

Knowledge, Attitudes and Practices of Post-operative Nutrition among Adults with Surgical Experience in Penang

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ABSTRACT: The aim of this study was to determine the knowledge, attitudes, and practices (KAP) of post-operative nutrition among adults with surgical experience in Penang. The main reason of selecting Penang as the study area is due to the increasing number of surgical cases in the state as well as its advantage of diverse ethnicity representative of Malaysia. A cross-sectional study via face-to-face administered and developed questionnaire regarding post-operative nutrition was carried out among respondents (n=60) (45% males and 55% females) aged 18 and above from three districts of Penang. Data collection was done at schools, colleges, markets, shops and hawker centres to represent adult population in Penang. Score grading system was used as score above 75% was graded as 'good', 50-74% as 'average' and below 50% as 'poor'. It is found that 50% of the respondents had poor knowledge of post-operative nutrition in overall and 88.3% of them had an average score of attitude towards post-operative nutrition. By using descriptive statistics, it is revealed that majority also tended to maintain the usual consumption of various types of food, rather than increasing their nutrient intakes as recommended for optimum wound healing. Knowledge and attitude differed significantly among different age groups ($p = 0.036$ and $p = 0.001$, respectively) and educational levels ($p = 0.017$ and $p = 0.022$, respectively) but did not differ significantly between gender and ethnicity using non-parametric Mann-Whitney and Kruskal-Wallis tests. There was a correlation between knowledge and attitudes ($p = 0.002$) by using Spearman correlation test. The present study suggested that healthcare workers should provide adequate patient education, improve patient attitude and practise regarding post-operative nutrition which may help in promoting optimum nutritional care after surgery among surgical patients.

Keywords: knowledge, attitudes, practices, post-operative nutrition, adults with surgical experience, Penang Malaysia

Introduction

Millions of patients undergo surgery each year worldwide (Allvin et al., 2008). The number of surgical cases performed in Malaysia is increasing rapidly from year to year. According to Health Informatics Centre of Malaysia (2011), the total number of surgical operations increased from 444,630 cases in 2001 to 1,038,792 cases in 2012, a drastic rise of approximately 134%.

Few studies have been performed to assess KAP towards post-operative nutrition among surgical patients (Pumulo, 2015; Bjerrum et al., 2011; Kobe, 2006). Thus, this study is important to see how well they understand that poor nutritional status after surgery is likely to contribute to both minor and major surgical complications, as well as how the nutrient requirements change after surgery as well as the importance of nutritional guidelines for optimum wound healing. Increased awareness of post-operative nutrition helps to reduce length of hospital stay, infection, complication, readmission rates, mortality and cost of medical care (Tappenden et al., 2013; Barker et al., 2011; Cerantola et al., 2011). No published study has determined the awareness and level of KAP among the adults with surgical experience in Malaysia. Hence, this study attempted to determine KAP of post-operative nutrition among adults with surgical experience in Penang. The findings may help healthcare workers in planning, designing, and implementing health education, as well as promotional activities and nutritional counselling, in a more effective way.

A staggering number of hospitalized patients receive no education at all about their dietary intake after being discharged (Jack et al., 2009). Although it is the healthcare workers' duties to ensure surgical patients receive access to safe, appropriate and adequate nutrition, much of the responsibility for post-operative recovery has been shifted to the patients after discharge (Kuivalainen and Jokivirta, 2014). This shift is often being carried out without considering patients' possibility or ability to take care of their own recovery (Allvin et al., 2008). Therefore, awareness of post-operative nutrition is not only important to healthcare workers, but also to patients who are subjected to surgery.

Significant increase in hospital readmission rates ($p < 0.0001$) was found among general surgery patients in the United States (Kassin et al., 2012). In the same study, 11.3% of general surgery patients were readmitted within 30 days of discharge, which might be due to inadequate patient education or knowledge after being discharged from hospitals (Silow-Carroll et al., 2011). According to a study by the Agency for Healthcare Research and Quality (2009), patients with a clear understanding of their after-hospital care instructions including diet and lifestyle requirements were 30% less likely to be readmitted than patients whom were lacking of information.

Low nutritional support was also reported being significantly correlated ($p = 0.001$) with post-operative complications (Andromalos et al., 2014; Bozzetti et al., 2007; Pear, 2007). Due to the substantial catabolic response to surgery, patients' nutritional status is also known to be worsening during hospitalization. Malnutrition is the third most frequent reason cited for post-operative hospital re-admission, and its implications are significant (Kazaure et al., 2012). It is reported that length of hospital stay of malnourished patients (15 days) was comparatively longer than those without malnutrition (5 days) (Sundresh et al., 2013). However, patients' nutritional information needs are often underestimated, meaning that many patients suffer from a lack of awareness, essential knowledge, guidance, and education on nutrition after surgery.

Increased of knowledge, developments of anaesthesiology and surgery techniques and economic pressures have resulted in shortened hospitalization time (Allvin et al., 2008). To illustrate this, the same study has proposed that even older patients can be discharged from hospital within 2 or 3 days after major colonic surgery. As a result, most surgical site infections are actually occurred post-discharge, placing a burden on patients who are often ill-prepared to manage surgical site infections. Since surgery covers a diverse range of conditions and diseases, awareness, knowledge, attitudes and practices of post-operative nutrition are important for optimum recovery and wound healing. Hence, the general objective of this study was to determine the knowledge, attitudes and practices (KAP) of post-operative nutrition among adults with surgical experience in Penang, Malaysia.

Material and Methods

This was a cross-sectional study that has been carried out in three main towns of three districts (North-east district, Northern district and Central district, respectively) of Penang, namely Georgetown, Butterworth and Bukit Mertajam for a duration of two months from June to November 2016. This study was done at schools, colleges, markets, shops and hawker centres to represent adult population in Penang. Calculation of surgical prevalence and minimum sample size was based on Department of Health New York (1999) and Binu et al. (2014). Calculation showed that the minimum sample size for this study was 52. The following shows the calculation of surgical prevalence and minimum sample size.

Prevalence of surgery

$$\begin{aligned}
 &= \frac{\text{Surgical cases in MoH hospitals during 2012}}{\text{Total population of Malaysian during 2012}} \\
 &= \frac{1,038,792}{29,510,000} \times 100\% \\
 &= 3.52\%
 \end{aligned}$$

n

$$\begin{aligned}
 &= \frac{(Z_{1-\frac{\alpha}{2}})^2 p (1 - p)}{d^2} \\
 &= \frac{(1.96)^2 \times 0.0352 (1 - 0.0352)}{(0.05)^2} \\
 &= 52.2 \\
 &\approx 60
 \end{aligned}$$

Where	n	=	Minimum number of respondents
	$Z_{1-\frac{\alpha}{2}}$	=	Z statistic (1.96 for the level of confidence of 95%)
	p	=	Expected proportion or prevalence
	d	=	Precision or sampling error

Source: Malaysia Ministry of Health (2012);
 Department of Statistics Malaysia (2012)

A total of 60 respondents (adults aged 18 and above with surgical experiences, irrespective of types of surgery underwent, and had duration of less than 12 months after surgery) were recruited in the study through multi-stage sampling, in order for the samples to be representative of the population (NHMS, 2015; Teddlie and Yu, 2007). In this study, stratified sampling technique was used, in which the population was divided into sub-groups

called strata, followed by simple random sampling to select samples. The population of Penang was first stratified into several regions based on districts, then each member in the clearly defined population had an equal chance of being included in the sample.

The research instrument used in the present study was a face-to-face administrative developed questionnaire consisting of four sections – (A) Demographics and Self-Reported Clinical Data, (B) Knowledge, (C) Attitudes and (D) Practices towards Post-Operative Nutrition. There were eight (refer to Table 1), 12 (refer Table 2), 20 (refer Table 3) and 11 items in the sections, respectively. Knowledge level of post-operative nutrition was determined using 12 questions consisted of true-false statements regarding the importance of maintaining normal nutritional status, post-operative nutritional guidelines, roles and sources of nutrients. Scores were calculated by using ordinal scales. The calculated score was graded as: “Good” = $\geq 75\%$, “Average” = 50-74%, and “Poor” = $< 50\%$ of the correct answer (Anand and Puri, 2013).

A total of 20 questions was asked in Section C of the questionnaire to determine attitudes towards post-operative nutrition of the respondents. There were six statements regarding perceptions on the importance of post-operative nutrition, 13 statements of health beliefs and food taboos for wound healing and one statement on their understanding of the dietary information after surgery given by physicians or other health professionals. These statements were modified from a previous literature by Harizah (2015) from Ministry of Health Malaysia. 5-point Likert scale, which is an interval scale (1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree) was used. To calculate the score for this section, same score grading system was used as in the knowledge score grading system from Section B. As both positive and negative statements were included in this section, agreement and strongly agreement on positive statements as well as disagreement and strongly disagreement reflected good attitudes by the respondents.

For the practice, 11 types of food and drink were listed based on Malaysia Dietary Guidelines, which can be later classified into five food groups (cereal and grains, fruits and vegetables, meat, poultry, egg, fish and legumes, milk and dairy products, water) that provide six main groups of nutrients, namely carbohydrates, proteins, fats, vitamins, minerals and fluid (Malaysia Ministry of Health, 2010).

Reliability of questionnaire was tested through a pilot test to determine the internal consistency of a group of items (Stangor, 2014). Cronbach's alphas of all titles were found to be greater than 0.6, which indicate acceptable reliability.

Construct validity was used to determine if an instrument actually measures what is intended or how trustful the research results are (Burton and Mazerolle, 2011). The questionnaire for the present study was developed from the published questionnaires and valid literature reviews of related studies (The Sol Goldman Pancreatic Cancer Research Centre, 2016; Declercq et al., 2015; Harizah, 2015; Lohsiriwat, 2014; Ministry of Health Sri Lanka, 2014; Elizabeth, 2013; Yusuf et al., 2013; Bidin, 2012; Lv et al., 2012; Cepeda-Lopez et al., 2011; Chew et al., 2011; Kratzing, 2011; Sickder et al., 2010; Australian Wound Management Association, 2009; Ariff and Beng, 2006).

Data obtained were analysed using Statistical Package for the Social Sciences (SPSS) version 20.0. Normality determination using Kolmogorov-Smirnov test was carried out in data analysis of the study. Descriptive test was used to determine the knowledge, attitude and practice of post-operative nutrition, respectively, among adults with surgical experience in Penang. The scores in knowledge and attitude towards post-operative nutrition were summed up and categorized into either good, average or poor (score above 75% was graded as 'good', 50-74% as 'average' and below 50% as 'poor').

To determine the factors influencing knowledge and attitudes of post-operative nutrition among adults with surgical experience in Penang, Mann-Whitney and Kruskal-Wallis tests were used in comparing scores of knowledge and attitudes towards post-operative nutrition among the respondents based on sociodemographic factors. Last but not least, to determine the relationship between knowledge and attitudes of post-operative nutrition among adults with surgical experience in Penang, Spearman's rank order correlation was used. In all analyses, results were considered significant when $p < 0.05$.

Results and Discussion

Demographic Profile and Self-Reported Clinical Data

The personal profile of the respondent pertaining to social demographic, surgical experience, diet consent, exercise and BMI were shown in Table 1. Based on their self-reported clinical data, most of the respondents underwent general surgery, while only one respondent underwent cardiothoracic surgery.

Majority of the respondents identified themselves as paying attention to eat a healthy diet sometimes. In terms of exercise frequency, most of them exercised only 1-2 times per week, for at least 30 minutes per session. Respondents who did not exercise were 36.7%. Results also indicated that half of the respondents had normal body mass index (BMI), with a mean BMI of 22.1 kg/m². Surprisingly, it was observed that in spite of less paying attention to eating a healthy diet and low weekly exercise frequency, majority of the respondents' BMI still fell within healthy normal range.

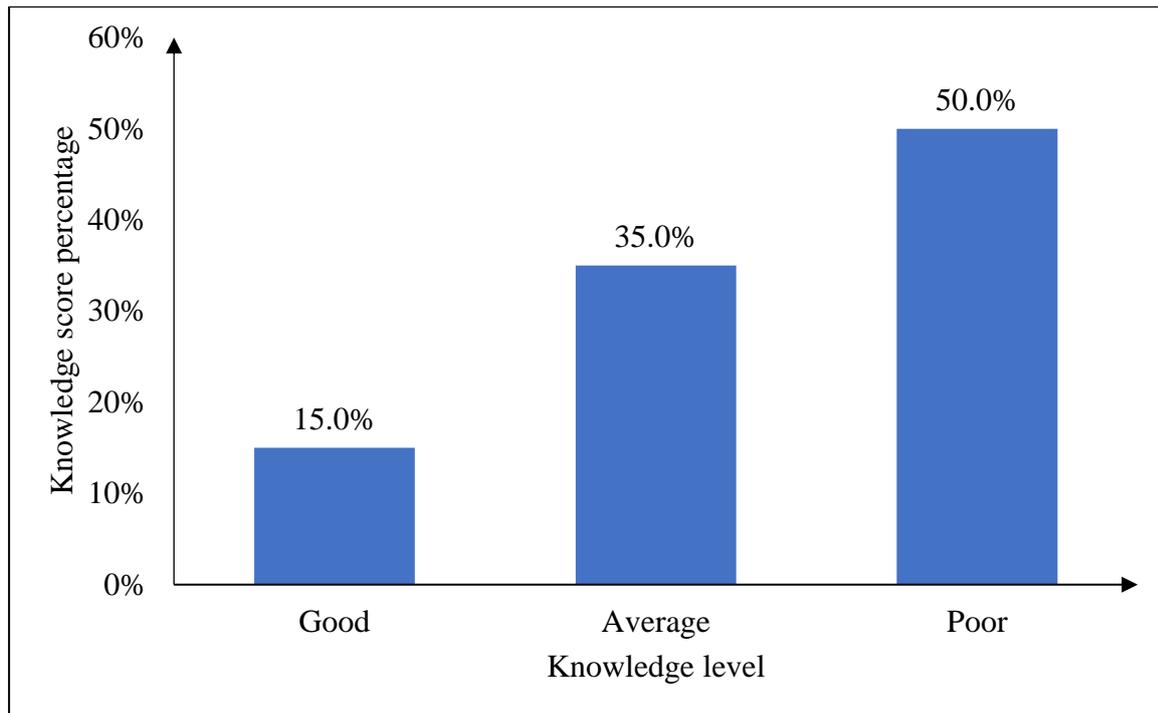
Table 1: The personal profile of the respondent pertaining to social demographic, surgical experience, diet consent, exercise and BMI

Characteristics	(n=60)	
	n	%
Gender		
Male	27	45.0
Female	33	55.0
Ethnicity		
Malay	21	35.0
Chinese	25	41.7
Indian	13	21.7
Others	1	1.6
Age group (year old)		
Mean	38.9 (16.5)	
18-32	24	40.0
33-47	16	26.7
48 and above	20	33.3
Highest educational level		
None	6	10.0
Primary school	10	16.6
Secondary school	19	31.7
Tertiary education	25	41.7
Type of surgical experience		
General Surgery	23	38.3
Orthopaedics	9	15.0
Ophthalmology	3	5.0

Otorhinolaryngology	5	8.4
Urology	3	5.0
Cardiothoracic Surgery	1	1.7
Obstetric and gynecologic surgery	14	23.3
Oral and maxillofacial surgery	2	3.3
Paying attention to eating a healthy diet		
Rarely	6	10.0
Sometimes	23	38.3
Often	21	35.0
Always	10	16.7
Frequency of weekly exercise		
Do not practise	22	36.7
1 - 2 times	27	45.0
3 - 5 times	7	11.7
More than 5 times	4	6.6
BMI (kg/m²)		
Mean	22.1 (3.9)	
Underweight	7	11.7
Normal	31	51.6
Overweight	18	30.0
Obese I	3	5.0
Obese II	1	1.7

Knowledge of Post-Operative Nutrition

Figure 1 shows the categories of respondents' knowledge scores. Majority of the respondents had poor knowledge of post-operative nutrition. The overall result for knowledge on post-operative nutrition was poor among adults with surgical with a median score of only 41.7%. Laffey et al. (2000) has found that the knowledge of perioperative care among 300 elective surgical patients in Ireland was limited, with an average knowledge score of only 31.9%. This was slightly lower than the finding of the present study. Many patients had incomplete knowledge of important aspects of their care after surgery. The outcome is also in alignment with the findings of a recent study by Bajracharya et al. (2014), who reported that the knowledge level regarding post-operative diet was low among 100 surgical patients in Nepal, with a knowledge score of only 31.0%. Lack of such knowledge may lead to questionable dietary practices or behaviours, which can result in delayed wound healing after surgery.



* Good score: $\geq 75\%$, Average score: 50-74%, Poor score: $< 50\%$ (Anand and Puri, 2013)

Figure 1: Post-operative nutrition knowledge score (n=60)

Results in Table 2, shown percentage answered correctly regarding post-operative nutrition knowledge questions by respondents. Most of the questions answered correctly, that might be due to the impact of mass media advertising on the health benefit of micronutrients, increasing public knowledge and awareness in Italy as reported by Hawkes (2013). Furthermore, implementation of the food pyramid may be one of the reasons making information regarding good sources of fat to become well-known, as supported by Hassan et al. (2015). For the aspect of water intake, a study by Rajiah (2012) revealed that majority of the respondents (88%) in Malaysia know that lack of water intake can cause health hazards.

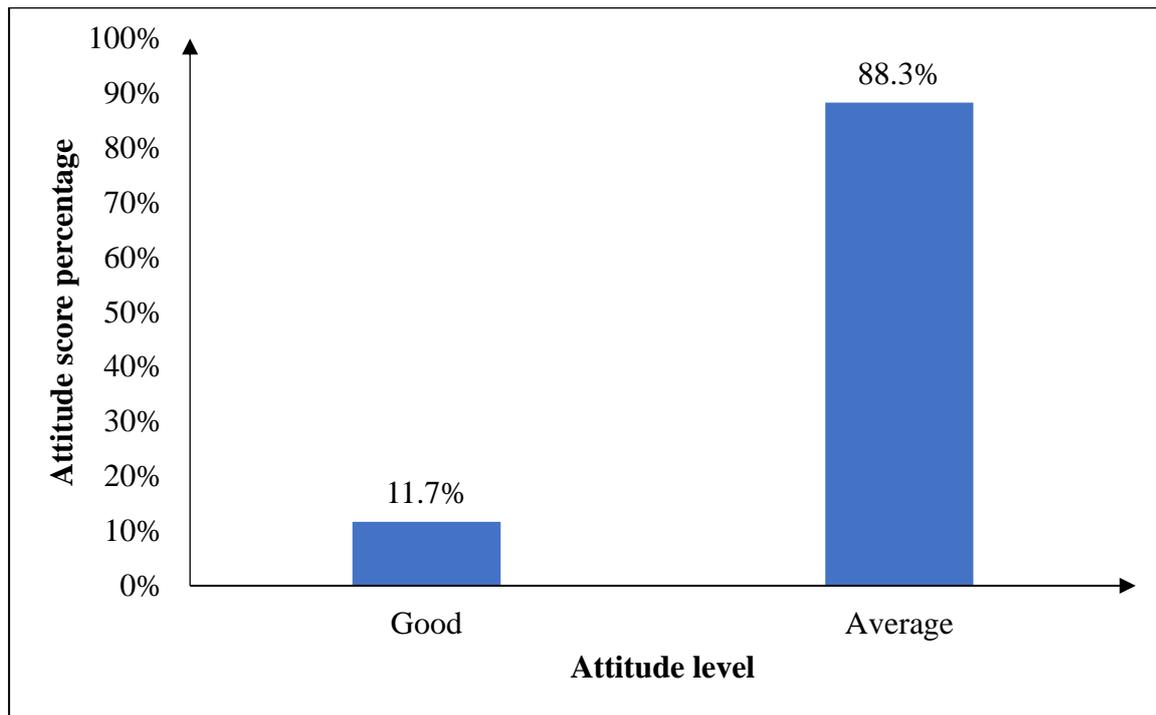
It was observed that although respondents knew the importance of vitamin and mineral intakes for faster wound recovery, their knowledge on nutrient-nutrient interaction was lacking, including the guidelines and effects. For instance, most respondents did not know that vitamin C helps to enhance iron absorption. Majority also did not know that consumption of iron and zinc at the same time can decrease absorption of the minerals. Additionally, they did not know that adding moderate amounts of fats after surgery, including mono- and polyunsaturated fats, improves caloric intake for wound healing.

Table 2: Post-operative nutrition knowledge question

Item	Percentage answered correctly (%)
1. Maintenance of normal nutritional status can prevent risk of post-operative complication in surgical patients.	75.0
2. Micronutrients such as vitamins and minerals are required in post-operative diet for optimum wound healing.	88.3
3. Dietary fat sources include meat, milk, cheese, butter, cream, yoghurt, ice-cream, spreads and cooking oil.	86.7
4. Patient who is having fever, drain losses or stoma losses after surgery only requires normal fluid intake.	78.3
5. Iron and zinc should be consumed at the same time for better absorption.	6.7
6. Best sources of iron in the diet include red meat, fish, eggs, wholemeal bread and dark green leafy vegetables.	58.3
7. Surgical patients require lower nutritional requirement after surgery.	48.3
8. Vitamin A can be found in milk, cheese, eggs, fish, red fruits and dark green vegetables.	40.0
9. Intake of carbohydrate and protein should be reduced after surgery.	36.7
10. Vitamin B complex acts as cofactors for enzyme systems which are important for metabolism of protein, carbohydrate, and fat.	26.7
11. Vitamin C helps to increase absorption of iron.	25.0
12. Dietary fat intake can help to promote wound healing.	15.0

Attitudes towards Post-Operative Nutrition

It was observed that the overall result for attitude towards post-operative nutrition was considerably average among adults with surgical experience with a median score of 64.2%. Figure 2 shows the categories of post-operative nutrition attitude score. Most respondents had average scores. In a study done by Morris et al. (2015), found that surgical individuals in a Midwestern area had positive nutrition attitudes (97.5%).



* Good score: $\geq 75\%$, Average score: 50-74%, Poor score: $< 50\%$ (Anand and Puri, 2013)

Figure 2: Post-operative nutrition attitude score (n=60)

The percentages of respondents with good attitude score for each item are shown in Table 3. Item regarding the importance of nourishing food and supplements had the highest percentage of respondents with good attitude. It was found that majority believed that eating nourishing food and taking supplements can help to maintain health and treat illnesses. They also disagree or strongly disagree with the restriction of vegetables and fruits intake after surgery due to taboo beliefs that vegetables and fruits are ‘poisonous’ food and contain cold elements which will prolong wound healing.

The finding were in aligned with findings by Alhomoud and Bondarev (2016), who also found that almost two-thirds (65%) of a total of 383 subjects perceived that the best way to maintain good health and ensure adequate nutrition is through food and dietary supplements together. Another study by Qidwai et al. (2012) among 400 patients indicated that 79% of the participants considered supplements to be helpful in curing diseases. According to Roberts and Marvin (2011), eating high amount of fruit and vegetables is the most frequently cited component of a healthy diet as rated by majority of adult respondents.

Table 3: Percentage of respondents with good attitude score for each item

Item	Percentage (%) of respondents with good attitude
1. I believe that eating nourishing food and taking supplements can maintain health and treat illness.	88.4
2. I believe that vegetables and fruits are ‘poisonous’ food, therefore the intake should be reduced after surgery.	81.7
3. I believe that vegetables and fruits are not recommended after surgery because the cold elements in them will prolong wound healing.	75.0
4. I think post-operative nutrition is important to enhance wound healing.	65.0
5. I think post-operative nutrition is important to reduce hospital readmission.	63.3
6. I think post-operative nutrition important to reduce risks of morbidity such as complications and surgical site infections.	60.0
7. I think post-operative nutrition is important to shorten hospital stay.	60.0
8. I think post-operative nutrition is important to reduce risk of mortality.	50.0
9. I believe that consumption of snakehead and eel is recommended for faster wound healing.	45.0
10. I think post-operative nutrition is important to reduce medical cost.	38.4
11. I believe that consumption of sea cucumber essence can enhance wound recovery.	36.7
12. I believe that consumption of soy sauce should be avoided as it would darken the scars.	25.0
13. I believe that the types of food that are allowed to be eaten by surgical patients are limited and their portions are small.	20.0
14. I believe that consumption of certain hot food such as lamb should be avoided.	18.4
15. I believe in the traditional notions of ‘hot and cold’ from the <i>Yin-Yang</i> or <i>Ayurvedic</i> systems.	18.3
16. I believe that consumption of eggs can cause wound itchiness and festering.	18.3

17. I believe that consumptions of hen meat should be avoided after surgery.	13.3
18. I believe in ' <i>pantang</i> ' practices or food restriction.	8.3
19. I believe that consumption of seafood such as squid, crab, clams, prawn and fishes (<i>ikan aya, kerisi, terubuk, tenggiri, parang, ikan merah, pari</i> and <i>butir nangka</i>) should be avoided as they are toxic.	6.7

The statement regarding restriction of seafood consumption scored the lowest percentage of the respondents with good attitude. There were respondents perceived seafood as toxic. According to Ariff and Beng (2006), Malaysia, with its multi-ethnic population of Malay, Chinese and Indian, uses many forms of traditional health care including taboos of restricting certain foods in spite of a remarkably modern health service. For example, seafood is perceived as 'toxic' that would cause wound itchiness and festering. However, it is factual that seafood is another good protein source for skin healing (Leonard, 2016). In addition, avoiding chicken meat after surgery is another popular myth. However, as poultry is a primary protein source, there should be no restriction for the intake after operation in order to enhance wound recovery (Harizah, 2015).

Practices towards Post-Operative Nutrition

Based on the results shown in Figure 3, majority of the respondents tend to maintain their usual intakes of all types of food. All respondents should increase their dietary intakes as recommended for optimum wound healing (Australian Wound Management Association, 2009). Decreased dietary intake may be due to the side effects of surgery such as loss of appetite, nausea and vomiting (Short et al., 2016).

It was also observed that most of the respondents increased their plain water intake. This may be due to their perception that drinking plenty of water daily is a good dietary practice as indicated in Malaysia Dietary Guidelines (Malaysia Ministry of Health, 2010). Finding from NHMS (2015) had also shown that the overall prevalence of adequate plain water intake was also high (72.9%) among Malaysian adults. Increasing nutrient intake among surgical patients who underwent bowel surgeries was supported by Australian Government Department of Health and Ageing (2013).

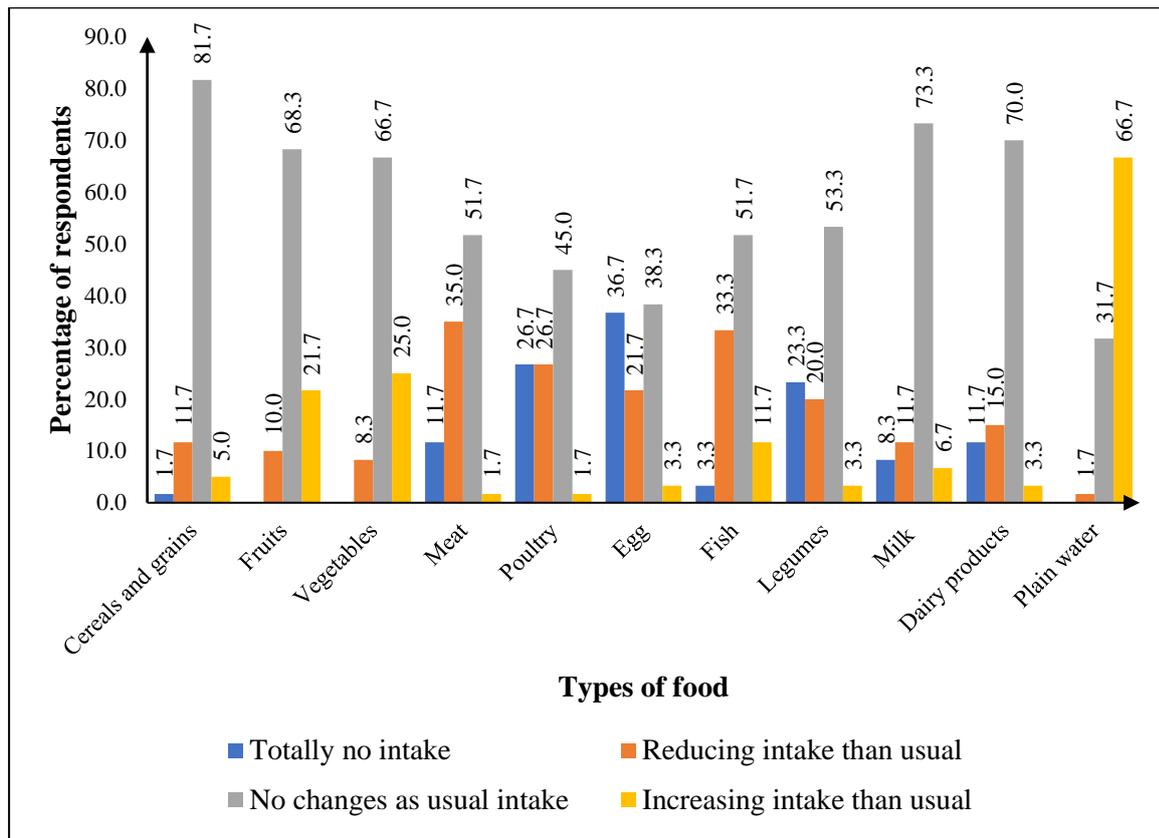


Figure 3: Post-operative eating behaviour for wound healing

Most of respondents reported reducing consumption of meat and fish compared to their usual intakes. This may be due to their strong religious beliefs of ‘*pantang larang*’ or avoidance, as these foods are considered as ‘hot foods’ that would impair wound healing. Fish is also believed to be ‘poison’ and may be prohibited (Bidin, 2012; Ariff and Beng, 2006). However, meat and fish are good source of fats and proteins, respectively, which help to improve caloric intake for wound metabolism. Adequate protein intake is also crucial for formation of new tissues, preserving muscle texture, and aiding immune system to prevent infections (The Sol Goldman Pancreatic Cancer Research Centre, 2016; Pierpont et al., 2014; Australian Wound Management Association, 2009).

Comparisons of Knowledge and Attitudes towards Post-Operative Nutrition with Sociodemographic Factors

The results in Table 4 showed that knowledge and attitude differed significantly among age groups ($p = 0.036$ and $p = 0.001$, respectively). Respondents in age group of 18-32 years old has the highest knowledge and attitude scores. These results support previous study of NHMS (2015) showing that the prevalence of adequate health knowledge was the highest among age group 20-34 years old compared to other age groups.

Knowledge and attitude also differed significantly among educational levels ($p = 0.017$ and $p = 0.022$, respectively). It was observed that respondents with tertiary education had the highest knowledge and attitude score. These results support study of NHMS (2015), demonstrating that overall adequate health literacy was the highest in respondents with tertiary education (11.0%).

Table 4: Differences between social demographic factors towards knowledge and attitude scores

Social demographic factors	Knowledge score		Attitude score	
	Median (IQR)	p-value	Median (IQR)	p-value
Gender		0.674		0.178
Male	50.0 (33.4)		65.3 (10.5)	
Female	41.7 (33.4)		63.2 (12.7)	
Ethnicity		0.363		0.271
Malay	41.7 (29.2)		62.1 (8.4)	
Chinese	50.0 (37.6)		65.3 (11.0)	
Indian	41.7 (29.2)		69.5 (17.4)	
Age group		0.036*		0.001*
18-32	58.3 (22.9)		69.0 (8.4)	
33-47	41.7 (16.6)		61.6 (10.1)	
48 and above	33.3 (18.8)		60.6 (11.9)	
Highest educational level		0.017*		0.022*
None	33.3 (18.7)		61.6 (15.5)	
Primary school	33.3 (14.6)		60.6 (10.8)	
Secondary school	41.7 (25.0)		63.2 (12.7)	
Tertiary education	58.3 (25.0)		67.4 (9.4)	

* Significant at $p < 0.05$ by Kruskal-Wallis test

These results could be because the younger generation has a greater level of education than the older generation. In addition, greater usage of breadth of technologies in the younger

generation compared to older generation could be one of the prominent factors that exposed them to higher level of knowledge and attitude. This may be due to the barriers and challenges faced by older adults in using new technologies. The barriers and challenges are like physical or health condition, sceptical attitudes about the benefits of technology, and difficulties in learning to use new technologies (Smith, 2014). Thus, usage frequency of internet for health information in younger generation was higher than that of older generation. Findings by Olson et al. (2011) had also revealed that younger adults possessed a slight greater usage frequency of internet for health information than older adults, with a mean score of 1.04 and 0.96, respectively.

Relationship between Knowledge and Attitudes towards Post-Operative Nutrition

There was positive, significant relationship between respondents’ knowledge with their attitudes ($p = 0.002$); however, strength of the relationship was considerably low ($r = 0.396$) as presented from the results shown in Table 5. This may indicate that attention and dietary guidelines are important to post-operative nutrition. Azizi et al. (2011) also reported a positive and significant correlation between nutrition-related knowledge and attitudes.

Table 5: Relationship between knowledge and attitudes

Variables of comparison	Correlation coefficient	Sig. level
Knowledge and attitude	0.396	0.002*

* Significant at $p < 0.05$ by Spearman correlation test

In this study, attitude median scores of the respondents were higher than their knowledge median scores. Although the respondents might not have good knowledge of post-operative nutrition, they showed good attitudes towards nutrition. This may be due to the reason that the respondents were willing to follow attitudes if the knowledge was complex. Therefore, the number of distinct dimension of knowledge is also important in influencing their willingness to follow attitudes and not merely affected by the amount of knowledge as supported by Fabrigar et al. (2006). Similar findings were also seen in the studies by Morris et al. (2015) and Plous et al. (1995), in which nutrition attitude score was higher than knowledge score.

Conclusion

In conclusion, most of the adults with surgical experience in Penang exhibited poor knowledge of post-operative nutrition. As for their attitudes, majority of the respondents scored average for attitudes towards post-operative nutrition. For the aspect of practices, it could be considered as less appropriate, as majority tended to maintain their usual consumption of various types of food rather than increasing their nutrient intake as recommended for optimum wound healing. This indicates that more health-related programs on post-operative nutrition need to be conducted among the public. Healthcare workers should help to provide adequate patient education, improve patient attitude and practise regarding post-operative nutrition to promote optimum nutritional care after surgery among surgical patients. Meanwhile, age group and educational level were the factors influencing knowledge and attitudes of post-operative nutrition significantly. There was a positive, significant relationship between their knowledge and attitudes, indicating that high knowledge was associated with high attitudes towards post-operative nutrition, and vice versa. This indicates a need to educate the public in order to change their attitude.

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