Original article

Agroecological comparison of levels and correlates of nutritional status of women

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Abstract

Background: Observation and focus group discussions during the first round survey indicated that women in the lowlands areas are more malnourished compared to the women in the highlands. Additional analysis was needed to verify the observation.

Objectives: To compare the levels and determinants of nutritional status of women living in lowland and highland areas in Limu wereda of Hadiya Zone, southern Region.

Methods: Information on potential factors influencing nutritional status were gathered in two rounds from 450 mothers in three randomly selected peasant associations.

Results: Women living in the lowlands are more malnourished compared to women living in the highlands (31.0% in the lowlands and 19.1% in the highlands; Odds ratio=1.62; 95% CI 1.1-2.4). Household size, agricultural production, age and parity were found to be similar among the two groups of women. However, religion, ethnicity, livestock holding (more in the lowland), land ownership (greater in the lowlands), education (more literate in the highlands) and types of illness (more malaria in the lowlands) were found to be significantly different among the two groups of women. The logistic regression analysis indicated that only agricultural production, sickness and education were associated with maternal malnutrition in the studied area.

Conclusion: Creating mechanisms and opportunities to increase agricultural production (in both low land and high land) and women's education as well as providing better access to health care, particularly, in the low lands are recommended to improve the situation. [*Ethiop.J.H. .'th Dev.* 2003;17(3):189-196]

Introduction

Several studies have indicated that malnourished mothers are more vulnerable to diseases, encounter more miscarriages, give birth to underweight children whose survival is at risk. Malnourished mothers also have reduce lactation performance contributing to the increased risk of child mortality and morbidity (1, 2).

Malnutrition is widespread among women in developing countries. The limited studies conducted regarding women's nutritional status in Ethiopia confirm that the situation is not different from many developing countries. For example, a study is Sidamo zone indicated that 16% of the women were severely malnourished (3). A study conducted in south-Western Ethiopia also indicated that 19.4% of the women were below BMI cut-off points of 18.5 (4). Another study undertaken in Hadiya zone in 1995 indicated that nearly 90% of pregnant women were below the recommended anthropometric standards (5). Another survey in southern Ethiopia showed malnutrition rates of 33.2% in North Omo, 32.0% in Haidya, 20.9% in Gurage and 17.7% in Kenbata Zones (6). The recent Demography and Health Survey indicated that 30.1% of the women in Ethiopia are malnourished (7).

A recent survey by SERA (Strengthening Emergency Response Abilities) project indicated that Limu woreda is one of the densely populated (351persons/km) woredas in Ethiopia (14). Land scarcity is one of the major problems in the woreda (as a result of the high

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density of the population) particularly in the midland (0.8 hectare) and highlands (0.52 hectare). Although the land holding status is relatively better in the lowlands (0.91 hectare) the soil is less productive. As a result of population pressure and subsequent environmental degradation and recurrent drought households in Limu woreda have been food insecure for many years. Drought and Disaster Prevention Commission designates Limu woreda as drought prone woreda.

Identification of the community-specific determinants of malnutrition is of paramount importance in designing targeted interventions. With this aim in mind, a study on levels and correlates of maternal malnutrition was conducted in Limu woreda of Hadiya zone in two rounds. The first round survey was conducted between December 2001 to January 2002 and the second round survey was conducted between August to September 2002.

During the first survey (December 2001 to January 2002), it was felt that malnutrition rate is significantly higher in lowlands compared to that of highlands. Analysis was done to verify these observations and identify factors that have contributed to high malnutrition rate in the lowlands (if the observations are true).

Methods

The study employed cross-sectional design. Hadiya zone was selected on the basis of the available information on the magnitude of maternal malnutrition (6). One peasant association from the lowland (out of 24 PAs), one PA from the midland (out of 27) and one peasant association from the highland (out of 9 PAs) were randomly selected. The sample size for the study was calculated using Epi Info, 2000. Using, 32% prevalence rate of malnutrition (from the previous study), 95% confidence level, 6% worst acceptable, and design effect of 2, the minimum sample size required was about 462. In total, 474 mothers were actually included in the study (158, 156 and 160 systematically selected women from a PA each in lowland, midland and highland respectively).

As mentioned earlier, during the first round data collection, it was felt that mothers in the lowland are more malnourished compared to mothers in the highland. Analysis was done to verify this observational assumption and this article presents the results of the analysis. As this is a post-data collection exercise, the only option to examine the adequacy of the sample is to retrospectively estimate the power of the study using the results obtained and the sample size used. The prevalence in the highlands is about 19%, and the prevalence in the lowland is about 31% (a difference of about 12%). The sample size is about 150 in each group. Using $\alpha = 0.05$, the 12% difference in prevalence and the sample size used will yield a power of more than 80% (15), a power usually recommended to be used.

A structured questionnaire was administered to pregnant women, lactating women and women who are not pregnant or lactating but who have children less than 5 years by trained enumerators. Some of the areas covered in the questionnaire included: demographic information, food beliefs, food taboos, staple crop production over the year, livestock holding, land holding, sickness over the year preceding the survey and types of sickness. Staple crop production over the year was converted to kcal by using Food Composition Table for Ethiopia (16) and finally to kcal/person/day. Livestock holding was converted to estimated value in birr by multiplying each livestock owned by respective market prices at the time of the survey.

Height of women was measured to the nearest 0.1 cm using a wooden board. Weight of women was measured on digital weighing scales to the nearest 0.1 kg. Standard procedures of height and weight measurements were followed (17). Scales were regularly calibrated and standardization of measurers was done.

Body Mass Index (BMI), the ratio of weight to height square, was used to assess nutritional status of the mothers. Although BMI underestimates the malnutrition rate of pregnant

women, pregnant women were included in the analysis because the main aim of this article is to compare nutritional status between women living in the lowlands and women living in the highlands. As long as the proportion of pregnant women is similar in the two groups (which is the case in this study) inclusion of pregnant women in the analysis, does not affect the findings.

Results

Table 1 shows some household characteristics of the two groups of women. There is marked difference in ethnic composition ($p<0.05$). Most of the women in lowlands are from Silte ethnic group while most of the women in the highlands are from Hadiya ethnic group. The difference in religion is also marked ($p<0.05$). Most of the women in the lowlands are Muslims while most of the women in highland are Christians. Although there is some variation in household size, the difference was not significant as such. Land ownership is significantly different ($p<0.001$). More households in the lowlands have greater than 0.75 hectare (average for the entire studied households) compared to households in the lowlands. Similarly, estimated average value of livestock holding is significantly different ($p<0.05$). More households have livestock valued greater than the average (1637 birr) in the lowlands compared to that of the highlands. Estimated production of staple crops (kcal/person/day) over the year preceding the survey, however was not statistically different.

Table 1: **Household characteristics of the studies women by agroecology**

Characteristics	Low land	High land	Significance
Religion			
Christian	13(8.5%)	128(82.1%)	
Muslim	140(91.5%)	28(17.9%)	P<0.001
Ethnicity			
Hadiya	68(44.4%)	151(98.1%)	
Silte	85(55.6%)	3(1.9%)	P<0.001
Household size			
3 and below	27(17.4%)	19(12.2%)	
4-6	67(43.2%)	81(51.9%)	
>7	61(39.4%)	56(35.9%)	Ns
Land ownership (hectare)			
<0.75 (average)	63(40.6%)	104(66.2%)	
>0.75	92(59.4%)	53(33.8%)	P<0.001
Liverstock (estimated value)			
<1637 birr (average)	78(50.3%)	100(63.7%)	
>1637 birr	77(49.7%)	57(36.3%)	0<0.05
Production (kcal/person/day)			
<1549 (average)	73(47.1%0	64(41.0%)	
>1549	82(52.9%)	92(59.0%)	Ns

The situation regarding some of the maternal characteristics are presented in Table 2. Age, Parity and pregnancy/lactation status were not different among women living in the lowlands and highlands. However, education level is significantly different among the two groups of women ($p<0.05$). Significantly more women in the highlands went to school compared to women in the lowlands.

Table 2: **maternal characteristics of the studied women by agroecology**

Characteristics	Low land	High land	Significance
Age			
<25	57(36.8%)	52(33.3%)	
25-35	80(51.6%)	88(56.4%)	Ns
>35	18(11.6%)	16(10.3%)	
Parity			
2 and below	38(24.7%)	36(23.1%)	
3-6	77(50.0%)	88(56.4%)	
>7	39(25.3%)	32(20.5%)	NS
Pregnancy/lactating status			
Lactating	108(68.8%)	107(67.7%)	
Pregnant	29(18.5%)	27(17.1%)	
Neither of the two	20(17.7%)	24(15.2%)	NS
Education			
Unable to read or write	112(76.7%)	81(52.6%)	
Able to read or write	43(23.3%)	73(47.4%)	P<0.01

Proportions of women who reported that they had at least one episode of illness over the year and the types of sickness are presented in Table 3. The proportion of women reporting at least one sickness over the year is similar among the two groups. However, there is a significant difference in the types of sickness among the two groups. Markedly more women were sick due to malaria in the lowlands compared to women in the highlands ($p<0.01$). In the contrary, more women were sick due to other diseases (typhoid, injury, asthma, gastritis, hypertension, eye sickness and the like) in the highlands compared to women in the lowlands.

Table 3: **Diseases situation among the two groups**

Characteristics		Residence	N(%)	Significance
At least one episode over the past year		Low land	86(54.4)	NS
		High land	90(55.9)	
Specific diseases	Malaria	Low land	33(38.4)	
		High land	6(6.7)	P<0.01
	ARI	Low land	19(22.1)	
		High land	21(23.3)	NS
	Other	Low land	34(39.5)	
		High land	63(70.0)	P<0.05

Nutritional status of women by agro-ecology in Limu woreda, Hadiya zone is presented in Table 4. As shown in the Table, the prevalence of maternal malnutrition is significantly higher than the prevalence of maternal malnutrition in the highlands. The malnutrition risk associated with living in the lowlands is almost one and half times higher compared to the risk associated with living in the highlands.

Table 4: **Nutritional status by agro-ecology**

Category	Low land (n=155)	Highland (n=157)
Severe (BMI<16.0)	1.9%	0.6%
Moderate (Bmi 16.0-17.0)	5.8%	1.9%
Mild	23.2%	16.6%
Total malnourished	31.0%	19.1%
Normal	69.0%	80.9%
Odds ratio=1.62 (95% CI 1.1-2.4)		

In order to examine the association of the studied household and maternal characteristics to maternal malnutrition, logistic regression analysis was done. As shown in Table 5, among the household characteristics, religion, ethnicity, household size, land holding and livestock holding are not associated with malnutrition in the study area.

However estimated production (kcal/person/day) of staple crops was found to be significantly associated with malnutrition (OR=2.8; 95% CI 1.6-4.6). Among the maternal characteristics shown in Table 6, age and parity were not associated with malnutrition Education (OR=1.6; 95% CI 1.2-4.5) and sickness (OR=1.5; 95% CI 1.1-2.3) were however associated with malnutrition.

Table 5: **Net odds of maternal malnutrition by selected household characteristics in Limu woreda of Hadiya zone**

Characteristics	Total women (high land + lowland) N=319 OR (95% CI)
Household size	
3 and below	1
4-6	0.8(0.1-1.2)
>7	0.9(0.3-3.4)
Production (Kcal/person.day)	
>1549 (average)	1
<1549	2.8(1.6-4.6)
Ethnicity	
Hadiya	1
Silte	0.5(0.2-1.4)
Religion	
Christian	1
Muslim	0.6(0.3-1.7)
Land	
<0.75 (average)	1.8(0.8-3.2)
>0.75	1
Livestock (estimated value in birr)	
<1637	1.2(0.6-1.8)
>1637	1

Table 6: **Net odds of maternal malnutrition by selected maternal characteristics in Limu woreda of Hadiya zone**

Characteristics	Total women (high land + low land) N=319 OR (95% CI)
Age	
<25	1
25-35	0.3(0.1-1.5)
>35	0.4(0.1-1.6)
Parity	
2 and below	1
3-6	1.3(0.2-3.2)
>7	1.4(0.3-3.2)
Education	
Illiterate	1
Literate	1.6(1.2-4.5)
Sickness over the year	
No	1
Yes	1.5(1.1-2.3)

Discussion

Comparisons of nutritional status unequivocally confirmed that women in the lowlands are more malnourished than women in the highlands.

As pregnant women are also included in the analysis, the actual malnutrition rate could be slightly more than what is reported here (BMI underestimates malnutrition rate of pregnant women). Even without taking the underestimation in to consideration, the prevalence of maternal malnutrition observed in both localities is significantly more than the rate of maternal malnutrition observed in some Sub-Saharan Africa. For example the Ugandan DHS, 1995 (18) showed that only about 10% of the Ugandan women were malnourished during the survey. The prevalence of malnutrition in the lowlands is similar with the national prevalence rate indicated by the Ethiopian Demographic and Health Survey (30.1%) conducted in 2000 (7).

As the rural population depends largely on the agricultural production for their food needs, it is only logical to assume that food production is the prime determinant of nutritional status. As shown in logistic analysis, estimated staple crop production is strongly associated with maternal malnutrition in the area. Since there was no significant difference in agricultural production of staple crops between the two groups of households, it can be assumed that the impact of staple food production on maternal nutrition in lowlands and highlands is similar.

Studies have shown that education can play a significant role in determining the nutritional status of women. Education plays a significant role by influencing behaviors, attitudes and practices towards appropriate feeding and care. It also plays a role by promoting women's involvement in income control and decision making.

The logistic regression analysis indicated that educational status is associated with maternal malnutrition. As the educational level of the women in the lowlands was significantly lower compared to the educational level of the women in the highlands (shown by bivariate analysis) it can be assumed that the low level of educational background could have played some role in increasing malnutrition rate in lowlands.

In the framework of determinants of malnutrition developed by UNICEF, disease is

considered as one of the immediate causes of malnutrition. Disease affects nutritional status by reducing appetite and dietary intake. It also affects by reducing absorption and by increasing nutrient loss. Diseases, such as malaria, which is significantly more prevalent in the lowlands affects nutritional status by anyone of these mechanisms. The contributions of malaria to maternal malnutrition in malaria endemic areas is more pronounced because malaria recurs several times and the chances of being infected and re-infected is high.

In this study, there was no difference in the proportion of women reporting at least one episode of illness over the last one year. However, the types of illness were significantly different among the two groups of women. As expected more women were sick due to malaria in the lowlands compared to women in the highlands. Sickness over the year preceding the survey was included in the logistic model and showed significant association with maternal malnutrition. Although, the proportion of women reporting at least one episode over the year is similar between the two groups, it is possible to assume that the type of illness 'malaria' appears to have contributed to the high level of malnutrition in the lowlands.

In conclusion, among the studied variables, staple crop production, education and sickness were found to be associated with malnutrition in the area. As estimated staple crop production was similar among the two groups of women, the effect on maternal malnutrition can be considered similar, therefore strengthened efforts to increase crop production in both the lowlands and highlands is recommended. Education was significantly different among the groups and most likely played a role in increasing the malnutrition rate in the lowlands, and therefore strengthened efforts to improve women's education in the lowlands is recommended. In addition, malaria which was mentioned by more women in the lowlands compared to that of the women in the highland appears to have contributed to the increased level of malnutrition in the lowlands and strengthened malaria control efforts are recommended in the lowlands.

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