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Caregivers' Awareness of Aflatoxin Contamination in Ready-to-Cook Complementary Foods and Its Associated Factors Among Children Aged 6 to 23 Months in Tanzania

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ABSTRACT

Background: Complementary foods are a vital component of infant and young child nutrition; however, they are highly vulnerable to aflatoxin contamination, which poses significant public health concerns. This study assessed caregivers' awareness of aflatoxin contamination in complementary foods and the associated factors among children aged 6 to 23 months.

Methods: A community-based cross-sectional study design was conducted. Data were collected using a structured questionnaire that gathered information on the socio-demographic characteristics of caregivers and children, as well as caregivers' awareness of aflatoxin contamination. Data analysis was performed to identify factors associated with awareness.

Results: Overall, 77% of caregivers were unaware of aflatoxin contamination in complementary foods and its health implications. Awareness was significantly associated with marital status, with married (AOR, 1.45; 95% CI, 1.21 to 1.74; *P*<.001) and separated/divorced caregivers (AOR, 1.77; 95% CI, 1.46 to 2.15; *P*<.001) more likely to be aware compared to unmarried caregivers. Educational level showed a positive association with awareness, with a higher likelihood among caregivers with primary (AOR, 1.76; 95% CI, 1.63 to 1.91; *P*=.003), secondary (AOR, 1.80; 95% CI, 1.64 to 1.99; *P*=.038), and tertiary education (AOR, 1.92; 95% CI, 1.57 to 1.94; *P*=.006). Self-employment was also associated with higher awareness of aflatoxin contamination (AOR, 9.74; 95% CI, 1.83 to 51.88; *P*=.008). Conversely, caregivers with female children were less likely to be aware compared to those with male children (AOR, 0.25; 95% CI, 0.053 to 0.897; *P*=.0085).

Conclusion: The study reveals generally low awareness of aflatoxin contamination among caregivers of young children. There is a need for strengthened and targeted food safety education interventions to improve knowledge and promote safe complementary feeding practices, thereby reducing aflatoxin exposure and its associated health risks in children.

BACKGROUND

Aflatoxins are a subgroup of mycotoxins, which are fungal toxins, and are among the most potent naturally occurring carcinogens. These are a group of structurally related polyketide mycotoxins that contaminate animals and field crops such as groundnuts, maize, cottonseed, cassava, cashew nuts, sorghum, millet and rice.[1-6] Contamination begins in the field through produce-soil contact and worsens with poor drying, drought, or insect damage.[7-9] The most toxic aflatoxin is B1, which is poorly degraded in the rumen and is quickly excreted into milk as metabolite aflatoxin M1.[2] Aflatoxins are toxic substances naturally produced by moulds (fungi) that may contaminate agricultural commodities as they grow on them.[6-8] Despite efforts to control fungal contamination, toxigenic fungi are everywhere in nature, and they can contaminate a wide range of agricultural products due to mouldy infestation both before and after harvest wherever humidity and temperature are sufficient.[2,7-9] The key environmental factors influencing whether a substrate can support mould growth are moisture content, temperature and duration of exposure.[10-15] Therefore, effective drying, proper storage and suitable transportation are essential for prevention.[1,16-18]

Globally, there are an estimated 450 types of mycotoxins, with aflatoxins being some of the most toxic and dangerous to humans and animals.[5,6] It is estimated that mycotoxins contaminate 25% of crops worldwide,[18] with more than 4.5 billion people living in developing countries exposed to chronic toxicity.[1] Six out of 18 different types of aflatoxins that have been identified are considered important and are

designated as B1, B2, G1, G2, M1, and M2, respectively.[18,19] These aflatoxin groups exhibit molecular differences. For example, the B-group aflatoxins (B1 and B2) have a cyclopentane ring while the G-group (G1 and G2) contains the lactone ring.[20] Whereas the B-group aflatoxins exhibit blue fluorescence, the G-group exhibits yellow-green fluorescence under ultraviolet (UV) light, thus making the use of fluorescence important in identifying and differentiating between the B and G groups.[7-9,21]

Aflatoxin B1 is the most common,[21] and the most widespread,[22, 23] in the world and accounts for 75% of all aflatoxin contamination of food and feeds.[24] Aflatoxin B1 is among the most potent carcinogenic compounds found in human and animal foods.[7, 9] Aflatoxins M1 and M2 are hydroxylated products of aflatoxins B1 and B2, respectively, and are associated with cow milk upon ingestion of B1 and B2 aflatoxin-contaminated feed. Furthermore, once formed from B1 and B2 forms, aflatoxins M1 and M2 remain stable during milk processing.[24, 25]

The level of awareness of aflatoxin contamination in foods and feeds in many developing countries is extremely low or non-existent altogether. For example, awareness of the potential danger posed by aflatoxin contamination of foodstuffs and basic knowledge of aflatoxin be 82% among communities in Tanzania.[25, 26.] Another study conducted in Kenya found that 41% of caregivers were not aware of the aflatoxin contamination of foodstuffs. [27-29] Most of the people living in rural areas use local products in the preparation of complementary foods, mainly cereals like maize and groundnuts, which come with an added risk of exposure to aflatoxins.[30-32] Dietary exposures to aflatoxin B1 has been identified as a major etiological risk factor for the development of hepatocellular carcinoma.[31, 32]

Large numbers of ordinary people in East African countries produce and consume food crops that are at risk of aflatoxin contamination. The same crops are also traded directly and through networks of middlemen in rural and urban markets that are not regulated for aflatoxins.[32-34] Agricultural extension officers might not be knowledgeable about aflatoxins and may not be able to actively raise awareness among farmers on aflatoxins, such as Good Agricultural Practices (GAP) and improved post-harvest handling.[33-35] There is strong agreement that aflatoxin contamination of important crops such as maize and groundnut poses a significant threat to public health, trade and livelihoods in Tanzania.[17,36,37]

The complementary feeding period, 6 to 23 months of age, is a critical window in which children are at risk of undernutrition. It is during this transition from exclusive breastfeeding to complementary foods that growth faltering often begins, contributing to the high burden of malnutrition among children.[38-40] Previous scholars have reported the association between aflatoxin contamination and undernutrition.[41-45] Another study conducted in Tanzania also showed that 40.4% of the participants were stunted, and a significant association was found between stunted growth and dietary exposure to AFB1.[42] This implies that early introduction of cereal-and groundnut-based complementary foods in Tanzania is associated with high risk of aflatoxin exposure and impaired growth in children. Although aflatoxin contamination of staple foods is widespread in low-income countries, awareness of its occurrence and the associated health risks from contaminated complementary foods remains limited.[27, 44] Aflatoxin contamination is generally not recognized as a significant food safety concern in local food production systems, and caregivers often lack adequate knowledge of the susceptibility of crops commonly used in the preparation of complementary foods to aflatoxin[17]. This study therefore aims to assess caregivers' awareness of aflatoxin contamination in complementary foods among children aged between 6 and 23 months in Dodoma and Singida regions, Tanzania.

MATERIALS AND METHODS

Description of the Study Area

This study was done in Singida and Dodoma Regions (Figure 1). These Regions form part of the central zone of Tanzania, which experiences low rainfall and short rainy seasons that are often erratic with long periods of drought. These Regions were selected purposively because of semi-arid climatic conditions characterized by temperatures ranging from 35 °C during the day to 10 °C during the night. Extreme temperature changes favour growth of fungi, which signals the possibility of aflatoxin production. Central Tanzania was conveniently selected because of its weather and a previous study indicating aflatoxin contamination in foods.[11,27] In 2016, the effects of aflatoxins in Dodoma and Manyara Regions were reported when there was an outbreak of aflatoxin contamination in cereals and 68 people were reported exposed to the poison, and 20 dead due to liver failure.[38]

Research Design

This study employed a quantitative cross-sectional design, with data collected through structured questionnaires that were assigned unique identification codes before data entry. The duration of this study was one year from May to June 2019 which is the period of post harvest in the study areas.

Sample Size

Sample size of this study was 100 households with children aged between 6 and 23 months. The age range was considered appropriate since it is associated with high rate of stunting which may be partly attributed to aflatoxin contamination in introduced complementary foods.[39, 40]

Sample size (N) of households with parents/caretakers-child pairs in this study was determined by applying the single proportional formula by Magnani,[48] used in the Statcalc program of Epi Info Version 6 as follows. [49]

$N=(t^2)p(1-p)/m^2$

Where;
N = the desired total sample.

t=standard normal deviate value (set at 1.96, which corresponds to the 95%confidence interval level).

m=margin of error, the degree of accuracy (taken to be 5% in this study).

p= the proportion of aflatoxin prevalence for complementary foods, taken to be 93%from baseline data.[50]
Substituting these figures in the above formula gives

FIGURE 1: Study Area

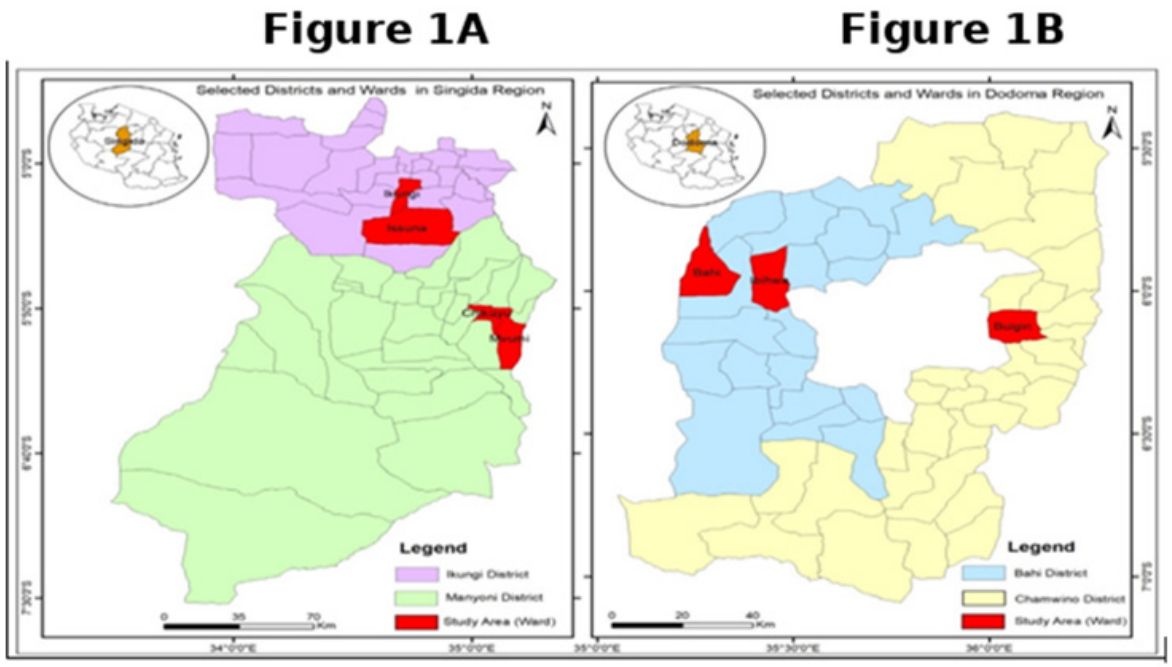


Figure 1A: The Maps of Ikungi and Manyoni Districts of Singida Region and Figure 1B: The Maps of Bahi and Chamwino Districts in Dodoma Region of the Study Areas.

a minimum sample size of 100. This sample assumes that a household has one child aged between 6 and 23 months. In case a household has more than one child aged between 6 and 23 months, one child was randomly selected to avoid clustering of information.

Sampling Procedures

A multistage probability sampling technique was used to select 100 households with children aged 6–23 months from Dodoma and Singida Regions, Tanzania. Districts, divisions, wards, villages/streets, and sub-wards were selected sequentially using simple random sampling procedures. Within selected clusters, eligible households were identified with support from community leaders and randomly selected by the research team. The study included 50 households from each region. In each selected household, the primary caregiver responsible for feeding and caring for the eligible child was recruited and interviewed using a structured questionnaire.

Data Collection

Four research assistants were recruited and trained for four days before the work of data collection commenced. Selection was based on previous experience in research work in communities' health assessment. The pre-test survey was carried out in an area not selected for the study and was done two weeks before the actual study took place. The survey included sections on socio-demographics for the child and caregivers, cultural beliefs and practices that are associated with aflatoxin (fungi) contamination in complementary food, handling and storage of crops used in preparation of complementary foods, and food insecurity.

Data Management

At the end of each day of data collection, the Principal Investigator (PI) assessed the completed interview questionnaires to look for omissions and inappropriate responses. This was aimed at improving the quality of data collection. There were also frequent debriefing meetings to discuss the progress of data collection. All the completed questionnaires were stored in a locked cabinet to be destroyed at the end of the study. Only the PI has the key to that cabinet.

Statistical Analysis

Statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) software, version 21. All statistical tests were two-sided, and a *P*-value of less than 0.05 was considered indicative of statistical significance. Data analysis was performed to examine associations between independent and dependent variables. Descriptive statistics, including frequencies, means, and standard deviations, were used to summarize participants' socio-demographic characteristics and their level of awareness of aflatoxin contamination.

Caregivers' awareness scores were computed by assigning

one point for each correct response and zero points for incorrect responses. The total score was converted into a percentage, and respondents who achieved ≥70% of the total score were categorized as aware, whereas those scoring <70% were classified as not aware. This classification approach was adapted from scoring methods commonly applied in Knowledge, Attitude and Practice (KAP) studies.[51] Each correct awareness response ("Yes") was assigned a score of 1, while an incorrect response ("No") was assigned a score of 0. The total awareness score ranged from 0 to 10 points. Caregivers who scored ≥70% (7–10 points) were categorized as having adequate awareness ("aware"), whereas those scoring <70% (0–6 points) were classified as having inadequate awareness ("not aware"). The categorized awareness status was used as the dependent variable for statistical analysis.

To identify factors associated with awareness of aflatoxin contamination, logistic regression analysis was applied. A bivariate logistic regression model was first used to assess the relationship between each independent variable and the outcome variable. Variables that were statistically significant in the bivariate analysis, as well as those considered biologically relevant, were subsequently entered into a multivariable logistic regression model to control for potential confounding and to determine independent predictors of awareness. The strength of associations was expressed using odds ratios (OR) with 95% confidence intervals (CI) and *P*- value <0.05.

Validity and Reliability

The structured questionnaire was developed based on the study objectives and relevant literature on caregivers' awareness and demographic characteristics. Content validity was assessed through expert review to ensure clarity, relevance, and consistency of the questionnaire items. The tool was pre-tested among caregivers with similar characteristics to the study population, and necessary adjustments were made before data collection. Reliability was evaluated using Cronbach's alpha coefficient to assess the internal consistency of awareness-related items, with a value of ≥0.70 considered acceptable. Data collectors were trained, and standardized procedures were followed to ensure consistency and quality of the collected data.

Research Clearance and Ethics

This study was approved by the Institution Research Ethics Committee (IRREC) Ref. No.UDOM/DRP/134/VOL IV/26 of The University of Dodoma. The permission to conduct the research in Dodoma and Singida Regions was granted by the President's Office with Ref. No. CHA.9/275/01/18. Each respondent in the study was briefed on what the study is all about and informed that their participation was voluntary; nobody was forced to participate in the study. Also, the respondents were assured of confidentiality and anonymity. Before the interview, participants were requested to give their verbal consent for participation.

RESULTS

Demographic Characteristics and Awareness of Aflatoxin of the Caregivers

All 100 eligible caregivers of children aged 6 to 23 months who were approached participated and completed the study questionnaire, yielding a 100% response rate. The complete participation was achieved through effective community sensitization, clear communication of the study objectives, and administration of questionnaires through face-to-face interviews. Table 1 shows the distribution of caregivers by demographic characteristics and aflatoxin awareness in Bahi, Chamwino, Ikungi, and Manyoni Districts. Of the 100 children who were enrolled in the study from the 100 households with children aged between 6 and 23 months, 64 were boys, and 36 were girls. The age of caregivers ranged from 17 to 80 years, with a mean age (SD) of 27 (6.4) years. About 36 (36%) of the respondents were aged 24-30 years, while respondents aged above 30 years were 29 (29%). Females made up 70 (70%) of the respondents. The results also showed that 77% of the caregivers were not aware of aflatoxin contamination in complementary foods and their health effects.

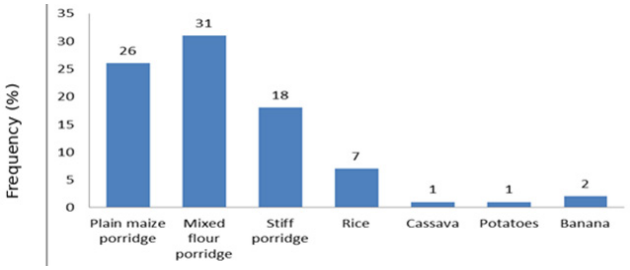
TABLE 1: Demographic Characteristics and Awareness of Aflatoxin of the Respondents (N= 100)

Variable	Frequency (n)	Percentage (%)
District		
Ikungi	25	25.0%
Chamwino	25	25.0%
manyon	25	25.0%
bahi	25	25.0%
Sex		
Male	30	30.0%
Female	70	70.0%
Age		
17-24	39	39.0%
25-34	47	47.0%
35-45	14	14.0%
Current Marital Status		
Not Married	31	31.0%
Married	69	69.0%
Education Level		
No formal education	10	10.0%
Primary	65	65.0%
Secondary and Higher	25	25.0%
Employment		
Agriculture	67	67.0%
Employed	23	23.0%
Not Employed	10	10.0%
Aware with aflatoxin		
Yes	23	23.0%
No	77	77.0%

Complementary Foods

Complementary foods for the children comprised mainly of ingredients from locally available food products. In Figure 2, the common foods were maize porridges (thin porridge and stiff porridge), bananas, potatoes, rice, finger millet, beans, cassava, groundnuts, meat, fresh cow's milk, eggs, vegetables and fruits. However, consumption of some of these foods differed by village depending on the dominant food crops grown in the area. (Figure 2)

FIGURE 2: Complementary Foods



Caregivers' Awareness on Aflatoxin Contamination

The overall awareness level of caregivers regarding aflatoxin contamination in the study areas is presented in Table 2. Awareness was assessed using a 10-item questionnaire, with each correct "Yes" response assigned a score of 1 and each "No" response assigned a score of 0. The total awareness score ranged from 0 to 10 points. Caregivers who achieved a score of ≥7 (≥70%) were categorized as aware, whereas those scoring <7 (<70%) were categorized as not aware. Overall, only 23 (23.0%) caregivers demonstrated adequate awareness of aflatoxin contamination, while the majority, 77 (77.0%), had inadequate awareness.

Factors Associated with Awareness of Aflatoxin Contamination

Bivariate and multivariate logistic regression analyses were done to determine the association of demographic factors with awareness of aflatoxin contamination. Results from the bivariate logistic regression analysis showed that marital status (married, separated/divorced), education level (primary, secondary, collage/ university), employment status (self-employed) and caregivers with girl children were significantly associated with awareness of aflatoxin contamination compared with their respective reference category ($P<.05$).

Table 3 shows factors associated with awareness of aflatoxin contamination. The model also reveals that there is a statistically significant relationship between aflatoxin awareness and marital status, with those married (AOR 145; 95% CI, 1.21 to 1.74, $P<.001$); separated or divorced (AOR 1.77; 95% CI, 1.21 to 1.74, $P<.001$). It was also noted that awareness of risk of aflatoxin increased with the education level, those with primary (AOR=1.76; CI, 1.63 to 1.91, $P=.003$), secondary (AOR=1.8, CI=1.64 to 1.99, $P=.038$) and those with college or university education level (AOR=1.92, CI=1.57 to 1.94, $P=.006$). It was also observed that self–employed respondents (AOR=9.74, CI=1.829 to 51.878, $P=.008$) were more aware of aflatoxin compared to unemployed respondents, which was used as the reference category. Although not significant, employed (AOR=0.745, CI=0.021 to 26.467, $P=.872$) and Housewife/houseman (AOR=0.94, CI=0.09-10.4082) were less aware about aflatoxin compared to unemployed respondents. The result also reveals that respondents with girl children (AOR=0.25, CI= 0.0527 to 0.897, $P=.0085$) were less aware about aflatoxin compared to those with boy children. Although gender was not significant, the study noted that females (AOR=4.5357, CI=0.8806 to 23.3603, $P=.071$) were more aware about aflatoxin compared to male respondents. The model also shows that birth weight and children's age ($p>.05$) were not statistically significantly associated with awareness of aflatoxin.

TABLE 2: Caregivers' Awareness Scores on Aflatoxin Contamination (N=100)

No.	Awareness Questions	Aware (Yes) n (%)	Not aware (No) n (%)
1	Have you ever heard about aflatoxin contamination in complementary foods?	20 (20.0%)	80 (80.0%)
2	Are you aware that some crops can become contaminated with aflatoxins?	22 (22.0%)	78 (78.0%)
3	Do you know that aflatoxins are produced by molds/fungi that grow on foods?	18 (18.0%)	82 (82.0%)
4	Are you aware that poor drying and improper storage of crops can increase aflatoxin contamination?	25 (25.0%)	75 (75.0%)
5	Do you know that aflatoxin contamination can occur in cereals and complementary foods given to children?	24 (24.0%)	76 (76.0%)
6	Are you aware that consuming aflatoxin-contaminated foods may negatively affect child health?	27 (27.0%)	73 (73.0%)
7	Do you know that aflatoxin exposure may contribute to poor growth and impaired immunity in children?	19 (19.0%)	81 (81.0%)
8	Are you aware that sorting and removing moldy grains can reduce aflatoxin exposure?	21 (21.0%)	79 (79.0%)
9	Do you know that proper drying of grains before storage helps prevent contamination?	28 (28.0%)	72 (72.0%)
10	Are you aware that dry and well-ventilated storage reduces aflatoxin risk?	26 (26.0%)	74 (74.0%)

TABLE 3: : Socio-demographic factors associated with awareness of aflatoxin contamination (N=100)

Variables	Crude Odds Ratio (OR) at 95%CI	*P-Value*	Adjusted Odds Ratio (AOR) at 95%CI	*P-Value*
Age of respondents	0.67(0.57, 1.13)	.905	0.99(0.93, 1.06)	.804
Marital Status				
Not Married	Reference	Reference	Reference	Reference
Married	1.37(1.11– 1.53)	.034	1.45(1.21, 1.74)	<.001
Separated/Divorced	1.54(1.25–2.05)	.021	1.77(1.46,2.15)	<.001
Widowed	1.01(0.99–1.24)	.097	1.21(0.98,1.50)	.076
Education Level				
No education	Reference	Reference	Reference	Reference
Primary	1.55(1.23–1.65)	.032	1.76(1.63,1.91)	.003
Secondary	1.7(1.62–1.92)	.028	1.8(1.64,1.99)	.038
College/University	1.82(1.44–2.34)	.007	1.92(1.57,1.94)	.006
Earning/Employment				
Unemployed	Reference	Reference	Reference	Reference
Employed	0.85(0.45–4.67)	.670	0.745(0.02, 26.47)	.872
Self-employed	9.74(1.65–15.87)	.008	9.74(1.83, 51.88)	.008
Housewife	0.87(0.12–10.42)	.790	0.97(0.09, 10.41)	.98
Gender				
Male	Reference	Reference	Reference	Reference
Female	3.35(0.99–15.47)	.082	4.53(0.88, 23.36) .071	
Child Sex				
Boy	Reference	Reference	Reference	Reference
Girl	0.35(0.12–0.78)	.034	0.25(0.05–0.90)	.0085
Birth weight	1.41(0.58–4.57)	.280	1.72(0.65–4.56)	.278
Children age	1.03(0.87–1.15)	.750	1.0003(0.99–1.004)	.850

DISCUSSION

Aflatoxin contamination in food is recognized as a major global public health challenge, largely driven by inadequate post–harvest handling practices, poor storage conditions, high humidity, warm temperatures, and limited awareness among farmers and caregivers.[2, 11–13] The findings of this study showed that 77% of caregivers were not aware of aflatoxin contamination in complementary foods or its potential health consequences. This observation is consistent with previous studies conducted in other settings.[16,17,26,46] Evidence from the literature indicates that long-term consumption of aflatoxin-contaminated foods is associated with a range of adverse health outcomes, including stunted growth, impaired physical and cognitive development, reduced immune function, and an increased risk of liver disease. Consequently, strengthening awareness and education among farmers and caregivers is critical for reducing mycotoxin exposure and mitigating aflatoxin-related health risks in the study area.

The present study found significant associations between socio-demographic characteristics and caregivers' awareness of aflatoxin contamination in crops used for preparing complementary foods. The associated factors included marital status, caregivers' level of education, self-employment status, and having female children. In particular, the findings indicated that caregivers' awareness of the risks of aflatoxin contamination increased with higher levels of education. This observation is in agreement with the findings reported by Dosman et al,[52] who noted that individuals with higher educational attainment were generally better informed and more aware of food-related risks, including those associated with food additives, and compared to individuals with lower educational levels. Comparable findings were also reported by Mutiga et al.[53] and Jolly et al.[54] who observed that higher educational attainment was associated with improved understanding and adoption of aflatoxin prevention practices among caregivers. These findings underscore the importance of strengthening caregiver education and food safety awareness initiatives as a strategy to reduce aflatoxin contamination and exposure among young children.

The current study demonstrated a significant relationship between marital status and awareness of aflatoxin contamination. Married participants were found to have higher levels of awareness regarding aflatoxin contamination compared to unmarried participants. This finding is consistent with previous research conducted in Ghana, [54] which reported that household and social characteristics significantly influenced awareness and perceptions of aflatoxin contamination. Similarly, another study,[54-56] revealed that household social and economic conditions play a crucial role in determining the adoption of aflatoxin prevention measures within African communities. One possible explanation for these findings is that married individuals may have greater access to information through communication, mutual support, and shared decision-making between spouses. Such collaboration within households may facilitate the

adoption of appropriate grain drying techniques, improved storage practices, and safe food preservation methods, thereby reducing the risk of aflatoxin contamination.

Concerning employment status, the present study found that self-employed participants were more likely to possess greater awareness of aflatoxin contamination compared to those in other employment categories. This finding is consistent with evidence from a study conducted in Kenya, [53] which reported that individuals involved in agricultural-related activities were more likely to adopt aflatoxin prevention strategies when equipped with sufficient knowledge and training. A possible explanation for this observation is that self-employed individuals may have more opportunities and flexibility to participate in agricultural extension services, community education programs, and food safety training.

The present study further demonstrated that caregivers of female children were more likely to have greater awareness of aflatoxin contamination than caregivers of male children. Evidence from previous studies suggests that, in some household contexts, female children tend to spend more time with caregivers during food preparation and feeding, which may influence caregivers' practices and attentiveness toward food safety and hygiene measures. [54-57] This closer interaction may contribute to improved awareness and implementation of strategies aimed at reducing food contamination. Nonetheless, strengthening caregiver education on safe complementary feeding practices for all children, regardless of sex, remains essential to minimizing aflatoxin exposure and supporting healthy child growth and development.

CONCLUSION AND RECOMMENDATIONS

The results of this study revealed that more than three-quarters of caregivers lacked awareness regarding aflatoxin contamination in complementary foods, despite being primarily responsible for household food preparation, storage, and feeding practices. The study further identified several socio-demographic factors, including marital status, educational level, self-employment status, and caring for a female child, as significant determinants of caregivers' awareness of aflatoxin contamination. These findings imply that social and economic characteristics may influence caregivers' knowledge and practices related to food safety and aflatoxin prevention. Consequently, there is a strong need to strengthen educational and awareness programs for caregivers on the health risks associated with aflatoxin contamination in complementary foods, together with effective prevention and control strategies. In addition, interventions promoting safe complementary feeding and proper food handling practices should be directed to all caregivers irrespective of the child's sex, with the aim of reducing aflatoxin exposure and enhancing healthy child growth and development.

Recommendations for Future Research

The following recommendations are suggested for future studies: (a) A broader study covering more regions in Tanzania and other East African countries would provide a more comprehensive understanding of aflatoxin contamination trends; (b) Conducting focus groups or key informant interviews with farmers, traders, and caregivers would provide deeper insights into awareness levels and behavioral factors influencing food safety practices; (c) Leveraging advanced molecular and spectroscopic methods for aflatoxin detection in food samples would enhance the study's scientific rigor and applicability.

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