

Original Research Article

Effect of educational program on knowledge, attitude and practice towards the quality standards of peanut oils among the supervisors of peanut oil milling factories

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ABSTRACT

Background: Awareness of food safety is found to be linked with associated health risks. Edible oil is important in human daily diets but will affect negatively if not suitable for consumption. Vegetable oils may rancid and lose the nutrition components which are important for body mechanism. The rancidity depends on the improper oil extraction method, handling and storage. Peanut oil is the most preferred oils in Myanmar. Many studies revealed that the developed countries have greater awareness and strict regulation than developing countries. There were also limited research about the quality of edible oils and public health concerns in developing countries.

Method: The interventional study to evaluate the effectiveness of the educational program on the supervisors from 80 peanut oil milling factories at Yangon, Mandalay, Magway and Bago Regions during 2024. This study assessed the knowledge, attitude and practices of the supervisors of the peanut oil milling factories by using the pre-structured self-administered questionnaires at before the intervention, one month and six months after the intervention.

Result: The knowledge, attitude and practice scores were found the significant differences (p value <0.001) by ANOVA and post-hoc test (Bonferroni) revealed the significant differences between baseline, intermediate and end-line.

Conclusion: This study pointed out that the educational program was effective and it was essential to all oil milling factories for both quality and safety of the peanut oils. And also, refresher training needs to conduct repeatedly to maintain the knowledge, attitude and practice levels of the food business operators.

Keywords: Educational program, Knowledge, Attitude and practice, Peanut oil, Aflatoxin

INTRODUCTION

In order to keep a healthy life, our daily meal has to include varieties of macronutrients and micronutrients. Supply of the macronutrients as fundamental products becomes the major concern of the food industry supply chain system since the macronutrients are the main sources of various kinds of carbohydrates, protein and fats (lipids). Meanwhile, raising awareness of how importance of fats or consumption of lipids is the public health issue especially in the developing countries. Consumption of

lipids needs to be balance because of its specific physical, chemical and nutritional properties.¹ Generally, beans and seeds are the main source of vegetable oils. Peanut is one of the major crops in Asia where its production is about 64% of the world.²

In spite of being important lipid source in our daily diet, some vegetable oils are far from the standards of the market requirements in terms of the physicochemical characteristics or for the texture and stability of the food products. The majority of food and feed crops throughout

the world is infected by fungi, and up to 60–80% of the total world's food crops are damaged by mycotoxins, with aflatoxins as the prime etiological agent.³ There are four major types of best known and studied aflatoxins and they are aflatoxin B1 (AFB1), aflatoxin B2 (AFB2), aflatoxin G1 (AFG1) and aflatoxin G2 (AFG2).⁴

Intake of diets with high portions of contaminants for long duration can result in significant complications and sometimes may even prove to be fatal.⁵ International Agency for Research on Cancer (IARC) has declared group-1 aflatoxins (comprising AFB1, AFB2, AFG1, AFG2, aflatoxin M1 (AFM1)) to be highly carcinogenic to human health.⁶

Mycotoxins are able to cause acute and chronic illness including cancers since they are potential pathogens, mutagens, teratogens and genotoxic complexes. To be exact, the higher the exposure to the aflatoxins, the more severe the negative effects. The exposure to aflatoxin contaminated food may increase the risk of incidence of hepatocellular carcinoma up to 30 times, especially in case of exposure to hepatitis B virus. Aflatoxins can pass the blood-testis barrier and it not only causes damage to the testicular tissue but also negatively affects spermatogenesis, resulting in the deterioration of sperm parameters. Even the inhalation of air particles contaminated with aflatoxins may result in tumorous growths in respiratory system. Moreover, lactating mothers who consume aflatoxin-contaminated food, will produce hazardous milk for the breast-feeding infants.⁷

AFB1 present in the food is converted to AFM1 which can initiate immunosuppression, retarded growth, hepatic disorders and carcinogenic effects in children.⁸ Up to 70% of the world inhabitants are exposed to aflatoxins beyond safe limits.⁹ More than 4.5 billion people in developing countries of Africa and Asia are found to be exposed to unsafe aflatoxin levels due to contaminated food consumption.¹⁰

There are also limited research and publications about the importance of quality of edible oils and the public health concerns in developing countries.¹¹ The rancidity depends on the improper oil extraction method, handling and storage. Major factors which influencing the rancidity of vegetable oils are moisture, microorganisms, air, antioxidants and directly exposure to sunlight.¹² Contaminated food is a component of diets of impoverished populations of the developing countries and the scientists and regulatory bodies have to be initiative for making the safe food in the plate of every person in this world. the annual edible oils consumption per capita of Myanmar was 14.39 kg, which has increased up to nearly 64% during the last 20 years.

Edible oil is one of the major factors in human daily diets but it will affect to human health if the oils' quality is not suitable for human consumption. This consumption amount might alarm the policy makers not only food safety

but also food security issues in public health sectors. Peanut oil was the most preferred oils with 61.4% followed by sesame and sunflower oil.¹³

Concerning with knowledge, attitude and practice among food handlers of processed food production, health education program produced the significant improvements in personal hygiene in the intervention group rather than control group, and follow up assessment showed that KAP was sustained over a period of 12 weeks after the intervention.¹⁴ There were some studies to assess the contamination of aflatoxin in peanut and peanut oils in Myanmar but there was no study concerning with health education program as intervention to those responsible persons of food business operators.

Accordingly, this proposed study will be a supportive part of ongoing national policies, a part of departmental activities and it will also be a reference document concerning quality of peanut oils not only for oil milling factories but also for our consumers. The objective of this study was to evaluate the effectiveness of the educational program on the knowledge, attitudes and reported practices of the supervisors of the peanut oil milling factories towards the quality and safety standards of peanut oils including iodine value, acid value, peroxide value and AFB1.

METHODS

Sampling

The interventional study was conducted to the peanut oil milling factories from 20 townships; Hlaing Thar Yar, Khayan, Hlegu and Thakayta Townships in Yangon Region, Chan Aye Thar San, Chan Mya Thar Si, Maharaung Myae, Pyi Gyi Tagon, Aung Myae Thar San and Meikhtila Townships in Mandalay Region, Magway, Pakkoku, Salin and Sin Phyu Kyun Townships in Magway Region, Pyay, Shwe Taung, Inn Ma, Paung De, Nattalin and Thae Kone Townships in Bago Region.

The study period was from January 2024 to December 2024.

Baseline data was collected at January and February 2024, educational program was conducted at March and April 2024, intermediate assessment was done at June, May 2024 and end-line assessment was completed at November and December of 2024.

There were two types of study population; the supervisors and the peanut oil milling factories.

Peanut oil milling factory

Peanut oil milling factories which registered at the oil milling association of Myanmar were selected for the assessment of sociodemographic characteristics of participants and factories.

Inclusion criteria of peanut oil milling factory include, factory which already registered at oil milling association, Myanmar and factory with at least six months' production.

Participant of peanut oil milling factory

Most responsible person from each peanut oil milling factory was assessed the knowledge, attitude and reported practices towards the quality standards of peanut oils.

Inclusion criteria of owner or supervisor of peanut oil milling factory include, participants who participates the entire process of peanut oil production (raw to finished-products) and at least have six months' experience in this factory and already completed 18th birthday.

Exclusion criteria of supervisor of peanut oil milling factory includes the one did not give consent for this study and the one cannot attend the education program which was conducted at March and April 2024.

The required sample size was calculated by the formula of Morgan and Case.¹⁵ A pool variance estimation 239 was referenced by with the correlation coefficient between post-test values (0.5), $\alpha=0.05=1.645$, $1-\beta=0.84$ (power=80%) and the magnitude of minimally significant difference on knowledge, practice scores between base line and follow-up period=1.07, drop-out rate 20% and then total sample size 80 was calculated.¹⁶

Recruitment strategy was included by advertising with posters, sending Viber message to the registered peanut oil milling factories under the oil milling factory association. Poster was delivered to the association of oil mill factory at Yangon as chairman of association has been residing at Yangon office then passing to the other regions. In this poster, detail about the study including intended date and time of introduction was declared. Interested participants were enrolled directly to researcher by phone or email or to chairman of oil mill factory association, Yangon.

Yangon, Mandalay, Magway and Bago Regions are the main economic regions in Myanmar, were selected purposively to reach the required study population. The registered oil milling factories under the association were listed. By means of lottery method, eighty participants were determined after getting consent. One participant per one factory was selected.

If there might an owner and a supervisor in one factory, researcher determined the one who understand well about the entire process of peanut oil production (from raw to end product) as the targeted participant. Informed consent of participants was taken before the assessment and the training.

All participants were assessed by using the pre-structured self-administered questionnaire on knowledge, attitude and reported practices towards the quality standards of peanut oils.

Educational program

This educational program concentrated on the areas that are fundamental and crucial to all peanut oil milling factories including recommended practices for peanut oil milling process, Good Manufacturing Practice (GMP) and quality and safety characteristics of edible oils especially peanut oils. The perception on the training was assessed by the feedback form which consisted of five categories; contents of the training, duration of the training, teaching materials of the training, whether the participants' expectation meet or not and overall rating of the training. The feedback was collected at the end of each training session from all attended participants.

Data management and analysis

The background characteristics variables (age, gender, education, rank, total service in factory, duration of factory, products' market, type of food safety certification, standard operation procedure, history of attending quality standard training and previous market recall experience), were displayed as the descriptive tables.

The independent variables (knowledge score, attitude score, reported practice score) were assessed by the Kolmogorov–Smirnov test whether normally distributed or not. Then, comparison of knowledge score, attitude score, reported practice score between baseline, intermediate and end-line were analyzed by repeated measures analysis of variance (ANOVA). If there was a significant time effect, post-hoc test was tested. The dependent variables (iodine value, acid value, and peroxide value) were assessed by the Kolmogorov–Smirnov test whether normally distributed or not.

Ethical approval

This protocol was submitted to Institutional Review Board (IRB) of University of Public Health, Yangon and approved at 17th January 2024. Teaching aids of education program including PowerPoints, lecture notes, pamphlets, video compact disk, online link for this study were shared to all participants and Oil Milling Association, Myanmar after this study.

RESULTS

Table 1 showed that the mean (SD) age of the study respondents was 47 (12.9) years, median was 47.5, minimum and maximum were found as 23 and 77 years respectively. The mean (SD) factory experience (year) of milling peanut oil was 21.5 (13.5) years, median was 20, minimum and maximum were 1, 70 years respectively. And mean (SD) of the personal experience (year) in the peanut oil milling factory was 15.5 (10.7) years, median was 13, minimum and maximum were 1 and 50 years, respectively.

According to the Table 2, 46-60 years' interval was the most common interval in age group which contributed 36.2% of all participants and 23-30 years interval was the least with 15.0%. In factory experience group, 1-15 years and 16-30 years' intervals were the two intervals which were the most common with 40.0% but 61-70 years interval was the least (1.3 %). In person experience group, 1-15 years' interval was the highest (60.0%) but 31-50 years interval was the only ten percent among three intervals. Male respondents were more than females which were 60, 20 in number and 75.0%, 25.0% respectively. Graduated level was the most educational status in this study with 61.3 % and there were five respondents who got the post-graduate level which contributed the least with 6.2%. In the rank of the peanut milling factory, owner was the dominant status with 86.3% over the supervisor (13.7%).

The descriptive Table 3 revealed that baseline knowledge score was the lowest mean (SD) with 10.5 (4) and the intermediate score was the highest mean (SD) 18.5 (2.1) among the three measurements. And also, the mean (SD) score of end-line 16.7 (2.4) was higher than baseline but lower than the intermediate.

Baseline was the lowest minimum knowledge score with 2 points but intermediate was the highest with 23 points. The mean (SD) of total knowledge scores was 15.3 (4.5). The median of the knowledge scores was 9 at baseline, raised to 19 at intermediate but decreased to 17 at end-line.

The mean (SD) of the baseline attitude scores was the lowest 27.3 (2.3) and mean (SD) of the intermediate scores was the highest 33(2.6). And the end-line mean (SD) score 31.4(SD 2.3) was higher than baseline but slight lower than the intermediate. Baseline was the lowest minimum attitude score with 23 points but intermediate had the highest (38 points).

The mean (SD) of total attitude scores was 30.6(3.4). The median of the attitude scores was 27 at baseline, increased to 33 at intermediate but slight decreased to 31.5 at end-line. And, mean (SD) of the baseline scores of the reported practices was the lowest 13.8 (4.3) and the mean (SD) of

the intermediate scores 16.6(2.5) was the highest. And the end-line mean (SD) score 14.7(2.4) was higher than the baseline but slight lower than the intermediate, which were the same as the above knowledge and attitude scores. Baseline had the lowest practice scores (3 points) and the intermediate got the highest (20 points). The mean (SD) of total reported practice scores was 15.1(3.4). The median of the practice scores was 15 at baseline, raised to 17 at intermediate but fall to 15 at end-line which was the same as baseline. The table 3 expressed that the mean of the baseline scores was the lowest and the intermediate scores were the highest. There were slight decreases in end-line than intermediate scores. The median of all types of scores were the same like the mean. Table 4 presenting an ANOVA (Analysis of Variance) with repeated measures, the p value associated with the Greenhouse-Geisser (G-G) correction was used as the assumption of sphericity was violated. Sphericity assumed that the variances of the differences between all combinations of the within-subject factors were equal. The repeated measures (ANOVA) determined that there were the significant differences in mean of the knowledge, attitude and practice scores of three points of time (baseline, intermediate and end-line). Therefore, post-hoc test (Bonferroni) was tested to know the mean differences among groups (baseline, intermediate and end-line).

Table 5 of post-hoc test (Bonferroni) mentioned that there were the significant differences between the baseline, intermediate and end-line of means of the knowledge, attitude and practice scores. In knowledge scores, the mean of intermediate was 8 points higher than the baseline and mean of end-line also 6.15 points higher than the baseline. But, mean of end-line was 1.8 points decreased than the intermediate. Mean score of the attitude (intermediate) was higher than the mean of the baseline with 5.6 points and the mean of end-line was 4 points higher than the mean of the baseline. Otherwise, the mean of end-line was 1.6 scores lower than the intermediate. The mean of the intermediate practice scores had 2.8 scores higher than the mean of baseline. And, mean of the end-line data expressed nearly 1 point above the mean of baseline. However, mean of end-line was reduced 1.88 points rather than the mean of intermediate.

Table 1: Background characteristics of the participants and factories (n=80).

Background characteristics	Mean	SD	Median	Minimum	Maximum
Age (years)	47	12.9	47.5	23	77
Factory experience (years)	21.5	13.5	20	1	70
Working experience (years)	15.5	10.7	13	1	50

Table 2: Background characteristics of the participants and factories (n=80).

Background characteristics	Frequency	Percentage
Age group (years)		
23-30	12	15.0
31-45	26	32.0
46-60	29	36.2

Continued.

Background characteristics	Frequency	Percentage
61-77	13	16.3
Factory experience group (years)		
1-15	32	40.0
16-30	32	40.0
31-45	12	15.0
46-60	3	3.7
61-70	1	1.3
Working experience group (years)		
1-15	48	60.0
16-30	24	30.0
31-50	8	10.0
Sex		
Male	60	75.0
Female	20	25.0
Education		
High school level and below	16	20.0
University level	20	12.5
Graduate level	49	61.3
Post-graduate level	5	6.2
Rank		
Owner	69	86.3
Supervisor	11	13.7
Products' market		
International	0	0
Local	78	97.5
Both	2	2.5
Food safety certification		
GMP	4	5.0
GHP	1	1.3
HACCP	2	2.5
ISO 22000	1	1.2
FSSC 22000	0	0
Myanmar FDA	42	52.5
Standard operation procedure		
Present	38	47.5
Absent	42	52.5
History of attending quality standards training		
Yes	18	22.5
No	62	77.5
Previous market recalled experience		
Yes	11	13.7
No	69	86.3

Table 3: Descriptive table of scores at each time of measurement (n=80).

Outcome variables	Time	Mean	SD	Median	Minimum	Maximum
Knowledge scores	Baseline	10.5	4	9	2	21
	Intermediate	18.5	2.1	19	13	23
	End-line	16.7	2.4	17	10	22
Attitude scores	Baseline	27.3	2.3	27	23	32
	Intermediate	33	2.6	33	27	38
	End-line	31.4	2.3	31.5	27	36
Practice scores	Baseline	13.8	4.3	15	3	19
	Intermediate	16.6	2.5	17	8	20

Continued.

Outcome variables	Time	Mean	SD	Median	Minimum	Maximum
	End-line	14.7	2.4	15	8	19

Table 4: Comparison of the peanut oil milling factory supervisors' knowledge, attitude and practice at baseline, intermediate and end-line (n=80).

Outcome variable	Periods of repeated measurement	Mean	SE	F	P value*
Knowledge scores	Baseline	10.6	2.1	314.98	<0.001 (G-G)
	Intermediate	18.6			
	End-line	16.7			
Attitude scores	Baseline	27.3	1.5	298.99	<0.001 (G-G)
	Intermediate	33			
	End-line	31.4			
Practice scores	Baseline	13.8	1.9	45.3	<0.001 (G-G)
	Intermediate	16.6			
	End-line	14.7			

*Repeated measures ANOVA

Table 5: Pairwise comparisons of the peanut oil milling factory supervisors' knowledge attitude and practice at baseline, intermediate and end-line (n=80).

Outcome variable	Pairwise comparisons	Mean difference	SE	P value*
Knowledge scores	Intermediate versus baseline	8.0125	0.3341	<0.001
	End-line versus baseline	6.15		<0.001
	End-line versus intermediate	-1.8625		<0.001
Attitude scores	Intermediate versus baseline	5.6875	0.2397	<0.001
	End-line versus baseline	4.075		<0.001
	End-line versus intermediate	-1.6125		<0.001
Practice scores	Intermediate versus baseline	2.8	0.3	<0.001
	End-line versus baseline	0.91		<0.01
	End-line versus intermediate	-1.88		<0.001

*Bonferroni test

DISCUSSION

Intervention like health education could improve the status of knowledge, attitude and practices not only food safety but also quality standards of the products. This interventional study revealed that all of baseline scores were the lowest, the intermediate scores (one month after the intervention) were the highest and the end-line scores (six months after the intervention) were lower than the intermediate. These findings revealed that educational training like refresher training needs to conduct repeatedly to maintain the knowledge, attitude and practice levels of the food business operators.

An Egypt study was done to assess the levels of knowledge, attitude and practice of 100 food handlers on food safety and temperature in Fayoum at 2020-2021 which was located 130 km south west of Cairo.¹⁷ The majority of the participants (96%) had no previous training program concerning the food safety.¹⁷ This finding was similar with the current study like most of the participants (77.5%) had no previous training.

The status of knowledge and attitude towards the safety and quality standards of peanut oil were the lowest at the

baseline among the three measurement periods. And, the intermediate scores were the highest, the end-line scores were slight lower than the intermediate in this study. These results were the same like the Malawi study of knowledge and attitude on the good agricultural practices to reduce the aflatoxin contamination in the agricultural products which were the lowest at the baseline and significantly increased in three knowledge questions at end-line.¹⁸ And also supported by the Jordan study which was conducted to assess the effect of food safety training on knowledge and practices in hotels' and hospitals' food service.¹⁶ The Jordan study revealed the increased the food safety knowledge and practice scores in post-test of the training.

This knowledge and reported practices on the safety and quality standards of peanut oil of this study were improved significantly in the end-line (mean, SD) than the base-line (mean, SD). The mean scores were significantly different among three points of time. Post-hoc tests using the Bonferroni test also revealed the intermediate had the highest knowledge, attitude and practice scores which were significantly different to the baseline and end-line (p value <0.001). Similarly, an interventional study conducted at Malaysia concerning the effect of food safety training on food handlers had the knowledge mean scores

was nearly 7 points higher at end-line comparing with baseline. The reported practices on food safety and personal hygiene in the intervention group were significantly higher at intermediate and end-line than the baseline. Also, the significant improvement of within group and between group were found at two items of the reported practices.¹⁴

And quasi experimental study was conducted at 2021 to assess the effect of training on the health related and food safety knowledge, attitude, and self-reported practice (KAP) of food handlers of 159 restaurants in Tehran, Iran during the COVID-19 pandemic period.¹⁹ The total knowledge scores of participants were found like low before training, and increased in scores after training. The total baseline attitude scores were improved after the training. Also, the self-reported practice scores of the participants before training were promoted after the education, respectively. These findings supported the current study like the knowledge, attitude and practice scores were the lowest before the training and got higher after the educational training.

As the mean differences of repeated measurements, the significant increases in the attitude scores and self-reported practice scores were found after the training by the repeated measure ANOVA but not significant difference in the knowledge mean scores.¹⁹ The attitude and practice mean differences were the same significant like the current study.

Strengths and limitations

This study was conducted at four major economical regions and most peanut oil production areas; thus, it could nearly cover the whole country's figure. This study could express the overall knowledge, attitude and practice scores of the supervisors of the peanut oil milling factories in Myanmar and could be the reference for the importance of the refresher courses to food business operators. These findings could be the supportive documents for the food safety regulations in Myanmar.

This study collected data on the general conditions of raw peanut and storage facilities with data collection form, not by the good hygienic practice checklist. Therefore, data could not express the good hygienic practice conditions of the oil milling factories.

CONCLUSION

This study pointed out that the educational program on the peanut oil production was effective to some extent and it is essential to all peanut oil milling factories not only for the quality but also for the safety of the peanut oils. This finding suggested that this educational curriculum should be included in the training activities for food business operators.

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