

ASSESSING FOODSERVICE PERSONNEL'S KNOWLEDGE, ATTITUDE AND PRACTICES IN IDDSI PUREED DIET PREPARATION IN MALAYSIA

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Abstract. Dysphagia, or difficulty swallowing, is becoming more common, particularly among Malaysia's older population. However, handling and preparing dysphagia meals require competent and motivated personnel to meet the feeding and nutritional needs. This study aimed to evaluate the knowledge, attitudes, and practices (KAP) of foodservice personnel in Malaysian government hospitals regarding pureed diets for dysphagia patients. A cross-sectional survey was done utilizing the validated KAP DYS Puree questionnaire, which was given online to foodservice personnel in public hospitals. Data were analyzed using SPSS version 29, containing descriptive statistics such as frequencies, percentages, means, modes, and standard deviations. A total of 162 respondents participated, the majority being women (n=115, 71.0%) employed in hospital foodservice departments. The results indicated moderate knowledge levels, with 65.4% (n=106) scoring between 9 and 16 among the respondents. Attitudes toward pureed diet preparation were largely positive, with 53.7% of respondents scoring in the excellent range (53–70), and 43.8% in the good range (35–52). Practice scores were similarly encouraging, with 70.4% reporting good practices (35–52). In conclusion, this study showed that foodservice staff in Malaysian government hospitals have good attitudes and practices when it comes to making pureed meals for patients with dysphagia, but their level of proficiency is still moderate. This suggests that in order to enhance understanding and to assure that individuals with dysphagia receive high-quality treatment, there is an urgent need for focused training and continuing education.

Keywords: *dysphagia, Knowledge-Attitude-Practice (KAP), foodservice personnel, pureed diet, IDDSI*

Introduction

Dysphagia, characterized by difficulty swallowing, is defined as the delayed or impaired transit of a food bolus from the oropharynx to the stomach (Chilukuri et al., 2018). This condition is commonly associated with aging, stroke, cancer treatments, and systemic diseases such as autoimmune disorders and gastroesophageal reflux disease (GERD) (Wang et al., 2023; Husmeela et al., 2021; Selvanderan et al., 2021; Chilukuri et al., 2018). Globally, dysphagia is becoming increasingly prevalent, particularly among the aging population. In Malaysia, the proportion of older adults rose from 5.2% in 1970 to 11.3% in 2020, reflecting this global trend (Ismail et al., 2021). Among elderly individuals, the prevalence of dysphagia is notably high in those with neurological conditions such as stroke, Alzheimer's disease, or amyotrophic lateral sclerosis (Chilukuri et al., 2018). Dysphagia can lead to severe health complications, including malnutrition, dehydration, aspiration pneumonia, and even death if not properly managed (Roberts et al., 2024; Kim and Lee, 2019). A Malaysian study reported that 59.1% of patients undergoing treatment for head and neck cancers

experienced dysphagia at various stages of their care (Husmeela et al., 2021). While the elderly are most commonly affected, younger individuals may also suffer from dysphagia due to conditions like eosinophilic esophagitis or autoimmune diseases. According to Roberts et al. (2024), dysphagia can be categorized into two types: oropharyngeal dysphagia, which occurs from the oral cavity to the upper esophageal sphincter, and esophageal dysphagia, which takes place between the upper and lower esophageal sphincters. Age-related degeneration or treatment-related effects such as chemotherapy and radiation can significantly increase the risk of dysphagia, particularly in individuals with head and neck cancers (Husmeela et al., 2021).

During hospitalization, dysphagia patients are often placed on texture-modified meals such as pureed diets to aid in their recovery (Lam et al., 2023). According to the IDDSI, pureed foods are classified as Level 4 and require precise preparation by trained food handlers to ensure the texture meets safety standards. Patients are typically prescribed pureed diets for two main reasons: to ease and ensure safe swallowing, particularly among those with mastication difficulties due to age or illness, and as a therapeutic measure following surgical procedures (Lam et al., 2023). However, pureed meals often present challenges in terms of food recognition and flavor, which can reduce patient intake and satisfaction. Studies show that individuals prefer pureed foods with strong, recognizable flavors, even if the appearance is less appealing (Lam et al., 2023). Poor palatability and texture often result in food waste, with reports from Malaysian hospitals indicating that pureed diets account for up to 65% of plate waste, primarily due to low acceptability (Azizan et al., 2023). The successful management of dysphagia through diet relies heavily on the knowledge, attitudes, and practices (KAP) of those preparing the food. Inadequate training or improper preparation of TMDs and TFs can result in serious consequences, including aspiration, pneumonia, malnutrition, asphyxiation, and death (Wu et al., 2022a). Therefore, it is critical that hospital foodservice staff are adequately educated and trained to prepare pureed diets in accordance with clinical guidelines. Furthermore, the Knowledge, Attitude, and Practice (KAP) model forms the theoretical foundation of this study. It posits that knowledge acquisition leads to attitude formation, which in turn influences practice (Kang and Bagaoisan, 2024). Although pureed diets are essential for managing dysphagia, foodservice personnel in Malaysian hospitals often face challenges due to insufficient knowledge, limited training, and inconsistent practices in pureed diet preparation according to the IDDSI standards. These shortcomings can compromise the safety, palatability, and nutritional adequacy of meals served to patients with dysphagia, potentially leading to serious health risks. Therefore, the core research problem is the lack of consistent knowledge, training, and adherence to IDDSI standards among hospital foodservice personnel, which may jeopardize the quality and safety of pureed diets served to dysphagia patients. Addressing these issues is critical to ensure compliance with IDDSI standards and ensure safe and nutritionally adequate meals for dysphagia patients (Azizan et al., 2023; Wu et al., 2022b). This study is guided by the following specific objectives: (1) To examine the knowledge of food handlers in preparing a texture modified diet for patients with dysphagia; (2) To determine food handler's attitudes about preparing pureed diets for dysphagia patients in a government hospital; and (3) To identify practices among food handlers in preparing pureed diets for dysphagia patients in the government hospital. Thus, this study aims to assess the current KAP of foodservice personnel in Malaysian government hospitals in relation to pureed diet preparation for dysphagia patients.

Literature review

Dysphagia

Dysphagia is when an individual finds it difficult to swallow food (Selvanderan et al., 2021). Patients with dysphagia have found it difficult to swallow food, especially with its rugged and rough texture. According to Luo et al. (2022), dysphagia is difficulty securely and effectively swallowing food or moving solid and liquid nutrition from the mouth to the stomach through the esophagus. Dysphagia frequently occurs as a result of sudden brain injury induced by cerebrovascular illness (Igarashi et al., 2020). Dysphagia is a disorder that impacts the process of preparing and transporting saliva and food through the digestive tract and is closely associated with swallowing (Kurosu et al., 2022). The patient with dysphagia will face choking when consuming food due to difficulty in swallowing. Dysphagia could significantly impact mealtime safety and satisfaction. However, texture-modified foods and thickened liquids help patients eat more comfortably and decrease the likelihood of inhaling food or liquid into the airways (Kim and Lee, 2019). According to Wu et al. (2022a), dysphagia is a chronic medical condition that can be effectively managed by safe and nutritious diets, including texture-modified diets (TMDs) and thickened fluids (TF). Roberts et al. (2024) stated that dysphagia can be categorized into oropharyngeal and oesophageal. Oropharyngeal dysphagia causes food bolus passage delay, while oesophageal dysphagia results in food being trapped in the esophagus or chest after swallowing (Chilukuri et al., 2018). Moreover, oropharyngeal dysphagia, especially in older individuals, is mainly linked to stroke, neurological conditions, and dementia (Selvanderan et al., 2021). There are high prevalence records showing that patients have strokes that lead to dysphagia. According to Chen et.al. (2024), there around 30.0% to 78.0% of patients gain dysphagia after having a stroke. Chilukuri et al. (2018) stated that the structural causes of oropharyngeal disorders include proximal esophageal webs, thyromegaly, Zenker's diverticulum, pharyngeal infections, vertebral osteophytes, head and neck malignancies, and a history of head and neck radiation. Nevertheless, neuromuscular abnormalities are frequently identified as the primary underlying factors in these conditions. However, Esophageal dysphagia is primarily caused by mechanical or obstructive disorders of the esophagus. At first, solids are typically complex for patients to ingest, and the condition may eventually progress to include liquids (Chilukuri et al., 2018).

Impact of Texture-Modified Diet (TMDs) Toward Dysphagia Patients

Dysphagia can lead to malnutrition and dehydration, aspiration pneumonia, poor general health, chronic lung disease, choking, and even death. However, the pureed diet, also known as the texture-modified diet, has been applied in the diet management of dysphagia patients (Lam et al., 2023). Traditionally, TMFs are altered to provide softer textures and reduced particle sizes with cohesive consistency through chopping, mincing, or blending with liquids while avoiding sticky textures, mixed consistencies, and fibrous food (Wu et al., 2022b). The food's soft and moist texture makes it safe to consume when swallowing is difficult. However, the texture, taste, and appearance of pureed food can cause the patients to have less appetite, leading to insufficient nutrients. According to Kim and Lee (2019), patients with dysphagia often exhibit low acceptance and poor adherence to modified diets because the thickening agents can alter the flavor and texture of beverages, potentially reducing their palatability for patients. According

to Azizan et al. (2023), a pureed diet diminishes patients' appetites due to the mechanical modification of food texture, resembling baby food. Food attributes, such as size, color, shape, flavor, viscosity, and texture, are often modified to accommodate dysphagia since thin fluids like water, soup, or juice are more prone to aspiration (Kyodo et al., 2020). According to Wu et al. (2022b), mealtimes significantly influence health outcomes and overall quality of life. Texture, appearance, flavor, and palatability are essential determinants of food intake among the elderly. Moreover, Lam et al. (2023) found that the three key factors influencing meal satisfaction among patients on pureed diets are taste, appearance, and recognizability of the food. However, nutritional content is associated with muscle preservation, immunological efficacy, and healing and recovery processes. Evidence indicates that texture-appropriate and appealing therapeutic meal formulations (TMFs) may significantly enhance older persons' nutritional intake and quality of life. The texture, taste, and appearance of a pureed diet can lead patients to have less appetite, which causes an increase in plate waste in the hospital. Furthermore, Lam et al. (2023) states that patients adhering to pureed diets experience lower meal satisfaction than those on regular diets. It has been consistently observed that individuals on pureed diets tend to have diminished enjoyment of their meals. Previous study found that the average total plate waste for texture-modified diets (TMD) for lunch and evening meals was 47.5%, considered high; more than 30% in the hospital setting is categorized as high. Besides, a hospital in Malaysia also has a high prevalence of plate waste on texture-modified diets based on the research conducted. According to Azizan et al. (2023), research done in a Malaysian hospital found that pureed diets accounted for 65% of total plate waste linked with texture-modified diets (TMD) due to the texture itself. Patients on pureed diets have reported that the challenge of identifying their food affects their ability to complete meals (Lam et al., 2023).

Texture Modified Diet (TMD)

Dysphagia, a persistent medical condition, can be effectively managed through the use of safe and nutritious options, such as texture-modified diets (TMDs) and thickened fluids (TF) (Wu et al., 2022a). The Modified Texture Foods (MTF) are prepared by mechanically modifying food consistency for easier swallowing, including textures from pureed to minced. Pureed meals are smooth and require minimum chewing, while minced foods require larger pieces and moderate chewing. Then, the preparation involves chopping, grinding, or blending, often involving the addition of a liquid to modify consistency, potentially reducing nutritional density and moisture content (Keller et al., 2012). The International Dysphagia Diet Standardization Initiative (IDDSI) is the first global framework providing standardized terminology and guidelines for texture-modified diets (TMDs) and thickened fluids (TFs) for dysphagia management, applicable across all ages, cultures, and care settings (Wu et al., 2022b). The texture is a sensory property characterized by several parameters, including a food product's rheological and structural features, as detected by mechanical, visual, auditory, and tactile sensors (Raheem et al., 2021). Dysphagia patients need nutritious foods with appropriate textures to enhance their intake and provide essential nutrients.

International Dysphagia Diet Standard Initiative (IDDSI)

The International Dysphagia Diet Standard Initiative (IDDSI) is a guideline for food handlers in preparing a texture-modified diet for dysphagia patients, providing the step

in pureed diet preparation in terms of technical skill. This ensures that the texture of the pureed diet can meet the condition of dysphagia patients for consumption. The IDDSI framework establishes the texture specifications for food and fluids to ensure safe consumption (Wu et al., 2022a). The IDDSI framework, developed with input from stakeholders across 57 countries, existing national terminologies, and empirical data, underwent systematic review and iterative refinement based on independent feedback analysis (Cichero et al., 2017). It consists of eight levels (0–7) distinguished by numbers, text labels optimized for translation, and color codes designed to be inclusive for individuals with color blindness. Accessible and objective measurement methods support its use by individuals with dysphagia, caregivers, clinicians, researchers, and industry professionals (Cichero et al., 2017). Moreover, Wu et al. (2022b) states that the International Dysphagia Diet Standard Initiative (IDDSI) framework categorizes food and beverages into seven levels, with liquids from 0 to 4 and meals from 3 to 7. According to the IDDSI framework (IDDSI, 2019), the levels vary from Level 3 (Liquidised) to Level 7 (Regular), with each level indicating a particular food texture and liquid thickness. Level 4 is related to pureed meals; Level 5 is to minced and moist foods, Level 6 is to soft and bite-sized foods, and Level 7 is to regular foods. IDDSI testing methods are designed to verify a specific product's flow or textural properties at the point of evaluation, with the testing conducted on food and drinks at the specified serving conditions, particularly temperature (IDDSI, 2019).

Pureed Diet

Pureed diets are often used as the first dietary intervention for individuals with moderate to severe dysphagia (Kyodo et al., 2020). Pureed food is thick and uniform, free of lumps or textural variety. Due to its smooth consistency, it is unnecessary to bite or chew it before consumption. Individuals often consume pureed food with a spoon since its consistency is sufficiently thick for piping, layering, or moulding into diverse forms. The fluidity limits consumption from a cup or with a straw. Pureed food must not be dense or adhesive since it may adhere to the mouth or throat, presenting a choking hazard. A pureed diet, also known as a texture-modified diet, provides food texture with a soft, smooth, moist, elastic, and easy-to-swallow texture for dysphagia patients (Raheem et al., 2021). Accordingly, texture-modified diets (TMD) refer to foods altered to achieve a softer texture and appropriate consistency, making them easier for patients to chew and manage. These modifications can be achieved through physical or chemical processes. Generally, foods with modified textures should be soft, moist, elastic, smooth, and easy to swallow. Based on the International Dysphagia Diet Standard Initiative (IDDSI), the pureed diet, classified as level 4 within the IDDSI framework, should be soft, moist, and retain its shape when presented to the patient (Azizan et al., 2023). A pureed diet is mainly served to patients with dysphagia due to difficulty in swallowing and helping them with their rehabilitation. Lam et al. (2023) state that pureed diets are typically prescribed to patients for two primary reasons. First, pureed foods are easier to handle and safer for individuals facing difficulties chewing and swallowing solid foods, which can result from aging or various medical conditions. Second, pureed diets may be provided to patients' post-surgery as a therapeutic dietary intervention to support their recovery during rehabilitation.

Theory of Knowledge, Attitude, and Practice (KAP)

The knowledge-attitude-practice (KAP) theory model is a commonly utilized theoretical framework in health education and behavioral intervention. According to the theory, knowledge is the foundation for developing the right attitudes and practice adjustments, while attitude drives practice changes (Kang and Bagaoisan, 2024). According to Lai et al. (2021), the Knowledge, Attitude, and Practice (KAP) theory posits that a change can influence an individual's behavior or practice in their attitude, which in turn is influenced by an increased level of knowledge of an individual. The KAP theory consists of three stages which are knowledge acquisition, attitude development, and practice construction. It is founded on information and driven by individual attitudes, resulting in practice change (Kang and Bagaoisan, 2024). Knowledge refers to the comprehension of information, including a conscious and non-symbolic sense of meaning (Liao et al., 2022). Knowledge is the basis and precondition for transformation practice. It refers to the knowledge, comprehension, and abilities humans gain through learning and experience accumulation. Individuals' ability to construct the right cognitions and attitudes depends on their acquisition and accumulation of information (Kang and Bagaoisan, 2024). The attitude pertains to the subjective assessment of something objective, which may be either positive or negative (Liao et al., 2022). Attitude is the motivation underlying practice change. It is based on an individual's comprehension and internalization of information, which results in a stable and long-lasting psychological state. Individual cognition and attitude toward practice eventually determine the beginnings and development of practice (Kang and Bagaoisan, 2024). Moreover, the practice refers to routine activities shaped by commonly accepted social norms and beliefs (Liao et al., 2022). Practice is a concrete expression of knowledge and attitude, serving as the primary objective of practice modification. It encompasses the behaviors and responses of people within contexts and circumstances, being profoundly shaped and influenced by knowledge and attitude (Kang and Bagaoisan, 2024). Applying the KAP model in foodservice enhances meal safety and quality. Improper food handling can cause contamination and foodborne illnesses (Zanin et al., 2017). The model is particularly relevant to food handlers in hospitals, who require adequate knowledge and positive attitudes to ensure safe dietary practices. Luo et al. (2022) emphasize that solid knowledge and favorable attitudes are essential for effective practices. A study support the idea that these components interact to shape behavior and foster sustainable change. For hospital food handlers, a high level of KAP ensures safe and nutritious meals for vulnerable patients. Putri and Susanna (2021) note that well-informed and conscientious food handlers can significantly reduce foodborne disease transmission. Makhunga et al. (2023) stress the importance of hygiene, especially handwashing, in preventing illness. Therefore, the KAP framework supports the need for continuous training and evaluation of food handlers in pureed diet preparation, ensuring optimal care for dysphagia patients.

Materials and Methods

Study design and sampling method

This study employed a purposive sampling method to select foodservice personnel working in government hospitals throughout Malaysia. Purposive sampling, a non-probability technique, was chosen because it enables researchers to target respondents who possess specific characteristics essential to the research. As Campbell et al. (2020) suggest, purposive sampling is effective for identifying participants likely to provide

rich, relevant data, making it an efficient approach when research resources are limited. The study was conducted in public hospitals across both East and West Malaysia, covering states such as Kedah, Kelantan, Melaka, Negeri Sembilan, Pahang, Perak, Perlis, Pulau Pinang, Selangor, Terengganu, Sabah, Sarawak, and the Federal Territory of Kuala Lumpur. Foodservice personnel working in the foodservice departments of these hospitals were invited to participate by completing an online questionnaire distributed through the Google Form platform. While purposive sampling was appropriate for this targeted population, its inherent limitation lies in the potential for selection bias and reduced generalizability. The study utilized a cross-sectional survey design to assess the knowledge, attitudes, and practices (KAP) of the respondents regarding the preparation of pureed diets for dysphagia patients. A cross-sectional approach, as described by Setia (2016), evaluates exposure and outcomes simultaneously, allowing for data collection from all participants at a single point in time. The study adopted a quantitative methodology using a structured questionnaire designed to collect objective data from a specific population, as described by Oberiri (2017).

Sample size

Based on internal workforce statistics, an estimated 700 food handlers were employed in government hospitals at the time of the study. The sample size was calculated using the Olonite Sampling Technique (OST), as outlined by Olonite (2021), which indicated a minimum of 117 respondents was necessary. To ensure a sufficient response rate, the research team maintained ongoing communication with the Catering Officer Committee at each hospital and issued weekly reminders to facilitate widespread distribution of the questionnaire. A total of 162 valid responses were received, yielding an estimated response rate of 23.1%.

Study instrument and questionnaire

The primary instrument used for data collection was the Knowledge, Attitude, and Practice Dysphagia Puree Questionnaire (KAP DYSPuree), adapted from existing validated tools by Azizan et al. (2023), and aligned with the International Dysphagia Diet Standardisation Initiative (IDDSI) framework (IDDSI, 2019). The questionnaire consisted of five sections; Section A to E (*Table 1*). Section A gathered socio-demographic data of the respondents, while Section B focused on food handler training and typhoid vaccination status. Section C included 25 items that evaluated knowledge related to dysphagia, the preparation of pureed diets, food safety, and nutrition. Section D comprised 14 items measuring food handlers' attitudes towards pureed diet preparation using a five-point Likert scale, ranging from "strongly disagree" to "strongly agree." Section E included 14 items assessing food handling practices, also rated on a five-point Likert scale, ranging from "never" to "always." A pilot study involving 100 foodservice personnel from non-participating hospitals was conducted to ensure clarity and consistency of the questionnaire. Feedback from the pilot helped refine unclear wording. The final questionnaire was completed by 162 respondents via Google Forms. Data were analyzed using SPSS version 29.0, and Cronbach's alpha for both the pilot and final data was 0.796, indicating acceptable reliability.

Table 1. Description of the questionnaire by section.

Section	Aspect	Source
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A	Sociodemographic respondent	Azizan et al. (2023)
B	Food handler training and typhoid vaccine qualification	Azizan et al. (2023)
C	Knowledge of food handler towards pureed diet preparation	Azizan et al. (2023); IDDSI (2019)
D	Attitude of food handler towards pureed diet preparation	Azizan et al. (2023); IDDSI (2019)
E	Practice of food handler towards pureed diet preparation	Azizan et al. (2023); IDDSI (2019)

Knowledge scores in Section C were assessed using a polytomous scoring method as described by Pokhrel et al. (2015) and calculated when correct answers received one point, and incorrect or "not sure" responses received zero. The total knowledge score ranged from 0 to 25, with higher scores reflecting greater knowledge. The Tertile method was employed to classify respondents' knowledge levels as poor, moderate, or good. For the attitude component in Section D, responses were scored from 1 to 5 based on a Likert scale, where 1 represented strong disagreement and 5 represented strong agreement. The total attitude score ranged from 14 to 70 and was classified into poor, good, and excellent levels, following the classification system used by Mohammed et al. (2022). Similarly, Section E, which examined practices, used the same five-point Likert scale, where responses ranged from "never" to "always." Each item was scored from 1 to 5, and the total practice score also ranged from 14 to 70. Practice levels were then categorized as poor, good, or excellent. Participants were given an information sheet outlining the study's goal, and informed consent was obtained electronically prior to questionnaire completion. Incomplete replies (i.e., missing a full section) were omitted from the analysis, whilst partially completed individual items were considered as missing values and analysed using pairwise deletion. All collected data were analyzed using SPSS version 29. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were employed to summarize the demographic characteristics of the respondents as well as their knowledge, attitudes, and practices regarding pureed diet preparation for dysphagia patients.

Pilot testing

This pilot test study was conducted among food handlers from Hospital Kuala Lumpur (HKL). To test the reliability of the questionnaire for this research, the targeted respondents were food handlers working in the hospital's food service department, with characteristics similar to those of the actual respondents in the main study. The questionnaire was distributed to these food handlers via the Google Form application. To ensure the reliability of the questionnaire, the pilot study aimed to collect a sufficient number of respondents to perform the Cronbach's alpha test. Based on the data collected through the Google Form application, a total of 100 respondents completed the questionnaire, which meets the recommended sample size for Exploratory Factor Analysis (EFA), which should be 100 or greater (Hair et al., 2010). The data were analyzed using SPSS version 29.0, and Cronbach's alpha was calculated. The alpha value for the overall questionnaire was 0.796, as shown in the Table. This alpha value of 0.796 indicates that the questionnaire is acceptable (Saidi and Siew, 2019) for the respondents in this study (*Table 2*).

Table 2. Result of Cronbach's Alpha value for the reliability of the pilot testing.

Questionnaire section	Item (N)	Alpha Value (α)
C: Knowledge of Food Handler towards Pureed Diet Preparation	25	0.776
D: Attitude of Food Handler towards Pureed Diet Preparation	14	0.849
E: Practice of Food Handler towards Pureed Diet Preparation	14	0.763
Value Range	53	0.796

Results and Discussion

Demographics of respondents

A total of 162 food handlers from various hospitals participated in the research questionnaire, reflecting the demographic characteristics of the respondents. The majority of participants were female (71%), aligning with the common gender distribution in hospital food services, where women typically outnumber men. The ethnic composition revealed that 94.4% were Malay, with a small representation of Indians (1.9%) and other ethnic groups (3.7%). In terms of age, most respondents fell within the 30–39 age range (48.8%), and regarding education, nearly half held diplomas. The primary job positions identified were Catering Assistants Grade N19 (50.6%) and Assistant Catering Officers Grade C29 (33.3%). Notably, over half of the respondents (53.7%) possessed more than 10 years of experience, indicating a knowledgeable workforce, while a small portion had less than one year of experience. Geographically, a significant number of respondents (50.0%) were located in Wilayah Persekutuan Kuala Lumpur, with fewer in other regions such as Sabah and Negeri Sembilan (Table 3). This over-representation may limit the findings' applicability to other regions, as personnel structures and training opportunities may differ. Furthermore, because the data were self-reported via an online questionnaire, there is a risk of response bias, which includes overestimation of knowledge or adherence to practices.

Table 3. Respondent demographic profile (n=162).

Demography information	Frequency (N)	Percentage (%)
Gender		
Male	47	29.0
Female	115	71.0
Ethnicity		
Malay	153	94.4
Indian	3	1.9
Other	6	3.7
Age		
21 – 29 year old	34	21.0
30 – 39 year old	79	48.8
40 – 49 year old	41	25.3
50 year old and above	8	4.9
Level of Education		
SPM	53	32.7
STPM	7	4.3
Diploma	80	49.4
Bachelor's Degree	21	13.0
Master's Degree	1	0.6
Position		
Catering Assistant Grade N19	82	50.6
Assistant Catering Officer Grade C29	54	33.3
Assistant Catering Officer Grade C32	15	9.3
Assistant Catering Officer Grade C38	4	2.5
Catering Officer Grade C41/44	7	4.3
Years of Work Experience		
Less than 1 year	19	11.7

1 to 5 years	32	19.8
6 to 10 years	24	14.8
More than 10 years	87	53.7
Hospital Location		
Johor	5	3.1
Kedah	4	2.5
Kelantan	8	4.9
Melaka	8	4.9
Negeri Sembilan	1	0.6
Pahang	9	5.6
Perak	5	3.1
Perlis	3	1.9
Pulau Pinang	5	3.1
Selangor	9	5.6
Terengganu	5	3.1
Sabah	11	6.8
Sarawak	8	4.9
Wilayah Persekutuan Kuala Lumpur	81	50.0

Food handler certification, Vaccination status, and standard references

The certification status, vaccination compliance, and access to reference materials among food handlers in Malaysian government hospitals were assessed in Section B of questionnaire (*Table 4*). The findings indicate that nearly all respondents (99.4%) possessed valid food handler training and typhoid vaccination certificates, reflecting strong adherence to food safety standards mandated by the Food Hygiene Regulations and monitored by the Ministry of Health (MOH) (KKM, 2020; MySLPM, 2019). As noted such training equips food handlers with essential knowledge related to hygiene, sanitation, and the prevention of food contamination. In terms of training duration, the majority of respondents (64.2%) reported receiving approximately one week of instruction, while a small minority (1.2%) underwent extended training lasting up to six months. Access to standardized resources was relatively high, with 77.8% of food handlers having access to standard recipes and 82.1% reporting the availability of unique references within their respective kitchens. Despite these positive indicators, notable gaps persist; 22.2% of respondents lacked access to standard recipes and 17.9% did not have unique references. These deficiencies could potentially lead to inconsistencies in food texture, nutritional adequacy, and safety in the preparation of pureed diets for dysphagia patients.

Table 4. Food handler certification, vaccination status, and standard references among the respondents.

Question	Category	Frequency (N)	Percentage (%)
A valid food handler training certificate	Yes	161	99.4
	No	1	0.6
A valid Typhoid Vaccine certificate	Yes	161	99.4
	No	1	0.6
The training period is given for pureed diet preparation	1 week	104	64.2
	3 weeks	22	13.6
	1 month	26	16.0
	3 months	8	4.9
	6 months	2	1.2
Have a standard recipe in pureed diet preparation place	Yes	126	77.8
	No	36	22.2
Have a special reference for pureed diet preparation in the kitchen	Yes	133	82.1
	No	29	17.9

Distribution of responses related to knowledge towards pureed diet preparation among the respondents

Table 5 presents food handlers' responses to 25 knowledge-based questions related to dysphagia diets. For general knowledge (Q1–Q5), most respondents demonstrated strong foundational understanding. In Q1, 98.8% correctly identified that pureed diets are intended for individuals with swallowing difficulties, aligning with Kyodo et al. (2020), who stated that such diets are commonly used for moderate to severe dysphagia. Similarly, high accuracy in Q2–Q5 indicated broad awareness. However, Q4 showed a drop, with only 66.7% answering correctly, revealing gaps in more detailed knowledge that warrant focused education. In contrast, responses to technical questions (Q6–Q10) reflected significant weaknesses. For example, 77.8% incorrectly answered Q6, which addressed the misconception that pureed diets require excessive water, and 82.7% misunderstood the correct preparation sequence in Q10. These findings highlight insufficient practical skills, increasing the risk of texture inconsistencies that can cause aspiration. Adherence to standards like the IDDSI framework is essential for safety and consistency (Cichero et al., 2017). Food safety knowledge (Q11–Q15) showed moderate awareness. While 70.4% recognized that pureed diets are more prone to contamination due to cooling, and 61.1% knew the correct cooking temperature (65°C), gaps remain. Proper food safety is critical in clinical settings, where vulnerable patients are at higher risk of foodborne illnesses (Guenouni et al., 2022). Furthermore, ensuring safe textures reduces choking risks and supports adequate nutrient intake. Nutrition-related knowledge (Q16–Q20) revealed notable deficiencies. Most respondents failed to recognize the importance of including vegetables in pureed diets, with 80.9% and 88.3% answering Q16 and Q19 incorrectly, respectively. This reflects a limited understanding of the nutritional role of vegetables, which are rich in essential vitamins, fiber, and bioactive compounds (Górska-Warsewicz et al., 2021). Addressing these gaps is vital to ensure that pureed meals meet patients' nutritional needs and aid recovery. Finally, knowledge of the IDDSI framework (Q21–Q25) was generally strong, with "True" as the most common response. However, moderate scores for Q22 (67.3%) and Q24 (64.8%) suggest partial understanding of IDDSI Level 4 classification and texture testing methods. While overall familiarity is promising, further training is needed to strengthen practical application.

Table 5. Frequency and percentage knowledge of pureed diet preparation of the respondent.

Item	Category	N	%	N	%	N	%	Mode
Q1	General Knowledge of Dysphagia Diet	160	98.8	2	1.2	0	0	1
Q2		134	82.7	6	3.7	22	13.6	1
Q3		155	95.7	5	3.1	2	1.2	1
Q4		108	66.7	44	27.2	10	6.2	1
Q5		133	82.1	21	13.0	8	4.9	1
Q6	Technical Knowledge in Pureed Diet Preparation	29	17.9	126	77.8	7	4.3	2
Q7		76	46.9	76	46.9	10	6.2	1
Q8		119	73.5	25	15.4	18	11.1	1
Q9		115	71.0	33	20.4	14	8.6	1
Q10		17	10.5	134	82.7	11	6.8	2
Q11	Food Safety Knowledge in Pureed Diet Preparation	114	70.4	21	13.0	27	16.7	1
Q12		37	22.8	109	67.3	16	9.9	2
Q13		99	61.1	56	34.6	7	4.3	1
Q14		62	38.3	86	53.1	14	8.6	2
Q15		57	35.2	72	44.4	33	20.4	2
Q16	Knowledge of Nutrition Apply in Pureed Diet Preparation	22	13.6	131	80.9	9	5.6	2
Q17		121	74.7	25	15.4	16	9.9	1
Q18		80	49.4	61	37.7	21	13.0	1

Q19		8	4.9	143	88.3	11	6.8	2
Q20		124	76.5	21	13.0	17	10.5	1
Q21	Knowledge of Applying IDDSI in Pureed Diet Preparation	158	97.5	0	0	4	2.5	1
Q22		109	67.3	32	19.8	21	13.0	1
Q23		129	79.6	18	11.1	15	9.3	1
Q24		105	64.8	22	13.6	35	21.6	1
Q25		149	92.0	7	4.3	6	3.7	1

Level of knowledge related to pureed diet preparation

Table 6 indicates that the most common knowledge score among food handlers was 14, falling within the moderate range (9–16), with 14.8% of respondents achieving this score. These findings align with previous studies by Amaich et al. (2024), Azizan et al. (2023) as well as Da Vitoria et al. (2021), which similarly reported low to moderate knowledge among food handlers. This underscores the need for targeted training, especially in areas such as food safety, grinding techniques, and temperature control, which are critical to the preparation of nutritionally adequate and safe pureed diets. Adequate nutrition is essential for preserving muscle mass, supporting immunity, and promoting recovery (Lam et al., 2023). However, dysphagia patients often struggle with adherence to texture-modified diets due to taste and texture dissatisfaction (Kim and Lee, 2019), potentially hindering recovery. Enhancing knowledge is thus vital for promoting more positive attitudes and practices, in line with the Knowledge, Attitude, and Practice (KAP) model (Luo et al., 2022).

Table 6. *Level of knowledge related pureed diet preparation distribution among the respondents.*

Level of knowledge	N	%
Poor (score 0 – 8)	5	3.1
Moderate (score 9 – 16)	106	65.4
Good (score 17 – 25)	51	31.5

Distribution of responses related to attitude towards pureed diet preparation among the respondents

Food handlers exhibited a strong positive attitude toward improving their skills, adhering to standardized practices, and seeking guidance in pureed diet preparation (Table 7). This was reflected by high mean scores for statements about consulting supervisors when uncertain (mean=4.19±0.813) and recognizing the importance of the IDDSI framework (mean=4.28±0.760). High scores were also reported for adherence to standardized recipes (mean=4.13±0.835) and consistent use of the IDDSI framework to assess texture (mean=4.16±0.771), highlighting a commitment to best practices (Table 7). Food handlers showed a strong willingness to learn, as indicated by a high mean score of 4.11±0.834 for interest in gaining knowledge before meal preparation. However, confidence in preparing pureed meals without reference materials was low (mean=2.43±1.074), suggesting a dependency on guidelines. The complexity of preparation was acknowledged (mean=3.22±1.062), though food handlers demonstrated awareness of the importance of achieving the correct texture (mean=3.78±1.026). The overall mean score of 3.74±0.920 indicates a generally favorable attitude, leaning towards agreement with most positive statements. While responses varied slightly, the standard deviation suggests most food handlers maintain a positive view, with minor differences in confidence or perceived difficulty. This showed that food handlers demonstrate a proactive attitude toward learning and following regulations, particularly

the IDDSI standards. Their openness to training and adherence to standardized procedures are critical strengths. However, further practical training is needed to build confidence and reduce reliance on references. As Lam et al. (2023) note, taste, appearance, and recognizability influence patient satisfaction, making the food handler's attitude essential in ensuring both safety and nutritional quality for recovery.

Table 7. Frequency and percentage attitude of pureed diet preparation of the respondent.

Question	1		2		3		4		5		M± SD
	N	%	N	%	N	%	N	%	N	%	
I'm efficient in preparing a pureed diet.	4	2.5	24	14.8	53	32.7	62	38.3	19	11.7	3.42 ± 0.963
I prefer to modify the recipe to make the diet taste better.	18	11.1	18	11.1	51	31.5	54	33.3	21	13.0	3.26 ± 1.161
I ensure accurate weighing of each ingredient when preparing the pureed diet.	1	0.6	9	5.6	42	25.9	74	45.7	36	22.2	3.83 ± 0.858
I can prepare a pureed diet without referring to any sources.	37	22.8	51	31.5	46	28.4	24	14.8	4	2.5	2.43 ± 1.074
I like to learn the way to prepare a pureed diet before I prepare it.	2	1.2	3	1.9	27	16.7	73	45.1	57	35.2	4.11 ± 0.834
I'm doing a preliminary study for the preparation of a pureed diet before assigned to cook it.	1	0.6	6	3.7	40	24.7	74	45.7	41	25.3	3.91 ± 0.837
I referred to the standard recipe before prepare the pureed diet.	2	1.2	4	2.5	23	14.2	75	46.3	58	35.8	4.13 ± 0.835
I'm preparing a pureed in the right way, even though I don't like it.	6	3.7	13	8.0	42	25.9	69	42.6	32	19.8	3.67 ± 1.003
I'm worried about preparing a pureed diet because it's too complicated.	12	7.4	25	15.4	57	35.2	52	32.1	16	9.9	3.22 ± 1.062
I will refer to my supervisor if I'm unsure about the pureed diet that needs to be prepared.	2	1.2	3	1.9	20	12.3	75	46.3	62	38.3	4.19 ± 0.813
I must understand that the IDDSI framework will be critical in preparing the pureed diet.	2	1.2	2	1.2	12	7.4	78	48.1	68	42.0	4.28 ± 0.760
I use the IDDSI framework as a guideline to identify the texture of a pureed diet.	2	1.2	2	1.2	19	11.7	84	51.9	55	34.0	4.16 ± 0.771
I learned that the appearance of a pureed diet should not form lumps.	3	1.9	5	3.1	32	19.8	76	46.9	46	28.4	3.97 ± 0.881
I make sure that the pureed diet has a soft and smooth texture that allows for easy mashing with little pressure form a dinner fork.	7	4.3	9	5.6	37	22.8	68	42.0	41	25.3	3.78 ± 1.026

Note: 1=Strongly Disagree; 2=Disagree; 3=Neither Agree or Disagree; 4=Agree; 5=Strongly Agree; M=Mean; SD=Standard Deviation.

Attitude score related to pureed diet preparation among the respondent

The attitude scores of food handlers toward pureed diet preparation varied, with scores ranging from 18 to 66. The majority of respondents (97.5%) exhibited excellent or good attitudes, highlighting a strong commitment to adhering to dietary preparation standards. The mode score of 56, achieved by 10.5% of respondents, indicates that most food handlers fell into the "Excellent" attitude category. Only a small minority (2.5%) exhibited poor attitudes, suggesting that negative perspectives were rare (*Table 8*). The overall positive attitude is consistent with findings from previous studies, such as Amaich et al. (2024) and Da Vitoria et al. (2021), which also reported high attitude levels among food handlers. Despite the moderate knowledge scores regarding pureed diet preparation, the positive attitude results reflect a strong willingness to provide safe and nutritious meals for dysphagia patients. However, the gap between knowledge and attitude suggests that while food handlers are motivated, further efforts are needed to integrate their knowledge with their positive attitudes. This would enhance the quality

and consistency of pureed meal preparation. Management should focus on addressing these gaps to ensure food handlers have the necessary knowledge and skills to match their excellent attitudes, ensuring patient safety and effective rehabilitation through proper diet preparation.

Table 8. Frequency and percentage level of attitude in pureed diet preparation.

Level of attitude	N	%
Poor (1 – 34)	4	2.5
Good (35 – 52)	71	43.8
Excellent (53 – 70)	87	53.7

Practice among food handler towards pureed diet preparation

Table 9 presents data on the frequency and percentage of responses to 14 practice-based questions assessing food handlers' adherence to pureed diet preparation procedures in a government hospital. These procedures include essential tasks such as ingredient measurement, proper food grinding, protocol compliance, and texture testing using methods recommended in the IDDSI framework (IDDSI, 2019). The findings suggest a generally strong compliance with standard procedures. The highest adherence was observed in the use of grinding machines (mean=4.17±1.072), with 48.1% of food handlers consistently utilizing this equipment. Similarly, many respondents reported seeking guidance from supervisors (mean=4.14±0.952), and 43.8% consistently followed the IDDSI guidelines for texture optimization (mean=4.12±1.042). These results highlight a collaborative environment and a commitment to maintaining the quality and safety of pureed diets. Moderate adherence was noted in texture testing practices. Tests like the fork-drip or spoon-tilt had a mean score of 3.80±1.173, with 31.5% always and 38.3% often performing them. However, more technical assessments such as the 10 mL syringe flow test (mean=3.13±1.428) and the finger test (mean=2.38±1.342) were less frequently used. This suggests a gap in training related to the full implementation of the IDDSI framework, potentially affecting diet texture accuracy and safety for dysphagia patients. Notably, 43.8% of respondents affirmed that they would follow IDDSI guidelines to improve diet texture, reflecting readiness to apply best practices when adequately trained. On the other hand, ingredient measurement practices were less consistent. Only 27.8% always measured liquids before adding them to pureed foods (mean=3.65±1.171), and just 18.5% consistently weighed ingredients beforehand (mean=3.25±1.258). These inconsistencies point to a need for greater standardization in food preparation procedures. The overall mean score for pureed diet practices was 3.29±1.209, indicating a general pattern of "sometimes" to "often" following proper procedures. While compliance with equipment use and protocols is relatively high, variability remains in texture assessment and ingredient quantification, underlining the need for focused training and standardized guidelines to ensure high-quality and safe pureed food preparation.

Table 9. Frequency and percentage practice of pureed diet preparation of the respondent.

Question	1		2		3		4		5		M± SD
	N	%	N	%	N	%	N	%	N	%	
I weighed every ingredient before preparing a pureed diet.	21	13.0	19	11.7	50	30.9	42	25.9	30	18.5	3.25 ± 1.258
I grind the food using only the normal water that's been cooked.	42	25.9	16	9.9	23	14.2	50	30.9	31	19.1	3.07 ± 1.489
The amount of liquid that I use when grinding meat for the pureed diet is based	40	24.7	28	17.3	49	30.2	39	24.1	6	3.7	2.65 ± 1.198

on my own estimate.											
I'm using a special grinding machine for the pureed diet.	9	5.6	4	2.5	15	9.3	56	34.6	78	48.1	4.17 ± 1.072
I got guidance from the chief/staff to prepare the pureed diet.	4	2.5	6	3.7	17	10.5	71	43.8	64	39.5	4.14 ± 0.952
I grind the ingredients first before cooking the pureed diet.	82	50.6	20	12.3	22	13.6	23	14.2	15	9.3	2.19 ± 1.421
I've been able to prepare a pureed diet in a short time because it's too easy.	17	10.5	33	20.4	68	42.0	35	21.6	9	5.6	2.91 ± 1.030
I referred to the standard recipe when preparing a pureed diet.	7	4.3	6	3.7	25	15.4	63	38.9	61	37.7	4.02 ± 1.036
I cook the pureed diet for 3 hours before serving.	50	30.9	29	17.9	39	24.1	31	19.1	13	8.0	2.56 ± 1.319
I will measure the liquid amount if needed add it to the cooked pureed diet.	12	7.4	11	6.8	44	27.2	50	30.9	45	27.8	3.65 ± 1.171
I will follow the IDDSI framework if I want to prepare a better textured pureed diet.	7	4.3	6	3.7	19	11.7	59	36.4	71	43.8	4.12 ± 1.042
I will use the fork-drip or spoon-tilt test when preparing the pureed diet to ensure the texture is thick.	13	8.0	8	4.9	28	17.3	62	38.3	51	31.5	3.80 ± 1.173
I will use a 10 mL syringe to conduct the IDDSI flow test to determine the liquid thickness.	36	22.2	14	8.6	38	23.5	41	25.3	33	20.4	3.13 ± 1.428
I will use the finger test to determine whether food slides smoothly and easily between fingers.	65	40.1	22	13.6	34	21.0	31	19.1	10	6.2	2.38 ± 1.342

Note: 1=Strongly Disagree; 2=Disagree; 3=Neither Agree or Disagree; 4=Agree; 5=Strongly Agree; M=Mean; SD=Standard Deviation.

Level of practice on pureed meal preparation among the respondents

The analysis of food handlers' scores in pureed diet preparation showed a broad range (14–70), with the mode at 47, placing most respondents in the "Good" category. As shown in *Table 10*, 70.4% of participants demonstrated good practices, 22.2% exhibited excellent practices, and 7.4% fell into the poor category. While overall performance was strong, the data suggests a need to improve practices further to shift more handlers from "Good" to "Excellent." There was a clear correlation between knowledge and practice, both clustering at moderate levels. This supports previous findings that limited knowledge can negatively affect food handling behavior (Da Vitoria et al., 2021). According to KAP theory, greater knowledge leads to better practices. As food handlers enhance their understanding, their skills and problem-solving capabilities improve. Therefore, Continuous education is crucial to strengthening knowledge and practical application in preparing pureed diets.

Table 10. Frequency and percentage level of practice in pureed diet preparation.

Level of practice	N	%
Poor (1 – 34)	12	7.4
Good (35 – 52)	114	70.4
Excellent (53 – 70)	36	22.2

Conclusion

The study analyzed the knowledge, attitudes, and practices of food handlers in Malaysian government hospitals regarding pureed diet preparation for dysphagia patients. It found that while most handlers had moderate knowledge and positive attitudes, there were gaps in technical skills, particularly in applying IDDSI guidelines. The study recommends implementing advanced training on IDDSI standards, adopting

standardized recipes, and leveraging technology to strengthen practical competencies across healthcare settings. The research faced challenges, including delays in obtaining approval from government institutions, but gained valuable insights. Future studies should explore private healthcare institutions and conduct longitudinal studies to evaluate the long-term impact of training on food handlers' practices and the health outcomes of dysphagia patients. Adopting a patient-centered approach will provide further insights into the effectiveness of current methods in meeting patients' nutritional needs and preferences, ultimately improving food service systems and patient care.

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Conflict of interest

The authors declare no conflict of interest related to this study.

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