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Knowledge, Attitude and Practice of Farmers' towards Aflatoxin in Cereal Crops in Wolaita Zone, Southern Ethiopia

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Abstract

Background: Worldwide, approximately a quarter of agricultural products are contaminated with aflatoxins, with maize, cereals, and groundnuts being the most susceptible Factors influencing growth of aflatoxin on crops in the field include drought, high temperature, high humidity, and insect infestation; growth is also influenced by sub-optimal harvesting, drying, and crop storage practices. People in developing countries are more likely to be exposed to aflatoxin due to favorable growth conditions and minimally enforced regulatory limits. The aim of this study was to investigate knowledge, attitude and practice of farmers towards Aflatoxin.

Methods: Community-based, cross-sectional, mixed methods were used to study aflatoxin systemic exposure in people living in rural communities of Wolaita zone of Ethiopia. To conduct assessment on farmers' knowledge, attitude and practice towards Aflatoxin exposure a structured questionnaire was used and 234 farmers were interviewed and focused group discussion was also conducted. The data was analyzed by using SPSS version 20 and presented by tables and level of significance was set at p-value ≤ 0.05.

Results: Among 234, only 129 (55%) survey respondents had some level of awareness about Aflatoxin while the rest (105 i.e. 44.1%) were unaware about Aflatoxin. Media was cited as the most dominant source of knowledge about Aflatoxin followed by local resident health workers. Most respondents associated the health effects of Aflatoxin with abdominal disease, internal organ disease (like liver disease) and cancer. About 98.7% of the respondents believe that they don't feel any disease condition at the time of data collection.

Conclusion: Majority of the community in the study area is aware of aflatoxin and its effect on health but almost all are unaware of toxins other than aflatoxin.

Keywords: *Cereal Crops; Aflatoxin; Awareness and Perception*

Background

Aflatoxins are potent carcinogenic substance and have also been implicated in human diseases like hepatitis B, tuberculosis by suppressing immune system. Aflatoxin B1 is the most frequently occurring subtype and as it has been found in most feeds and foods and is highly carcinogenic, causing liver cancer in humans [1]. It has also immunosuppressive, mutagenic, and teratogenic effects [2]. The International Agency for Research on Cancer (IARC) has been also classified both AFB1 and AFM1 as class I carcinogens [3].

Worldwide, approximately a quarter of agricultural products are contaminated with aflatoxins, with maize, cereals, and groundnuts being the most susceptible [4-6]. Factors influencing growth of aflatoxin on crops in the field include drought, high temperature, high humidity, and insect infestation; growth is also influenced by sub-optimal harvesting, drying, and crop storage practices. People in developing countries are more likely to be exposed to aflatoxin due to favorable growth conditions and minimally enforced regulatory limits [4-6].

Aflatoxicosis outbreaks occurred in rural eastern Kenya in 2004, 2005 and 2010 and were primarily associated with consumption of maize. During the 2004 outbreak, GM aflatoxin levels among patients with potential liver dysfunction ranged from 120 to 1200 pg/mg albumin [7]. A separate study in Kenya showed aflatoxin exposure did not vary by sex, age group, marital status, religion, or socioeconomic characteristics, but did vary by province and was higher in urban than in rural living situations [6]. Levels were also higher in people who reported being sick in the past week or seeking healthcare in the past 3 months.

There are different factors responsible for aflatoxin contamination at various levels. These are pre-harvest level i.e. at soil level-native population of *A. flavus* group of fungi varies from farm to farm depending on soil types and crop rotations. Prolonged drought 3 - 4 week during seed formation and maturation stages triggers aflatoxin contamination. Harvesting level- This is mechanical damage to the pods at the time of harvesting, threshing or damaging testa during the process of decortications. Harvesting of crop immediately after irrigation and consequent high initial pod moisture at the time of processing and storage, promote condition for aflatoxin build up in the produce. Inefficient and slow drying process under the humid condition enhances aflatoxin contamination risk greatly. Post-harvest level (storage level) - storage of produce in warm and humid room with a large stack directly on the floor favours rapid multiplication of the fungus and affects even good lots. Therefore, this study was aimed to investigate knowledge, attitude and practice of farmers towards Aflatoxin in three project implementation districts of Wollita Zone, SNNPR [8-30].

Materials and Methods

Study area and target population

The study was conducted in Wolaita Zone of Southern Nations, Nationalities and Peoples' Regional State (SNNPRS) in Ethiopia. Wolaita has 13 woredas with 310,454 households (in 2007) and a total estimated population of 1,808,548 (in 2015). It has an area of 4,208.64 square kilometers. Maize, wheat, sorghum, barley, and teff are commonly cultivated in this area. Three woredas namely Boloso Sore, Damot Pulasa, and Dugna Fango were selected for this study.

Name of Woreda	Population	Number of Kebeles/village	List of Kebeles
Boloso Sore	31,809	6	Sore Humba
			Woybe Dogo
			Admancho Arfita
			Gido Humba
			Afama Adila
			Shuye Humba
Damot Pulasa	10,393	6	Olola
			Lamarada
			Busha
			Warbira Golo
			Warbira Suke
			Golo Shanto
Dugna Fango	14,723	6	Duguna Boloso
			Duguna Kindo
			Waraza Lasho
			Ofakelecha
			Arsi Woyde
			Duguna Sore

Table 1: *Target Population and list of kebeles in selected weredas of Wolaita zone.*

Study design

Community-based, cross-sectional, mixed methods were used to study aflatoxin systemic exposure in people living in rural communities of Wolaita zone of Ethiopia.

Data collection methods and tools

Data collection method and tools for the evaluation of farmers' knowledge, attitude and practice towards Aflatoxin exposure.

To conduct assessment on farmers' knowledge, attitude and practice towards Aflatoxin exposure a structured questionnaire was used and 234 farmers were interviewed from selected Weredas of Wolaita Zone of Southern Ethiopia. The questions were associated with their age, qualification, occupation, family, as well as farm size, and whether they have previous knowledge of aflatoxin contamination in milk, cereal crops and local beverages. The questionnaire was also related with the ways of storage system for their grains (crops); amount of their consumption of milk, cereal crops and local beverages. Group discussions on farmers' knowledge, attitude and practice towards Aflatoxin exposure were conducted with selected farmers, agriculture workers and experts in the same Weredas.

Data analysis

The data was analyzed by using SPSS version 20 and presented by tables and level of significance was set at p-value ≤ 0.05.

Results and Discussion

Results from individual questionnaires

The data in the table 2 indicates village wise distribution of 234 questionnaires collected across a total of 18 kebeles in three Weredas (districts). Among the 18 kebeles/village, based on the total population of each wereda, 108 questionnaires were collected from Boloso Sore, 66 from Damaota Pulasa and 60 were from Duguna Fango.

Woreda	Kebele	No of questionnaires
Boloso Sore	Sore Humba	18
	Woybo Dogo	18
	Gido Humba	18
	Admancho Arfita	18
	Afama Adila	18
	Shuye Humba	18
Duguna Fango	Duguna Sore	11
	Duguna Kindo	11
	Duguna Boloso	11
	Waraza Lasho	11
	Ofakelecha	11
	Arsi Woyde	11
Damota Pulasa	Golo Shanto	10
	Warbira Suke	10
	Olola.	10
	Lamarada	10
	Busha	10
	WarbiraGolo	10
Total		234

Table 2: *Number of questionnaires collected from different villages of Wolaita zone.*

The data in the table 3 illustrates the socio-demographic characteristics such as residence, sex, age, religion, educational qualification and occupation of the individuals surveyed. The parameter educational qualification was added in the questionnaires to know about the farmers' degree of ability to understand about aflatoxins and their health effects. It has been observed that among the 234 interviewed people, 119 (50.9%) were illiterate. Regarding the occupation status, it has been observed that out of 234, 176 (75.6%) were engaged in farming, while 13 (5.6%) had some sort of business to support their livelihood.

Variables	Parameter	Frequency	Percent (%)
Sex	Female	99	42.3
	Male	135	57.7
Residence	Rural	232	99.1
	Urban	2	0.9
Age	19 - 30	53	22.6
	31 - 45	126	53.8
	46 - 60	42	17.9
	> 61	13	5.6
Educational status	Illiterate	119	50.9
	Primary	81	34.6
	Secondary	22	9.4
	Tertiary	9	3.8
	Graduate	3	1.3
Marital status	Single	1	0.4
	Married	202	86.3
	Divorced	2	0.9
	Widowed	29	12.4
Occupation	Business	13	5.6
	Farmer	176	75.2
	Housewife	39	16.7
	Other	6	2.6
Religion	Orthodox	90	38.5
	Protestant	116	48.7
	Catholic	26	11.1
	Others	4	1.8
Family size	1 - 3	15	6.5
	4 - 5	48	20.6
	≥ 6	171	73.1
Monthly income	50 - 100	90	39.3
	101 - 999	134	58.5
	1000 - 5000	5	2.2
Farm size in hector	0.5	196	84.1
	1	30	12.9
	2	7	3

Table 3: *Parameter wise data collected from 234 questionnaires.*

Data on type of cereals (grains) consumed by the interviewees revealed that maize is the most widely source of food among the households surveyed, consumed by 232 households (99%) (Table 4). Most of the households (about 94%) obtain the maize from the market while the rest (6%) obtains from their farm land. The weekly consumption of the local community residing in the study area is more than 15Kg per week and the commonly used storage material is fiber packet. About 38% of the respondents do not consume milk and most of the respondents (67.5%) drink local beverages such as kinito, borede, areka and tela.

Variables	Parameter	Frequency	Percent
Type of grain used	Maize	232	99.1
	Sorghum	1	0.4
	Other	1	0.4
Grain consumption	Always	234	100.0
Source of grain	Market	220	94.0
	Farm	14	6.0
Storage of grain	Fiber packet	150	64.1
	Plastic container	9	3.8
	Open space	10	4.3
	Gotera	14	6.0
	Other	51	21.8
Amount of grain consumed in a week	5 Kg	7	3.0
	10 Kg	9	3.8
	15 kg	3	1.3
	> 15 Kg	215	91.9
Use of grain	Home consumption	223	95.3
	Beverage preparation	9	3.8
	Consumption and selling	2	0.9
Rate of milk consumption	None	89	38.0
	1 - 2	45	19.3
	3 - 4	45	19.3
	>= 5	56	23.5
Do you use local beverage	Yes	158	67.5
	No	76	32.5
Type of beverage used	Tela	17	7.3
	Borede	12	5.1
	Kinito	92	39.3
	Areka	32	13.7
	others	81	34.6

Table 4: *Parameter wise data collected from 234 questionnaires.*

Only 129 (55%) survey respondents had some level of awareness about Aflatoxin (Table 5) while the rest (105 i.e. 44.1%) were unaware about Aflatoxin (Table 5). Media was cited as the most dominant source of knowledge about Aflatoxin followed by local resident health workers. The current survey also revealed that only one of the 234 interviewed individuals had knowledge about mycotoxins other than Aflatoxin. Surveyed individuals also reported drying, and storing well dried and healthy looking grains as possible ways of managing Aflatoxin. Most respondents associated the health effects of Aflatoxin with abdominal disease, internal organ disease (like liver disease) and cancer. About 98.7% of the respondents believe that they don't feel any disease condition at the time of data collection.

Variables	Parameter	Frequency	Percent
Awareness of aflatoxin	Yes	129	55.1
	No	105	44.9
Effect of aflatoxin on health	Abdominal disease	104	46.8
	Internal organ disease	115	51.8
	Cancer	3	1.4
Reduction of aflatoxin level	Modification of life	174	78.7
	Change of eating style	47	21.3
Attitude towards aflatoxin in crops	So some extend	134	60.4
	Nothing	4	1.8
	Most like	84	37.8
Source of information for aflatoxin	Mass media	192	86.5
	Health workers	28	12.6
	From society	2	0.9
Do you know other toxin	Yes	1	0.4
	No	233	99.6
Do you have any health problem	Yes	3	1.3
	No	231	98.7

Table 5: *Awareness and attitude towards Aflatoxin in local community of Wolaita zone.*

Results obtained from focused group discussion

Focused group discussions on knowledge, attitude and practice of farmers on Aflatoxin exposure in regards to crop contamination, and its health and economic impacts were performed in three Weredas (Bolososore, Dugna Fango and Damot Pulasa) where interviews of farmers were conducted using structured questionnaires. In these group discussions 60 participants (20 from each Wereda) were involved. Selected farmers, agriculture experts and agriculture extension workers are participated in theses group discussions.

Most of the participants in focused group discussions understand the word Aflatoxin and its health effects in human beings as well as in animals. Majority of the participants have heard about Aflatoxin and its impacts through awareness creation training delivered by AMREF Ethiopia and Government agriculture workers. Fungal infection, seizure/convulsion, peptic ulcer, dyspepsia, heart failure and hepatic disorders are health effects of aflatoxin mentioned during the focused group discussion. One of the participants shared the death of cattle (cow) after ingestion of spoiled food. The local peoples were preparing 'areke' from the spoiled maize and individuals who drunk such beverage were exposed to psychosis and liver diseases in previous time.

The participants briefly mentioned the mechanism to reduce health effects of aflatoxin during focused group discussions. After maturation cutting of cereal crops, picking up spoiled cereals, not using cereal powders from marketing, washing with hot water, proper storage and harvesting conditions are methods by which the community reduces exposure to aflatoxin. The community representatives clearly described their belief towards aflatoxin as a poison and that poison can be communicated from animals to human being through milk and meat and that is why they didn't feed spoiled food to human beings and animals.

Conclusion

Majority of the community in the study area is aware of aflatoxin and its effect on health but almost all are unaware of toxins other than aflatoxin. Awareness creation on aflatoxin and other poisons should be targeted for larger populations to minimize the poison effects of aflatoxin and other poisons to larger populations.

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