUTRITION IN TANZANIA

Maganga, Susan J. Tanzania Food and Nutrition Centre, Dar es Salaam, Tanzania.

Literature on nutrition education of the last 10 years shows a growing focus on education and Communication as a means of changing attitude and behaviour in improving and promoting the health and nutrition status of target audiences. In recent years, the emphasis has shifted away from the simple dissemination of knowledge and information on nutrition, primarily in a one to one, classroom or clinical setting to more or less field settings where messages designed to improve health and nutrition related behaviour are reinforced through effective channels of communication. The major question which remains however, is how to translate this new base of experience into more effective strategies that can help solve the wide range of serious nutritional problems affecting health in Tanzania. Referring specifically to Tanzania, and other countries experiences in prevention of micronutrient malnutrition, this paper gives an analysis of the state of the art of nutrition education in the 80s and shows how Tanzania is fairing in the 90s towards achieving the national nutrition goals by the year 2000. The analysis is based on literature review and on knowledge attitude and practice (KAP) studies done by the Tanzania Food and Nutrition Centre and others. The analysis draws heavily upon 12 years experience of the author in nutrition education in Tanzania. The analysis is relevant to micronutrient malnutrition in Tanzania and proposals on what should be done and how to achieve sustained elimination of micronutrient deficiencies in the country by the year 2000 conclude the paper.

ACTIVITY PATTERN AND TIME ALLOCATION OF RURAL WOMEN IN FARMING POST-HARVEST SEASONS IN TANZANIA

Lukmanji, Z., Magambo, F. Ngonyani M. Mayombana C, Sikane C., Rutahakana, R.

Tanzania Food and Nutrition; Centre, P.O. Box 977, Dar es Salaam, Tanzania.

Activity time allocation of 50 women who had children under 5 years of age, was measured and recorded with stop watches during the lean and post-harvest seasons. Time spent was also estimated for one day by recall method and then compared with the values obtained through stop watch for the same day. Energy expenditure was calculated by methods recommended by WHO. Women's work routine for the day comprised domestic chores, child care, farming income-generating activities, recreation/rest and external household tasks such as attending a village meeting in both the seasons. The average work time which include rest time per women was 664 minutes/day in the post-harvest season and 825 minutes/day in the lean season. The time for farming and resting and energy expenditure was significantly higher in the lean season. The time estimated by 24-hour recall method was significantly less than for stop watch method. No relationship was observed between women's work and the children's nutritional status. The study raised several questions including those with regard to the reference values for women's work and men's contribution to household work.

USING ANTHROPOMETRY AS A MEASURE OF MATERNAL NUTRITIONAL STATUS AND TO PREDICT BIRTH OUTCOMES IN TANZANIA

Materu, M.G., Kavishe, F.P., Ballart, A. Tanzania Food and Nutrition Centre, P.O. Box 977, Dar es Salaam, Tanzania.

A community based study of 331 pregnant women was conducted in Ilula, Tanzania. Women were followed up from the time they reported to be pregnant until the children turned 5 years. Maternal weight gain during pregnancy correlated positively with birth weight. The total pregnancy weight on average was 6 kg. Women with positive weight gain deliver babies who, on average, were 240g heavier than those women with negative weight gain. Women with lower BMI in early pregnancy gained more weight than those with higher BMI. Child

growth was shown to be related to birth weight up to the age of two years. On average child growth followed 100 percent of the Harvard reference values up to six months, dropping to less than 80 percent of the value at 24 months of age. It is concluded that maternal anthropometry is a good measure of maternal nutritional status and a good predictor of birth weight. In its turn, the birth weight can predict the nutritional status of the child up to the age of two years. It is also concluded that community-based pregnancy monitoring using anthropometric indicators can be done at village level in Tanzania, with good coverage, provided that well instructed and motivated local personnel are given moderate supervisory support.

USE OF LACTIC-FERMENTED CEREAL WEANING GRUELS: INHIBITED GROWTH OF ENTEROPATHOGENS AND LOWER PREVALENCE OF DIARRHOEA IN CHILDREN

Lorri, W., Svanberg, U. Tanzania Food & Nutrition Centre, Dar es Salaam, Tanzania, and Department of Food Science, Chalmers University of Technology, Goteborg, Sweden.

Diarrhoea causes high child morbidity and mortality rates in developing countries. The most common diarrhoea causing pathogens include enterotoxigenic *Escherichia coli* (ETEC), *Campylobacter*, *Shigella*, and *Salmonella*. Different strains of these enteropathogens were inoculated in lactic fermented cereal gruels prepared from a natural culture obtained in Tanzania. A strong growth inhibiting effect was shown on all enteropathogens, which suggests that lactic-fermented cereal gruels may not be a source of infection. A prospective epidemiological study was carried out to evaluate the effect of regular consumption of lacticfermented gruels on diarrhoea prevalence in young children. Two groups of about 100 children each under five years of age, were selected, based on whether fermented gruels were used or not. The nutritional status of the children in each group, comparing their weights for age in relation to standard, was not statistically different ($p>0.05$). The mean age of the children in each group is similar. For each group an average frequency of feeding of 3.5 per day was reported. Monthly follow-ups on the prevalence of diarrhoea among selected children for a period of 9 months were carried out. Watery loose stools, two or more times per day were defined as diarrhoea. The mean prevalence of diarrhoea was 2.1 for children using fermented gruels as compared to 3.5 for those using non-fermented gruels ($p<0.001$).

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by

Festo P. Kavishe

with contributions by S. S. Mushi

APRIL, 1993

UN ACC/SCN country case study supported by United Nations Children's Fund (UNICEF). A case study for the XV Congress of the International Union of Nutritional Sciences, September 26 to October 1, 1993 Adelaide

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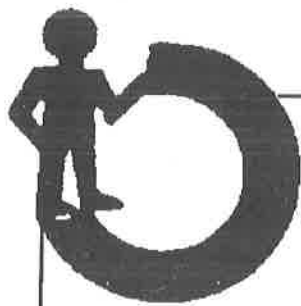
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