Exploring Aflatoxin Prevention and Control Practices in Banke, Nepal

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Background

Aflatoxins are a family of toxins produced by certain fungi (Aspergillus flavus and Aspergillus parasiticus). Aspergillus flavus and Aspergillus parasiticus fungi are abundant in warm and humid regions of the world. These fungi are found in agricultural crops such as maize, peanuts, cottonseed, and tree nuts. Aflatoxins are harmful to animals and humans.

Much is unknown about the determinants of aflatoxin exposure, and how specific agricultural practices may lead to, or help limit, food contamination and diet exposure.

Based on prior studies, chronic consumption of aflatoxins may be a public health concern in Nepal.

Objectives and Methods

The purpose of this analysis was to explore common agricultural practices that may be associated with aflatoxin (AFB1) exposure in pregnant women.

Data from 1,675 pregnant women ages 16-49 enrolled in an ongoing USAID-supported longitudinal birth cohort study in 17 selected Village Development Committees (VDCs) of the Banke district, Nepal, was used for this analysis.

Participants were asked to respond to a pre-natal questionnaires exploring risk factors for aflatoxin exposure and stunting, such as maternal and child diet, education, sanitation and hygiene, agricultural grain drying and storage practices, etc. The questionnaire evaluated drying and storage practices for high risk aflatoxin foods such maize, peanuts, rice, wheat and pulses. Farmers were asked about drying, storage structures, storage period, storage problems and insecticide/fungicide usage during storage. One maternal venous blood sample was collected during pregnancy to assess levels of aflatoxin B1.

Descriptive statistics and bivariate analyses were used to explore how agricultural practices may be associated with AFB1 exposure levels. Data was collected electronically and analyses were conducted with Stata® SE version 14.

Figure1: Maternal venous blood draw (for aflatoxin B1testing)

Figure 2: Pre-natal interview with mother

Results

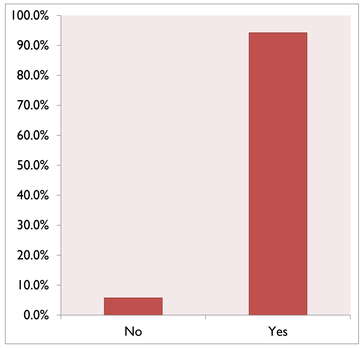

Figure 3: Percentage of participants with detectable AFB_1

AFB_1 albumin-adducts were detected in 94% of the serum samples.

The mean serum AFB_1 concentration was 3.2 (±8.3) pg/mg-albumin adducts. The geometric mean was 1.37 (CI: 1.30-1.44) pg/mg-albumin adducts.

AFB_1 levels ranged from undetectable (<0.4) to 147 pg/mg-albumin adducts.

Of the participants, 76% reported producing rice, 51% pulses, 61% wheat, 25% corn and only 2% reported producing groundnuts.

The majority of producers reported drying their crops immediately after harvest (from 86% for corn and almost 100% for rice).

Indoor mud bins (Dehari) were the most commonly used storage structures for rice, pulses and wheat, while sealed containers (made of plastic, metal or glass) and plastic bags were the most commonly used storage structures for corn and groundnuts.

Figure 4: Local crop storage units

The majority of participants stored rice, pulses and wheat, typically in Deharis, for very long periods of time (≈ one year or more).

Storage period was significantly associated with AFB1 levels for rice (p=0.041).

Results

Figure 5: Moldy maize, peanuts and chilies from local households

Insects were reported as the most common storage problem followed by rodents and mold. Very few participants reported using insecticides in or around the storage area for rice, pulses and wheat, and use of fungicides in and or around the storage area was essentially non-existent.

Participants reported drying most rice and wheat on the field; pulses on the field, on dirt and on plastic sheets; and corn and groundnuts on dirt and plastic sheets.

The most common method reported for verifying crop dryness was visual inspection (65% rice, 45% pulses, 52% wheat, 63% corn) for all crops, except for groundnuts, for which cracking sound with teeth and visual inspection were the most commonly used methods. Method of inspection was significantly associated with AFB1 levels for wheat (p=0.023).

Conclusions and Future Work

The presence of aflatoxin exposure was widespread among the sub-sample with AFB1 results.

Most participants reported producing at least one food considered to be at high risk for aflatoxin contamination.

While data analysis is ongoing, preliminary findings show a few practices such as method for dryness verification and storage period were associated with AFB1 for certain crops.

Future work will study additional variables to identify potential risk factors for aflatoxin exposure in this population.

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