

Aflatoxin Awareness and Preventive Behaviour in A Malaysian University Population: Implications For Risk Communication and Food Safety Education.

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ABSTRACT

Objective: This study aimed to assess the level of aflatoxin awareness and the extent of preventive behaviours among students and staff at a Malaysian university, and to investigate the relationship between these factors and attitudes, with the goal of informing risk communication and food safety education strategies.

Background: Aflatoxin contamination remains a significant food safety concern in tropical regions such as Malaysia, where environmental conditions favour fungal growth in food commodities. However, evidence on aflatoxin-related awareness and preventive behaviour among tertiary education populations remains limited.

Methods: A cross-sectional survey was conducted between November 2025 and January 2026 among students and staff at SEGi University, Kota Damansara, Selangor, Malaysia (n = 400). A structured questionnaire was used to assess knowledge, attitudes, and practices (KAP) related to aflatoxin contamination. Data were analysed using non-parametric statistical methods following assessment of normality, including the Mann–Whitney U test for group comparisons and Spearman's rank correlation.

Results: More than half of the respondents demonstrated poor knowledge (56.5%), while 32.5% had moderate and 11.0% had good knowledge. The mean knowledge scores were 3.09 ± 3.03 among students and 3.15 ± 3.51 among staff. Attitudes were predominantly neutral (53.8%), with mean scores of 14.08 ± 3.59 (students) and 14.23 ± 3.73 (staff). Preventive practices were comparatively higher, with 57.0% of respondents reporting good practices; mean practice scores were 15.46 ± 3.02 among students and 16.84 ± 3.11 among staff. No significant differences were observed between students and staff in knowledge ($p = 0.844$) or attitude ($p = 0.747$), while practice scores were significantly higher among staff ($p < 0.001$). Knowledge showed a strong positive correlation with attitude ($r_s = 0.605$, $p < 0.001$), whereas attitude demonstrated a moderate positive correlation with practice ($r_s = 0.372$, $p < 0.001$). The direct association between knowledge and practice was weak ($r_s = 0.174$, $p < 0.001$).

Conclusions: The findings reveal a notable knowledge–practice gap, with satisfactory preventive behaviours observed despite limited aflatoxin-specific knowledge. This suggests that practices are likely driven by general food safety habits rather than hazard-specific awareness. To effectively reduce exposure risks, educational strategies must move beyond knowledge dissemination. Future interventions should actively target the behavioural and attitudinal drivers within university populations.

Keywords: aflatoxin contamination, quality education, food safety, preventive behaviours, risk communication, household food, responsible consumption and production, learning education, Malaysia

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INTRODUCTION

Aflatoxins are toxic secondary metabolites produced primarily by *Aspergillus* species that contaminate staple food commodities such as cereals, nuts, and dairy products [1–3]. Among them, aflatoxin B₁ is the most potent and has been classified as a human carcinogen due to its strong association with hepatocellular carcinoma [1,4]. These toxins are of particular concern because they are

chemically stable and can persist despite conventional food processing methods, including cooking and storage [2,5].

In tropical and subtropical regions, environmental conditions such as high temperature and humidity favour fungal growth and toxin production, increasing the risk of contamination along the food supply chain [2,6]. Malaysia, with its warm and humid climate, presents conditions

conductive to aflatoxin contamination in commonly consumed foods, including rice, peanuts, and dairy products[7,8]. Despite existing regulatory limits and monitoring systems[9,10], studies continue to report the presence of aflatoxins in food products, indicating ongoing exposure risks within the population [8,11].

While the occurrence and toxicological effects of aflatoxins are well established, limited attention has been paid to behavioural determinants that influence exposure risk. Furthermore, limited evidence exists on knowledge, attitudes, and preventive practices related to aflatoxin contamination among university populations in Malaysia[11,12]. Understanding these factors is essential, as awareness and risk perception play an important role in shaping food safety behaviours and reducing exposure risk.

Therefore, this study aimed to evaluate aflatoxin awareness and preventive behaviours among students and staff at a university in Selangor, Malaysia, and to examine their relationship with attitudes to inform risk communication and food safety education strategies.

2. Methods

A cross-sectional survey was conducted between November 2025 and January 2026 among students and staff at SEGi University Kota Damansara, Selangor, Malaysia, to assess knowledge, attitudes, and practices (KAP) related to aflatoxin contamination. Eligible participants were individuals aged ≥ 18 years who were enrolled or employed at the university and able to complete a self-administered questionnaire in English.

Participants were recruited via a QR code and survey link distributed through institutional email, messaging platforms, and university communication channels, using a stratified convenience sampling approach to ensure representation among students and staff, as well as across health-related and non-health-related fields. Participation was voluntary, and electronic informed consent was obtained prior to accessing the survey.

The minimum sample size was calculated using a single-proportion formula ($Z = 1.96$, $P = 0.50$, $d = 0.05$), yielding 384 participants. To account for incomplete responses, the target sample size was increased, and 400 complete responses were included in the final analysis.

Data were collected using a structured questionnaire adapted from previously validated aflatoxin KAP

instruments and related behavioural models [8,12]. The instrument comprised four sections: sociodemographic characteristics, knowledge (10 dichotomous items; score range 0–10), attitude (4 items; 5-point Likert scale; score range 4–20), and practice (4 items; 5-point frequency scale; score range 4–20). Knowledge items were scored as 1 (correct) or 0 (incorrect/“don’t know”), while Likert responses were summed to generate composite scores, with higher values indicating more favourable outcomes.

Domain scores were categorised using a predefined 60% threshold: knowledge (poor, moderate, good), attitude (negative, neutral, positive), and practice (poor, fair, good). Internal consistency was assessed using Cronbach’s alpha, yielding values of 0.883 (knowledge), 0.665 (attitude), and 0.643 (practice), indicating acceptable reliability[13,14].

Responses were collected anonymously via an online platform and exported for analysis. Only complete responses were included, and records with missing data in key KAP variables were excluded from domain-level analysis.

Data were analysed using IBM SPSS Statistics (version 27). Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarise participant characteristics and KAP scores. The normality of the data was assessed using the Shapiro–Wilk test, which indicated that the KAP scores were not normally distributed ($p < 0.05$). Accordingly, non-parametric methods were employed. Differences between groups were evaluated using the Mann–Whitney U test, while associations between KAP domains were examined using Spearman’s rank-order correlation. A two-sided p-value of < 0.05 was considered statistically significant.

Ethical approval was obtained from the SEGi University Research Ethics Committee prior to data collection. Participation was voluntary, and confidentiality and anonymity were maintained throughout the study.

3. Results

A total of 400 complete responses were included in the analysis, comprising 307 students (76.8%) and 93 staff members (23.2%) (Table 1), female respondents accounting for 59.2% ($n = 237$) of the sample.

Table 1. Sociodemographic Characteristics of Respondents (n = 400)

Variable	Category	n	%
Age Group	< 20	43	10.8
	20–24	195	48.8
	25–29	71	17.8
	30–39	20	5.0
	40–49	47	11.8

	≥ 50	24	6.0
Gender	Male	163	40.8
	Female	237	59.2
Role	Students	307	76.8
	Staff	93	23.2
Field of Study/Work	Health/Medical	163	40.8
	Non-Health/Non-Medical	237	59.2

Overall KAP levels

Poor knowledge predominated, with 56.5% of respondents classified as having poor knowledge, 32.5% moderate knowledge, and 11.0% good knowledge. The mean knowledge score was 3.09 ± 3.03 among students and 3.15 ± 3.51 among staff.

Attitudes were largely neutral, with 53.8% of respondents falling within this category, while 37.8% demonstrated positive attitudes and 8.5% negative attitudes. The mean

attitude score was 14.08 ± 3.59 for students and 14.23 ± 3.73 for staff.

Preventive practices were comparatively higher, with 57.0% of respondents reporting good practices, 40.5% fair practices, and 2.5% poor practices. The mean practice score was 15.46 ± 3.02 among students and 16.84 ± 3.11 among staff (Table 2).

Table 2: Overall Knowledge, Attitude, and Practice (KAP) Levels Among Respondents (n = 400)

Domain	Level	n	%
Knowledge	Poor	226	56.5
	Moderate	130	32.5
	Good	44	11.0
Attitude	Negative	34	8.5
	Neutral	215	53.8
	Positive	151	37.8
Practice	Poor	10	2.5
	Fair	162	40.5
	Good	228	57.0

attitude scores ($p = 0.747$). However, practice scores were significantly higher among staff compared to students ($p < 0.001$) (Table 3).

Group comparisons

There were no statistically significant differences between students and staff in knowledge scores ($p = 0.844$) or

Table 3: Comparison of KAP Scores Between Students and Staff

Domain	Students Mean $\pm$ SD	Staff Mean $\pm$ SD	p-value
Knowledge	3.09 ± 3.03	3.15 ± 3.51	0.844
Attitude	14.08 ± 3.59	14.23 ± 3.73	0.747
Practice	15.46 ± 3.02	16.84 ± 3.11	<0.001

Note: Mann–Whitney U test used; significance set at $p < 0.05$.

Correlation analysis

Spearman's rank correlation analysis demonstrated a strong positive association between knowledge and attitude ($r_s =$

0.605, $p < 0.001$). The relationship between attitude and practice was moderate ($r_s = 0.372$, $p < 0.001$), while the association between knowledge and practice was weak ($r_s = 0.174$, $p < 0.001$) (Table 4).

Table 4: Spearman Correlation Between Knowledge, Attitude, and Practice (n = 400)

Relationship	Spearman's r_s	p-value	Strength of Correlation
Knowledge ↔ Attitude	0.605	<0.001	Strong positive
Attitude ↔ Practice	0.372	<0.001	Moderate positive
Knowledge ↔ Practice	0.174	<0.001	Weak positive

Note: Spearman's rank-order correlation was used because KAP scores were not normally distributed. Significance level set at $p < 0.05$.

4. Discussion

The study uncovered a noticeable gap between knowledge and practice, where awareness of aflatoxin-specific risks was relatively low, yet reported preventive behaviours were generally positive. This pattern suggests that individuals may be applying general food safety practices without necessarily recognising aflatoxin as a distinct risk. Comparable observations have been reported in former Malaysian and international studies, where awareness of mycotoxins tends to be lower compared to broader food hygiene knowledge [2,11].

One possible explanation is that individuals often rely on visible indicators, such as spoilage, when determining food safety. However, aflatoxin contamination is not detected through smell, taste, or appearance, and it may still be present even in foods that appear normal. In addition, the heat stability of aflatoxins means that routine cooking methods do not effectively eliminate the toxin. As a result, routine food safety practices may not provide sufficient protection against exposure[9].

The relationships observed between KAP domains provide further insight. Although knowledge was strongly associated with attitude, its direct relationship with practice was comparatively weak. In contrast, attitude demonstrated a stronger correlation with behaviour. This may reflect that awareness of risk and level of concern may play a vital role in influencing behaviour more than factual knowledge alone. Comparable patterns have been described in other KAP-based studies, where attitudes act as a key link between knowledge and actual practices [4,8].

From a public health perspective, these findings highlight the need for interventions that extend further than information dissemination. Educational strategies should not only improve knowledge of aflatoxin contamination but also strengthen risk perception and promote behaviour change. Targeted risk communication that emphasizes the weaknesses of visible inspection and routine food handling practices may enhance the effectiveness of prevention efforts, particularly in populations with limited awareness. This study provides valuable baseline data on aflatoxin-related knowledge, attitudes, and practices within a university population in Malaysia. The findings contribute to the regulated body of evidence in this area and underscore the importance of addressing both cognitive and behavioural components in food safety interventions.

5. Conclusion

Aflatoxin-related awareness in this university population was limited, indicating a clear knowledge–practice gap. These findings suggest that general food safety behaviours may occur without specific understanding of aflatoxin-related risks, consistent with previous evidence highlighting gaps between awareness and practice in food safety contexts [2,11]. Educational approaches should therefore move beyond general messaging and incorporate targeted risk communication on contamination pathways, health effects, and limitations of routine food handling practices. Future multicenter studies across Malaysian tertiary institutions are warranted to determine the generalizability of these findings and to inform the development of effective, evidence-based public health interventions.

REFERENCE

- Schrenk D, Bignami M, Bodin L, Chipman JK, del Mazo J, Grasl-Kraupp B, et al. Risk assessment of aflatoxins in food. EFSA Journal. Wiley-Blackwell Publishing Ltd; 2020;18. <https://doi.org/10.2903/J.EFSA.2020.6040>
- Jallow A, Xie H, Tang X, Qi Z, Li P. Worldwide aflatoxin contamination of agricultural products and foods: From occurrence to control. Compr Rev Food Sci Food Saf. Blackwell Publishing Inc.; 2021;20:2332–81. <https://doi.org/10.1111/1541-4337.12734>
- Alameri MM, Kong ASY, Aljaafari MN, Ali H Al, Eid K, Sallagi M Al, et al. Aflatoxin Contamination: An Overview on Health Issues, Detection and Management Strategies. Toxins (Basel). MDPI; 2023. <https://doi.org/10.3390/toxins15040246>
- Liu Y, Wu F. Global burden of Aflatoxin-induced hepatocellular carcinoma: A risk assessment. Environ Health Perspect. 2010;118. <https://doi.org/10.1289/ehp.0901388>
- Kumar A, Pathak H, Bhadauria S, Sudan J. Aflatoxin contamination in food crops: causes, detection, and management: a review. Food Production, Processing and Nutrition. BioMed Central Ltd; 2021.

<https://doi.org/10.1186/s43014-021-00064-y>

6. Umar A, Bhatti HS, Honey SF. A call for aflatoxin control in Asia. CABI Agriculture and Bioscience. BioMed Central Ltd; 2023. <https://doi.org/10.1186/s43170-023-00169-z>
7. Khalisanni Khalid, Noorhapizah Napiah, Ruzaina Ishak, Raseetha Siva, Sumaiyah Abdullah. Occurrences of Aflatoxins in Selected Rice Production Areas in Malaysia. *Journal of Tropical Plant Physiology*. 2022;14. <https://doi.org/10.56999/jtpp.2022.14.1.21>
8. Lin Chang W, Abu Saad H, Jamaluddin R, Redzwan Sabran M. Aflatoxin Occurrence, Food Regulations, Dietary Exposure, and Risk Assessment: A Mini Review from the Malaysian Perspective. *Malaysian Journal of Medicine and Health Sciences*. 2023;19:296–306. <https://doi.org/10.47836/mjmhs19.1.38>
9. van der Meulen B. Impact of the codex alimentarius: The influence of the joint FAO/WHO food standards programme on eu food law. *European Food and Feed Law Review*. 2019;14.
10. FIRST SCHEDULE (Regulation 3) FOOD REQUIRING WRITTEN WARRANTY Canned food for infants and children Cereal-based food for infants and children Colouring substance Flavouring substance Full cream milk powder Infant formula Skimmed milk powder

Tea, tea dust, tea extract and scented tea.

11. Lin CW, Jamaluddin R, Saad HA, Sabran MR. Determinants of knowledge, attitude, and practice towards aflatoxin contamination in food and aflatoxin biomarker levels among healthy Malaysian adults. *Malays J Nutr. Malaysian Journal of Nutrition*; 2024;30:323–34. <https://doi.org/10.31246/mjn-2023-0089>
12. Balan B, Dhaulaniya AS, Kumar M, Kumar M, Kumar P. Aflatoxins in food: Prevalence, health effects, and emerging trends in its mitigation—An updated review. *Food Safety and Health*. John Wiley and Sons Inc; 2024. p. 39–71. <https://doi.org/10.1002/fsh3.12030>
13. Joly BM, Gray C, Cousineau K, Pearson K, Harder VS. The development, validity, and reliability of the Researcher Investment Tool. *J Clin Transl Sci*. Cambridge University Press; 2025;9. <https://doi.org/10.1017/cts.2024.673>
14. García-García J, Gil MÁ, Lubiano MA. On some properties of Cronbach's α coefficient for interval-valued data in questionnaires. *Adv Data Anal Classif*. Springer Science and Business Media Deutschland GmbH; 2025;19:831–54. <https://doi.org/10.1007/s11634-024-00601-w..>