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Fighting Hidden Hunger: Diversity, Composition and Nutrient Adequacy of Diets of Lactating Mothers in Jimma Zone, Southwest Ethiopia

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Introduction

Maternal and child undernutrition is amongst the major challenges of our times. It has been on the global agenda as central to health, sustainable development, and progress (Black et al., 2008). Maternal and child undernutrition and micronutrient deficiencies affect approximately half of the world's population. The human, social and economic costs to society at large are enormous in terms of lost productivity, health, and well-being, decreased learning ability and reduced fulfilment of human potential (Ahmed, Hossain, & Sanin, 2012). Mothers from low-income settings are amongst the most vulnerable to undernutrition because their body's nutrient reserve is severely affected due to frequent pregnancies and lactation (Haileslassie, Mulugeta, & Girma, 2013).

According to UNICEF's conceptual framework of undernutrition, inadequate dietary intake is an immediate cause of maternal and child undernutrition (Black et al., 2008). The study area, Jimma zone, is year round green but unfortunately characterized by household food insecurity (Belachew et al., 2013) and information on the diversity, composition and nutrient adequacy of diets consumed by mothers during lactation period is lacking. The objective of our experiment was therefore to assess the diversity, composition and nutrient adequacy of diets of lactating mothers in Jimma zone, Southwest Ethiopia.

Material and Methods

The study was conducted in Southwest Ethiopia, Jimma zone. Three districts were purposively selected based on their agricultural production. Omo Nada, Dedo and Mana are cereal, vegetable and cash crop producer districts, respectively. The study had two components, survey and lab work. The survey was a community-based cross-sectional study. The study population included all lactating mothers in the study area. From these, 558 lactating mothers were sampled (Faul, Erdfelder, Lang, & Buchner, 2007) following a multistage stratified sampling procedure. Semi-structured questionnaires were used to collect data on socio-demographic, socio-economic and dietary practices. Dietary diversity data was obtained using a single 24-hour dietary recall. Mothers who consumed <4 food groups out of the 7 were classified under low dietary diversity score group. Descriptive data analysis was done using SPSS statistical software. Ethical clearance was obtained from research and ethical review board of Jimma University.

The second part was a laboratory work. Based on the survey data, the main kinds of foods that lactating mothers habitually eat in the study area were identified. Composite samples were collected, dried, ground and packaged (Pomeranz & Meloan, 2000). These samples were analyzed for proximate composition (protein, fat, carbohydrate, moisture, ash and fiber), energy content, mineral (iron, zinc, calcium and phosphorous) and anti-nutritional factors (phytate and tannin) following the respective standard methods of analysis. Nutrient adequacy ratio (NAR) was calculated as the ratio of a subject's nutrient intake to the estimated average requirement calculated using the Food and Agriculture Organization/ World Health Organization recommended nutrient intakes for mothers. The mean adequacy ratio (MAR) was calculated as the sum of NARs for all evaluated nutrients divided by the number of nutrients evaluated, expressed as a percentage (Steyn, Nel, Nantel, Kennedy, & Labadarios, 2006).

Results and Discussion

Diets and dietary practices

Results of the 24 hour recall showed, majority of the mothers consume cereals and grains (99.3%), vegetables (99.1%) and oil and fat (97.3%). Fewer participants reported consumption of fruits (25.1%) and dairy products (12.9%). Teff (79.0%), maize (74.2%) and sorghum (69.5%) were dominantly consumed cereals whereas onion (86.0%), kale (50.4%) and potato (25.4%) were dominantly consumed vegetables. Commercial cooking oil (96.8%) was dominantly consumed among fats and oils. Majority of the study participants did not change their previous food intake habit during lactation and eat the same amount of meal as they were not lactating; which is against the recommendations.

Dietary diversity score (DDS)

Table 1 shows the association between socio-demographic variables and maternal dietary diversity. Mothers who live in cereal producing district and rural villages, who are in 25-29 years age group, illiterate and poor mothers had lower DDS. These results are in agreement with previous reports which reported that there is a positive relationship between dietary diversity and diversified agricultural production and income from agricultural product (Gonder, 2011), being younger mother (Ogechi, 2014), and formal education to the mother (Ajani, 2010).

Table 1. Distribution of maternal DDS by different variables in Jimma Zone, March –May 2014.

Variables	Low DDS n (%)	High DDS n (%)	$\chi 2$ (P-value)
Districts			
Mana (cash crop producing)	86 (46.2)	100 (53.8)	
Omo-Nada (cereal producing)	120 (64.2)	66 (35.5)	
Dedo (vegetable producing)	93 (50.0)	93 (50.0)	0.001**
Place of residence			
Rural	220 (59.1)	152 (40.9)	
Urban	79 (42.5)	107 (57.5)	0.000**
Age group			
15-19	10 (38.5)	16 (61.5)	
20-24	61 (42.1)	84 (57.9)	
25-29	122 (56.7)	93 (43.3)	
30-34	68 (59.1)	47 (40.9)	
35-49	38 (66.7)	19 (33.3)	0.002**
Educational status			
Informal education	212 (62.7)	126 (37.3)	0.000**

Formal education	87 (39.5)	133 (60.5)	
Socio-economic status			
Poor	132 (71.0)	54 (29.0)	
Medium	98 (52.7)	88 (47.3)	
Rich	69 (37.1)	117 (62.9)	0.000**

**=Significant at the 0.01 level

Dietary composition

Table 2 shows the proximate composition, calorific value and mineral content of predominantly consumed foods in the study area. The proximate composition and calorific value of the sampled foods ranged between 24.8–65.6%, 7.6–19.8 %, 2.1–23.1 %, 2.0–27%, 1.0–21.2%, 0.9–45.8 %, 124.5–299.6 Kcal/100g for moisture, protein, crude fat, crude fiber, total ash, total carbohydrate and energy content, respectively. The mineral contents ranged between 9.5–52.5mg, 2.2–4.2mg, 42.6–318.2mg, 150.7–379.9mg for iron, zinc, calcium and phosphorus, respectively. The anti-nutritional factors contents ranged between 11.1–178.9mg for phytate and 3.7–315.9mg for tannin.

Table 2. Proximate, energy and mineral composition of diets of lactating mothers in Jimma Zone

Food types	Pro	Fat	Car	Fib	Ash	Moi	Ene	Fe	Zn	Ca	P
Lentil sauce	18.2	23.1	4.8	5.2	11.9	36.8	299.6	20	3.4	0.2	0.3
Bean sauce	19.8	17.5	10	5.3	11	36.4	276.5	20.5	3.4	0.2	0.4
Pea powder sauce	16.8	19. 8	2.2	4.3	16.9	40	254.2	27.6	4.2	0.3	0.3
Kale sauce	19.6	6.5	0.9	27	21.2	24.8	140.5	24.8	2.8	0.1	0.3
Injera (T)	10.1	2.6	45.6	2.5	1.5	37.7	246	21.8	3.4	0.3	0.3
Injera (T+S)	10.7	2.8	43.8	2.2	1.8	38.7	243.5	39.7	3.2	0.2	0.4
Injera (T+M)	9.6	7.5	34.8	7.6	2.6	38	245.1	52.5	3.1	0.3	0.3
Injera (T+M+S)	9	3.3	39.2	12.2	2	34.4	222.3	39.4	2.7	0.2	0.4
Injera (T+S+R)	9.9	5.5	8.9	8	2.1	65.6	124.5	22	2.2	0.2	0.2
Unleavened bread (W+M)	10.8	2.1	45.8	2	1.2	38.1	245.2	9.5	2.2	0.1	0.3
Unleavened bread (M)	7.6	3.5	42.8	2	1	43.2	233.1	12.5	2.5	0.3	0.3
Unleavened bread (W)	11.5	3.5	33.3	2.1	1.5	48.2	210.5	20.7	3.8	0.2	0.3

Pro=Protein; Car=Carbohydrate; Fib=Fiber; Moi=Moisture; Ene=Energy; Fe=Iron; Zn=Zinc; Ca=Calcium; P=Phosphorous. Unit for proximate, calcium and phosphorous is g/100g. Unit for energy is kcal/100g. Unit for iron is mg/100g. T=teff; S=sorghum; M=Maize; R=Rice; W=Wheat

Nutrient adequacy

Majority of the maternal diets did not contain adequate protein, fat and energy (NAR<1). Most of the cereal based diets contain adequate minerals (NAR>1) and fermentation is believed to have played its role for this. The overall adequacy is less than 1 for all diets (MAR<1) (Table 3). High phytate intakes and poor fruit consumption may compromise iron, zinc and to a lesser extent calcium status in these mothers (Lopez, Leenhardt, Coudray, & Remesy, 2002).

Table 3 Nutrient adequacy ratio of commonly consumed maternal foods

Food types	Protein	Fat	Car	Fiber	Energy	Fe	Z	Ca	P	MAR
Lentil sauce	0.5	0.6	0	0.3	0.2	3.5	0.5	0.4	0.5	0.44
Bean sauce	0.5	0.4	0.1	0.3	0.2	3.6	0.5	0.4	0.7	0.45
Pea powder sauce	0.5	0.5	0	0.3	0.2	4.8	0.6	0.5	0.5	0.45
Kale sauce	1.4	0.4	0	4.1	0.2	11.2	1.1	0.2	1.3	0.65
Injera (T)	0.9	0.2	1.2	0.5	0.5	12	1.5	1.8	1.9	0.78
Injera (T+S)	0.9	0.2	1.2	0.4	0.5	21.9	1.5	1.3	2.1	0.78

Injera (T+M)	0.8	0.6	0.9	1.4	0.5	28.9	1.4	1.7	1.8	0.86
Injera (T+M+S)	0.8	0.3	1	2.2	0.4	21.7	1.2	1	2.1	0.82
Injera (T+S+R)	0.8	0.4	0.2	1.5	0.3	12.1	1	1	0.8	0.73
Unleavened bread (W+M)	0.9	0.2	1.2	0.4	0.5	5.2	1	0.5	1.5	0.71
Unleavened bread (M)	0.6	0.3	1.1	0.4	0.5	6.9	1.2	1.5	1.5	0.75
Unleavened bread (W)	1	0.3	0.9	0.4	0.4	11.4	1.7	0.8	1.9	0.75

Car=Carbohydrate; T=teff; S=sorghum; M=Maize; R=Rice; W=Wheat

Conclusions and Outlook

The dietary diversity of lactating mothers in the study area was not satisfactory. Macronutrient and energy content of the diets were below the recommendations. There were adequate minerals in the diets and fermentation is believed to have played its role for this. A community based nutritional education on diet diversification and local processing techniques based on multi-sectoral approach are needed to curb the problem of malnutrition among lactating mothers in the study area.

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