

ORIGINAL ARTICLE

What drives grease trap implementation and maintenance in food premises? A cross – sectional study of knowledge, practice and barriers on grease trap implementation in food premises around Kajang, Selangor

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ABSTRACT

Background: Fat, oil, and grease (FOG) are often discharged into wastewater due to improper disposal, resulting in environmental concerns. Grease traps serve to intercept FOG before it enters sewer systems. This study aimed to assess the food premise workers' knowledge, practices, and perceived barriers regarding grease trap implementation and maintenance in Kajang, Selangor. **Methodology:** A survey was conducted among 60 food premise workers to assess their knowledge, practices, and barriers to implementing and maintaining the grease trap. The grease trap installation and maintenance were assessed using validated observational checklists. Descriptive statistics and Spearman's correlation were performed using SPSS Version 26. **Results:** The median knowledge score was 4.00 (IQR=1.00), while the median practice score was 3.00 (IQR=2.00). Approximately 68.3% of premises exhibited proper grease trap maintenance, yet only 18.3% maintained a logbook. Budget constraints (83.3%) and lack of staff knowledge (98.3%) were the most reported barriers of implementing and maintaining the grease trap. No significant correlation was found between knowledge/practice scores and observed maintenance. **Conclusion:** Despite moderate awareness, practical implementation of grease trap maintenance remains limited. Educational and behavioural interventions are recommended to enhance compliance and effectiveness.

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Keywords: Fat, oil and grease (FOG); grease trap; knowledge, practice, grease trap implementation barriers, food premise.

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INTRODUCTION

Fat, oil, and grease (FOG) are generated from the production of edible oils, food processing, butcheries, and discarded food (1). The use of fat, oil, and grease is common in both small and large industries. FOG can be found in wastewater when small and large industries do not filter the water before releasing it into the sewage system. FOG can cause a variety of problems in biological wastewater treatment systems, both on-site and in public sewage treatment facilities.

FOG can also interfere with wastewater processing. Therefore, it is important to eliminate FOG; if it cannot

be eliminated, it needs to be reduced before continuing treatment (2). Fats, oils, and greases are composed of fatty acids and glycerol. The compound in FOG is glyceride, which is the primary component of vegetable oils and animal fats. Triglyceride compounds can be either solid or liquid at standard room temperature and have a density lower than that of water, where the triglyceride compound can float (3).

The FOG released into wastewater can soap in an alkaline medium and make it harder to remove from wastewater. Moreover, if FOG is discharged untreated, it can lead to serious environmental problems (4). FOG discharge is a major source of river pollution, and this problem has persisted for a while, interfering with the functioning and maintenance of the public sewage system (5). Alam Flora Sdn Bhd reported 130 tonnes of fats, oils and grease were dump into the drains by food operator in Kuala Lumpur area (6). An article from the New Straits Times also stated that the wastewater that

comes from food premises has become an issue that concerns the Department of Environment (DOE) (5). In addition, prominent levels of FOG in wastewater will accelerate the growth of *E. coli* in the sullage as well as in the sewer system, such as a drain, which will eventually pollute the river (5,7). Every food premises is required to install grease traps to prevent and reduce FOG from entering the wastewater and avoid interference with the sewerage system (8).

The grease trap function captures and separates fats, oil, and grease before entering the drain and sewer. This waste, which mostly consists of culinary by-products such as food scraps, cooking oil, sauce, and others, needs to be filtered to prevent it from clogging drains and sewers and polluting the environment, especially water (9). In addition, the installation of grease traps on food premises is compulsory. This is because, according to the law of Local Government Act 1976, Licensing of Food Establishments (Federal Territory of Putrajaya) By-Laws 2016 section 15 states that every restaurant and eating house required to install a grease trap and the owner of the food premise must ensure that the sullage water from each sink flows through the grease trap. Moreover, all solid waste and FOG that have been trapped in the grease trap need to be disposed of properly. Food premise owners who do not comply with the act can be penalized as not exceeding RM2000 or imprisonment not exceeding one year or both. If the food premise owner repeats the offence, then the fine not exceeding RM200 per day after conviction will be charged (10). On January 1, 2017, Kuala Lumpur City Hall (DBKL) mandated that the food premise owner be required to pay grease trap maintenance fees to reduce pollution in Sungai Klang. Grease trap maintenance fees are counted when applying for a business licence in DBKL territories (11).

In Malaysia, studies on grease trap implementation in the food industry are scarce. It was still unclear to those who worked in the food premises regarding the purpose of the grease trap implementation; hence, most of the food premises took this as unimportant. (7). Furthermore, some food premise owners did not care about the installation of grease traps on their premises, and the maintenance of grease traps in food premises is still inadequate. This is because of the installation cost and stolen cases of grease traps from the premises (12). Furthermore, it was reported that a restaurant in the HSK Industrial Centre had an overflowing grease trap because it was not well-maintained (13). Poor maintenance of grease traps can contribute to flow blockage due to the accumulation of FOG, offensive odors, and pest attraction. Thus, having a good knowledge and practices on the function of the grease trap helps in preventing cases like overflowing, unpleasant odour, and blockage. In addition, identifying the barriers to grease trap installation among the owner of a food premises can help to curb the issue in the future. Hence, it is important to identify knowledge,

practice and barriers to grease trap implementation and maintenance for mitigation of this problem.

MATERIALS AND METHODS

Study design and study location

A cross-sectional study was conducted using structured self-administered questionnaires and observational checklists. The study involved food premise workers in Kajang and was conducted in collaboration with Kajang Municipal Council (MPKj). Food premises were conveniently sampled based on the premises inspection list prepared by MPKj.

Observation on the grease trap installation and maintenance was assessed using a validated checklist (14). In addition, a self-administered questionnaire was distributed to the representative of the food premise worker to evaluate their knowledge, practices and barriers related to grease trap installation and maintenance.

Study population and sample size

The sample size of the food premise was calculated by using Raosoft online sample size calculator. A total of 60 food premises around Kajang were included in the study. One representative preferably the kitchen worker was selected for questionnaire completion.

Study instrument

An observation was conducted using a validated checklist (14) to assess various aspects of grease trap conditions in food premises. The evaluation included the placement of the grease trap, the flow of sullage water in and out of the trap, proper installation, the presence of maintenance records or logbooks, and any signs of leakage or blockage. Additionally, the overall maintenance status of the grease trap was examined.

In addition to observation, a survey questionnaire was structured into four sections: demographic information, knowledge, practices, and barriers to grease trap implementation and maintenance. It comprised closed-ended questions, including binary ("yes" or "no") responses, Likert-scale items, and multiple-choice questions.

The demographic section collected data on respondents' gender, race, level of education, and work experience in the food industry. Responses were recorded in a multiple-choice format. Subsequently, respondents' knowledge was assessed through questions regarding the function of grease traps and their necessity in food premises (15). Responses were dichotomous ("yes" or "no"), and total scores were calculated based on the number of correct answers.

On the other hand, five items were included to evaluate the extent to which respondents adhered to proper grease

trap upkeep. These questions were developed based on literature examining the consequences of neglecting grease traps and best practices for maintenance (14, 15). Responses were measured on a three-point scale (always, sometimes, never). Scores were given based on the response (always = 2; sometimes = 1; never = 0).

Furthermore, barriers to grease trap implementation and maintenance were ascertained through five items addressing common challenges faced by food premise owners. These questions were formulated based on literature and reports highlighting issues such as a lack of knowledge on grease trap maintenance, difficulties in cleaning, and incidents of grease trap theft (14,15). Responses were recorded on a three-point Likert scale (disagree, neither disagree nor agree).

Statistical Data Analysis

The SPSS version 26 was used for data analysis. The method used to analyse data was descriptive analysis and spearman correlation. Descriptive analysis was used to get frequency, percentage and mean/median of the data. Depending on the data distribution, the correlational test of Pearson/Spearman correlation test was used to determine if there was any correlation between knowledge score and practice score with maintenance of the grease trap.

Research Administration

The questionnaire was distributed to 60 food premises workers from 60 food premises. The criteria for choosing the respondent were the respondent need to be in charge in handling and cleaning the grease trap and they was able to understand English, Malay and able to read. Moreover, an observation was carried out by using validated checklist where the criteria being observed was the placement of the grease trap in the food premise, the flow of the sullage water in and out of the grease trap, the proper installation of the grease trap, the presence of the record or logbook on the maintenance of the grease trap, the present of the leakage or blockage and if the grease trap was well maintained.

Ethical approval

Ethical approval for this study was obtained from the University Research Ethics Committee of the Universiti Kuala Lumpur (UREC/2024/FYP/Mestech/16).

RESULTS

Sociodemographic Characteristics

This study involved 60 respondents from 60 food premises. Participants provided demographic details, including gender, ethnicity, education level, and work experience. The sample comprised 56.7% males and 43.3% females. The majority of respondents (38.3%) belonged to other ethnic groups, including Thai, Indonesian, Bangladeshi, Pakistani, Myanmar, Nepalese,

and Filipino, followed by Malays (35.0%), Chinese (23.3%), and Indians (3.3%).

Regarding educational background, 63.3% of respondents had completed secondary education, while 36.7% had pursued tertiary education. In terms of work experience, 50% of respondents had been employed in the food industry for over two years, while the remaining 50% had less than two years of experience. The sociodemographic characteristics of the respondents are summarized in Table I.

Table I: Sociodemographic information of the respondents (n=60)

| Variables | n (%) |
|---------------------------|-----------|
| Gender | |
| Male | 34 (56.7) |
| Female | 26 (43.3) |
| Race | |
| Malay | 21 (35.0) |
| Indian | 2 (3.3) |
| Chinese | 14 (23.3) |
| Others | 23 (38.3) |
| Educational level | |
| Primary | 0 (0.0) |
| Secondary | 38 (63.3) |
| Tertiary | 22 (36.7) |
| Working experience | |
| Less than 1 year | 18 (30.0) |
| More than 1 year | 42 (70.0) |

Grease Trap Implementation in Food Premises

Observations conducted on grease trap implementation assessed multiple parameters, including installation location, installation method, inflow and outflow functionality, capacity, presence of maintenance logbooks, and overall maintenance condition. The findings revealed that more than 80% of grease trap installations met the appropriate standards for flow and capacity, while 68.3% of grease traps were adequately maintained. However, 38.3% exhibited blockages or leakage issues, potentially compromising their effectiveness (Figure 1 – Figure 3). Furthermore, the assessment indicated that most of food premises did not maintain a logbook to document grease trap maintenance activities (Table II).



Fig. 1: The right way to install grease trap and well maintained



Fig. 2: The improper grease trap installation



Fig. 3: The grease trap is not well maintained

Table II: The implementation of the grease trap in food premises in Kajang (n=60)

| Implementation criteria | n (%) |
|---|-----------|
| Location of the grease trap | |
| Inside kitchen | 52 (86.7) |
| Outside kitchen | 8 (13.3) |
| Proper installation of the grease trap | |
| Yes | 50 (83.3) |
| No | 10 (16.7) |
| Proper flow in and out of the grease trap | |
| Yes | 51 (85.0) |
| No | 9 (15.0) |
| Appropriate capacity of the grease trap | |
| Yes | 54 (90.0) |
| No | 6 (10.0) |
| Improper fitting of the grease trap including blockage and leakage | |
| Yes | 23 (38.3) |
| No | 37 (61.7) |
| Present of the logbook or record | |
| Yes | 11 (18.3) |
| No | 49 (81.7) |
| Maintenance of the grease trap | |
| Yes | 41 (68.3) |
| No | 19 (31.7) |

Knowledge and Practices Regarding Grease Trap Implementation

The knowledge assessment indicated that respondents demonstrated a fundamental understanding of grease trap requirements, with a median knowledge score of 1.00 (0.00) for recognizing their necessity. However, knowledge regarding optimal grease trap placement was limited, as indicated by a median score of 0.00 (1.00), suggesting that most respondents were unaware of proper installation locations (Table III).

Table III: Knowledge on grease trap implementation (n=60)

| Item | Median (IQR) |
|--|---------------------|
| i) Do all food premises require a grease trap? | Median (IQR) |
| a) Median score | 1.00 (0.00) |
| | n (%) |
| b) Correct response | 60 (100) |
| c) Wrong response | 0 (0) |
| ii) Can a grease trap be placed anywhere in the food premises? | Median (IQR) |
| a) Median score | 0.00 (1.00) |
| | n (%) |
| b) Correct response | 33 (55) |
| c) Wrong response | 27 (45) |
| iii) Is it necessary to clean grease traps regularly? | Median (IQR) |
| a) Median score | 1.00 (0.00) |
| | n (%) |
| b) Correct response | 60 (100) |
| c) Wrong response | 0 (0) |
| iv) Does the size of the grease trap depend on the size of the food premises? | Median (IQR) |
| a) Median score | 1.00 (0.00) |
| | n (%) |
| b) Correct response | 54 (90) |
| c) Wrong response | 6 (10) |
| v) Is it important to dispose the collected grease in the grease trap properly? | Median (IQR) |
| a) Median score | 1.00 (0.00) |
| | n (%) |
| b) Correct response | 58 (97) |
| c) Wrong response | 2 (3) |

Scores were reported as median (IQR) due to non-normal distribution. Marks were given as '1' for correct answer and '0' for incorrect answer.

Similarly, although most respondents acknowledged the importance of regular grease trap cleaning, practical application was inconsistent. The median knowledge score on the necessity of frequent cleaning was 1.00 (0.00) (Table III), yet the actual cleaning practices was performed only occasionally (55%) (Table IV). The study further revealed that training opportunities for grease trap maintenance were scarce, as reflected in the percentage of 62% indicating that training sessions were seldomly provided. Additionally, grease trap record-keeping practices were inadequate, with more than 80% reported of never had the maintenance record. Furthermore, most food premises did not engage professional services for grease trap maintenance potentially leading to suboptimal upkeep and functionality (Table IV).

The findings also demonstrated that more than half of the food premises improperly disposed the grease (Table IV). This suggests that grease was frequently discarded into regular trash bins rather than being disposed of in accordance with proper waste management protocols.

Table IV: Grease trap practices (n=60).

| Items | n (%) |
|--|---------|
| Grease trap cleaning | |
| Never | 0 (0) |
| Sometimes | 33 (55) |
| Always | 27 (45) |
| Employees are trained on proper disposal of food waste to prevent clogs in the grease trap. | |
| Never | 15 (25) |
| Sometimes | 22 (37) |
| Always | 23 (38) |
| Grease trap maintenance record keeping. | |
| Never | 49 (82) |
| Sometimes | 6 (10) |
| Always | 5 (8) |
| Frequency of grease trap be maintenance by a qualified professional. | |
| Never | 51 (85) |
| Sometimes | 8 (13) |
| Always | 1 (2) |
| Frequency of grease disposal collected from the grease trap in the regular trash | |
| Never | 9 (15) |
| Sometimes | 19 (32) |
| Always | 32 (53) |

Barriers to Grease Trap Implementation and Maintenance

Several challenges were identified as barriers to grease trap maintenance. The most significant constraint was budget limitations, with 83% of respondents agreeing that financial constraints impacted grease trap installation and maintenance. Additionally, most of respondents agreed that a lack of knowledge among staff posed a challenge in maintaining grease traps efficiently (Table V). The study further found that 50%

Table V: Barrier toward implementation and maintenance of grease trap (n = 60).

| Item | n (%) |
|--|---------|
| Budget constraints is a barrier in implementing and maintaining a grease trap in a food premise. | |
| Disagree | 9 (15) |
| Neither disagree nor agree | 1 (2) |
| Agree | 50 (83) |
| Knowledge lacking on grease traps maintenance among kitchen staff can be a barrier to maintain the grease trap. | |
| Disagree | 1 (2) |
| Neither disagree nor agree | 0 (0) |
| Agree | 59 (98) |
| Problems with the plumbing system create barriers to implement and maintaining grease traps. | |
| Disagree | 30 (50) |
| Neither disagree nor agree | 1 (2) |
| Agree | 29 (48) |
| It is difficult to clean the grease trap due to its installation method. | |
| Disagree | 28 (47) |
| Neither disagree nor agree | 3 (5) |
| Agree | 29 (48) |
| Does case like stolen of the grease trap one of the barriers you face to install grease trap? | |
| Disagree | 21 (35) |
| Neither disagree nor agree | 0 (0) |
| Agree | 39 (65) |

of respondents disagreed that plumbing system issues significantly affected grease trap implementation, suggesting that most food premises did not experience major infrastructure-related difficulties. Similarly, 47% disagreed that installation methods complicated grease trap maintenance, indicating that installation itself was not perceived as a major hurdle. Finally, 65% of respondents strongly agreed that grease trap theft was a concern, suggesting that some establishments faced security-related issues in maintaining grease traps.

Correlation Between Knowledge, Practices, and Grease Trap Maintenance

Statistical analysis revealed no significant correlation between knowledge scores and observed grease trap maintenance ($r = -0.015$, $p = 0.908$). Similarly, no correlation was found between practice scores and grease trap maintenance ($r = -0.159$, $p = 0.224$), suggesting that self-reported knowledge and practices did not necessarily translate into actual grease trap upkeep (Table VI).

Table VI: Correlation between knowledge score and grease trap maintenance.

| Variable | r-coefficient | p-value |
|---|---------------|---------------------|
| Knowledge score and grease trap maintenance | -0.015 | 0.908 |
| Practice score and grease trap maintenance. | -0.159 | 0.224 |
| | | Median (IQR) |
| Total score for grease trap practice | | 3.00 (2.00) |

Practice scores were presented as median (IQR) due to non-normal distribution. Significance at $p < 0.005$

DISCUSSION

The present study's findings on grease trap implementation and maintenance reveal several critical knowledge gaps and practical challenges, which can be further understood through the lens of behavioral frameworks and their implications for policy change. This will be discussed in the subsequent section.

Knowledge Gaps in Grease Trap Implementation

Respondents demonstrated general awareness regarding the necessity of grease traps; however, a persistent misconception regarding proper placement was observed. This aligns with previous research highlighting that incorrect grease trap placement significantly reduces efficiency, leading to increased blockages and overflow issues (15, 24). From a behavioral perspective, this discrepancy reflects the intention-behavior gap described in behavioral science, where awareness does not consistently translate into correct actions (35). One plausible explanation is the 'overconfidence bias', where individuals overestimate their competence, leading to poor decision-making despite adequate awareness.

Referring to the COM-B model (Capability, Opportunity, Motivation – Behavior), it is evident that while motivation exists, the psychological capability (accurate procedural

knowledge) and physical opportunity (access to correct technical resources or training) are lacking. To bridge this gap, training modules should be redesigned to include experiential learning and behavioral nudges, such as visual reminders or peer-led demonstrations, which have been shown to improve technical compliance in food safety practices (36).

Challenges in Maintenance Practices

Despite recognizing the need for regular grease trap cleaning, the lack of systematic record-keeping and professional servicing suggests operational inefficiencies. The absence of maintenance logs limits the ability to track cleaning frequency, increasing the risk of blockages and improper disposal practices (30). According to the Behavioral Insights Theory, routine practices like grease trap cleaning require consistent cues, feedback, and reinforcement to become habitual (37).

From a policy perspective, mandating logbook documentation supported by periodic inspections could reinforce accountability through regulatory reinforcement. Moreover, the low engagement of professional maintenance services may be attributed to financial constraints or a lack of awareness regarding available services. Additionally, offering incentives such as certification for establishments maintaining compliance can act as a motivator, encouraging businesses to maintain regular upkeep practices. (31, 32).

Barriers to Implementation and Compliance

Financial constraints emerged as a significant challenge, mirroring findings from previous research that budget limitations hinder grease trap maintenance in small and medium-sized food businesses (32). These barriers align with the Structural Model of Health Behavior, which emphasizes how institutional and environmental constraints influence individual practices (38). Policymakers should consider introducing subsidies or financial assistance programs to support grease trap installation and servicing, particularly for small enterprises.

Similarly, limited staff training contributed to poor maintenance practices, emphasizing the need for structured educational programs. Research has indicated that mandatory training can significantly improve adherence to maintenance protocols, reinforcing the need for regulatory bodies to enforce compulsory training initiatives (33). While plumbing system issues were not perceived as a major concern, ensuring industry-standard installation remains crucial. Properly installed grease traps have been shown to reduce long-term operational difficulties and maintenance costs (34).

To enhance compliance, policymakers may consider implementing tiered subsidy schemes that provide financial assistance for both grease trap installation and

professional maintenance services. Similar approaches have proven effective in strengthening hygiene infrastructure in other industries (39). In addition, making competency-based training a mandatory component of the business licensing process could help embed food hygiene practices into daily operations, ensuring continuity even when there is staff turnover.

Furthermore, the identification of grease trap theft in this study reveals a new behavioral barrier to compliance that requires immediate policy and enforcement response. Although rarely documented in existing literature, such security issues have the potential to undermine public confidence in health policies and infrastructure investments. Therefore, future interventions should address this risk by encouraging the adoption of secure grease trap designs and incorporating theft-prevention strategies into municipal waste management regulations. Despite these significant findings, it's crucial to address some of the study's limitations. Factors like potential bias in self-reported practice responses might have led to inaccuracies in the results. Plus, since this was a cross-sectional study, it only offers a snapshot of maintenance practices at one specific time, making it hard to assess long-term trends.

CONCLUSION

This study concludes that while food premise workers have basic knowledge of grease traps, their practices remain insufficient. These findings suggest a clear need for structured behavioral interventions, including hands-on training and follow-up reinforcement, to bridge the gap between knowledge and routine practice.

Although grease trap monitoring is part of food premise inspection procedures among the local and health authorities, it is recommended that communication campaigns using behavioral insights such as visual cues, reminder systems, or peer-led demonstrations can support long-term adherence to grease trap regulations. Additionally, linking compliance to incentives such as public hygiene ratings or certification schemes may further motivate food operators to maintain proper waste management practices.

By shifting the focus from mere awareness to structured enforcement mechanisms, local and health authorities can foster a stronger culture of compliance and help build consistent, responsible practices that protect both the environment and public health. The findings from this study can support such efforts by offering practical and actionable recommendations to guide future policies and implementation strategies.

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