

Knowledge, attitude and practice towards dietary iron among patients with thalassemia and their caregivers in Peninsular Malaysia

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ABSTRACT

Introduction: Thalassemias are the most common human monogenic disorders in the world. Regular blood transfusion and increased intestinal absorption of iron among thalassemia patients will lead to iron overload, which will not only markedly decrease their life expectancy but also pose a heavy burden to the healthcare system. The objective of this study was to evaluate the level of knowledge, attitude and practice towards dietary iron among thalassemia patients and their caregivers.

Methods: An analytical cross-sectional study using purposive sampling method was conducted at eight thalassemia societies in Peninsular Malaysia. 260 respondents comprised of patients and caregivers were assessed with two separate sets of questionnaires.

Results: Knowledge on dietary iron among the respondents was unsatisfactory, despite them having good knowledge on thalassemia disorder. Female patients were found to have better dietary knowledge, attitude and practice compared to males. The percentage of caregivers with good attitude and good practice were significantly higher compared to adult patients. Caregivers with children on iron chelators were noted to have better dietary attitude and practice. Thalassemia knowledge and children on vitamins were found to be the predictors of dietary knowledge among the patients and caregivers respectively.

Conclusion: The level of knowledge on dietary iron among the patients and caregivers was unsatisfactory in spite of their attitude and practice towards dietary iron were good. Effective delivery of dietary information to the patients and caregivers is essential to enable them to choose a healthy diet for their condition.

KEY WORDS:

Thalassemia; knowledge; attitude; practice; dietary iron

INTRODUCTION

Thalassemias are the most common inherited single-gene disorders in the world.¹ About 5% of the world's population are carriers of alpha-thalassemia and 1.5% are carriers of beta-thalassemia. Alpha-thalassemia is prevalent in Southeast Asia, Africa, and India whereas beta-thalassemia is prevalent in Mediterranean, Middle East and Southern China.² Globally, about 60,000 symptomatic individuals

were born every year, and majority of them were in the developing countries.³ In 2010, there were a total of 4768 transfusion-dependent thalassemia patients registered with the National Thalassemia Registry of Malaysia,⁴ and beta-thalassemia major is still an ongoing public health problem in Malaysia.⁵

Regular blood transfusion is necessary for patients with thalassemia major. However, regular blood transfusions can lead to iron overload and complications that is associated with it.⁶ In addition, increased intestinal absorption of iron also plays a role in iron overload in thalassemia major.⁷ Although patients with thalassemia intermedia may not require regular blood transfusion for survival, iron overload can occur over time as patients with thalassemia intermedia absorb five to ten times more iron than normal individuals.⁸ The clinical manifestation of iron overload include diabetes mellitus, hypogonadism, hypothyroidism, hypoparathyroidism, and other endocrine disorders.⁹ Cardiac siderosis and its associated cardiac diseases are the major cause of mortality in thalassemia major,^{10,11} whereas iron overload in thalassemia intermedia mainly occurs in the liver leading to liver fibrosis, cirrhosis and potentially hepatocellular carcinoma.^{12,13} As the body does not have an active mechanism of removing the iron, the only way of removing the excess iron from thalassemia patients is the use of iron chelators.¹⁴ For patients with thalassemia intermedia who do not receive iron chelators, a diet low in iron is recommended.¹⁵

There are two types of dietary iron: heme iron and non-heme iron. Heme iron comes from haemoglobin and myoglobin of animal tissues and non-heme iron is found mainly in plants. Because heme iron is absorbed unchanged by the intestine, the absorption of heme iron is relatively constant and unaffected by the composition of foods,¹⁶ whereas the absorption of non-heme iron is greatly influenced by the presence of enhancing and inhibiting factors in the meals.¹⁷ The main dietary enhancers of iron absorption include vitamin C, meat, fish, and poultry, whereas inhibitors include tannins and polyphenols (found in tea and coffee), calcium, dairy products, and phytate.^{18,19,20} In addition, cooking foods with iron utensils could also significantly increase their iron content.²¹

Knowledge and attitude towards health are positively correlated with healthy lifestyle of thalassemia patients.²² The aim of the present study was to determine the level of

This article was accepted: 7 April 2019

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knowledge, attitude and practice towards dietary iron among thalassemia patients and their caregivers in Peninsular Malaysia.

MATERIALS AND METHODS

An analytical cross-sectional study was conducted from July to September 2016. The study was carried out by eight thalassemia societies of the following states in Peninsular Malaysia: Kedah, Kelantan, Negeri Sembilan, Perak, Perlis, Pulau Pinang, Selangor and Terengganu.

The inclusion criteria were adult patients with thalassemia major or intermedia aged 18 years and above; and caregivers of patients below 18 years of age living in Peninsular Malaysia. Whereas the exclusion criteria were patients or caregivers who were unable to comprehend the questionnaires either in English or Malay. Caregivers who were not the usual caregivers of the respondents but at times accompanied the patients to the events and did not know much about the background of patients and medical history were excluded from the study.

A purposive sampling method was used to select the respondents. Based on the prevalence of knowledge towards vitamin among thalassemia patients stood at 75%,²³ and with the estimation of 50% of prevalence in the current study, the sample size calculated for one category of respondents was 74. For both adult patients and caregivers, a total of 148 respondents was required. Taking into consideration of 20% of non-eligibility and 50% of non-response rate, the final sample size was found to be 252.

Ethical approval was obtained from the Penang Medical College Institutional Research Ethics Committee before commencing the study. Patient Information Sheets were given to all respondents to read, and written informed consents were taken after fully explaining the nature and purpose of the study.

The questionnaires were developed based on the information obtained from literature review. The questionnaires were developed in English and translated into Malay language using a forward and backward method. A pilot study involving sixteen thalassemia patients was conducted in order to assess the face validity of the questionnaires and the feasibility of the study. Two paediatricians in charge of thalassemia units of two different hospitals had earlier reviewed the questionnaires so as to validate the contents of the instruments.

There were two separate sets of questionnaires employed in this survey: one set for adult patients with thalassemia and one set for caregivers of thalassemia patients below 18 years of age. The contents of both sets of questionnaires were essentially similar except the words used for addressing the respondents were different. The questionnaires were divided into seven sections as follows:

The first section consisted of 11 questions referring to the respondents' sociodemographic characteristics. The second section consisted of seven questions that covered information

regarding the patients' medical history pertaining to thalassemia. While the third section consisted of nine multiple choice questions with five options each to assess the respondents' knowledge on thalassemia. One mark was assigned for each correct response and zero for incorrect answer. The score range for section three was from zero to nine. A score of nine, which was based on 75th percentile as the distribution of scores was strongly skewed to the left, was used as the cutoff point to categorise their knowledge on thalassemia into satisfactory and unsatisfactory.

The fourth section consisted of ten items to evaluate the level of knowledge on dietary iron and its relation to health. The respondents were requested to choose from three options provided: 'Yes' 'No' or 'Don't know'. One mark was allocated to each correct answer. The score range for section four was from zero to ten. The fifth section consisted of four multiple selection questions and three multiple choice questions to determine the level of knowledge on dietary factors affecting iron absorption. The score range for section five was from zero to 18. The level of overall knowledge on dietary iron among the respondents was assessed by using the questions in section four and section five in the questionnaires as each section represented one aspect of dietary knowledge. The combined score of section four and section five ranged from zero to 28. A combined score of 17, which was based on the mean as the scores were normally distributed, was used as the cutoff point to categorise the level of overall knowledge on dietary iron into satisfactory and unsatisfactory.

The sixth section consisted of six "Yes" or "No" closed-ended questions to evaluate their attitude towards dietary iron. The score range for section six was from zero to six. A score of six, which was based on 75th percentile as the score distribution was strongly skewed to the left, was used as the cutoff point to categorise their attitude towards dietary iron into good and poor. And the seventh section consisted of four "Yes" or "No" questions to examine their practice related to dietary iron. The score range for section seven was from zero to four. A score of four, which was again based on 75th percentile, was used as the cutoff point to categorise their practice related to dietary iron into good and poor.

Data was analysed using Stata version 13.0. Descriptive statistics was used to describe the respondents. For numerical variables such as the age of respondents, mean and 95% confidence interval were displayed. Whereas for the categorical variables such as gender and employment, frequency and percentage were displayed. For inferential statistics to test the research questions, logistic regression was used to analyse the associations between the independent variables and the level of knowledge, attitude and practice related to dietary iron. Independent variables with p-value less than 0.25 from univariable analysis were entered into multivariable logistic regression analysis as recommended by Hosmer et al.²⁴ to include those variables that could be of clinical importance but failed to be picked up at p-value less than 0.05. Kendall's rank correlation test was used to examine the interrelationships between the level of knowledge, attitude and practice towards dietary iron among the respondents. The statistical results were considered significant at $p < 0.05$.

RESULTS

Sociodemographic characteristics

A total of 260 respondents which included 137 adult patients and 123 caregivers. The mean age of adult patients was 27 years (95% Confidence Interval (95%CI): 25.56, 28.48) which ranged from 18.2 to 66.5 years and of the caregivers was 41.2 years (95%CI: 39.84, 42.64) with a range from 27 to 58.7 years. 62.8% of the adult patients and 68.3% of the caregivers were females. There was no other relationship between the caregivers and children other than parents-children relationship. Majority of the adult patients (96.4%) and caregivers (90.2%) were Malays and most of them had attained secondary education or higher. Slightly more than half of both categories of respondents were unemployed during the survey (Table I).

Medical history and treatment history profiles of the patients

There were 81.6% of adult patients and 83.7% of children on iron chelators and about half of them were taking vitamin supplements during the survey. Majority of them claimed that they had never had any complications related to thalassemia or its treatment (Table II).

Analysis of respondents' knowledge on dietary iron and its relation to health

Table III reveals that majority of the adult patients (94.2%) and the caregivers (98.4%) had heard of dietary iron and most of them had heard of and knew the importance of iron chelators. A total of 90.4% of the adult patients and 88.5% of the caregivers knew that it was harmful to take more iron and about three quarters of them were aware that blood transfusion could increase the iron level in their body. Moreover, most of the adult patients (70.8%) and the caregivers (78.3%) knew that dietary iron was bad for their health and majority of them were aware that iron overload could affect their liver and heart. However, only 46% of the adult patients and 33.6% of the caregivers knew that iron overload could lead to diabetes mellitus, and the difference was of statistical significance ($p < 0.001$).

Analysis of respondents' knowledge on dietary factors affecting iron absorption

As demonstrated in Table IV, majority of the respondents were able to correctly identify liver, beef, oyster and clam as the types of foods that have high iron content out of 14 options provided in the multiple selection questions. Nearly 73.0% of the adult patients and 69.9% of the caregivers recognised that tea could inhibit iron absorption, however, majority of them were unaware that milk, coffee and ice cream float could also reduce the absorption of iron. Less than one third of the respondents correctly selected egg as food that could decrease iron absorption and majority of them could not identify cheese and ice cream could diminish the absorption of iron. The findings showed that majority of both categories of respondents were unaware that fruits such as watermelon, orange, lemon and papaya should be avoided while having their meals in order to reduce iron absorption. Moreover, about half of respondents did not know that cooking with iron utensils could lead to an increase in iron content of the foods. Only 48.9% of adult patients and 57.0% of caregivers knew that vitamin C could enhance the absorption of iron. There were significantly

higher percentage of caregivers (72.4%) who recognised breakfast cereal was commonly fortified with iron compared to adult patients (59.1%) with $p = 0.025$.

Analysis of respondents' attitude towards dietary iron

The attitudes of respondents towards dietary iron are presented in Table V. The percentage of the caregivers (95.1%) who were concerned about the iron content of foods were significantly higher than that of the adult patients (83.8%) at $p = 0.003$.

Analysis of respondents' practice towards dietary iron

There were significantly greater proportion of the caregivers (88.5%) who read the labels of food products for iron content compared to the adult patients (67.7%) at $p < 0.001$. The proportion of respondents who would consider what types of foods would best be taken at the same time in order to minimize iron absorption were found to be significantly greater among the caregivers (93.4%) compared to the adult patients (84.6%) with $p = 0.02$ (Table V).

Scores of thalassemia knowledge, dietary knowledge, attitude and practice among the respondents

The mean scores of knowledge about thalassemia among the adult patients and their caregivers were 7.54 (95%CI: 7.26, 7.82) and 7.89 (95%CI: 7.63, 8.14) respectively with the corresponding mean percentage scores of 83.8% and 87.7%. There was no significant difference in mean scores on overall dietary knowledge observed between the adult patients 16.66 (95%CI: 15.97, 17.35) and the caregiver 16.67 (95%CI: 15.97, 17.38). The mean percentage scores on overall dietary knowledge for the adult patients and the caregivers were 59.5% and 59.6% respectively. The mean scores achieved by the caregivers on attitude 5.76 (95%CI: 5.64, 5.89) and practice 3.59 (95%CI: 3.43, 3.74) were significantly higher compared to adult patients, which were of 5.41 (95% CI: 5.19, 5.63) and 3.13 (95%CI: 2.93, 3.33) respectively with $p < 0.05$. The proportion of the caregivers with good attitude (86.2%) and good practice (75.6%) were significantly higher compared to the adult patients (72.3% and 54.0%, respectively) with $p < 0.05$.

Inferential Statistics

Among the adult patients, gender was the only sociodemographic factor significantly associated with knowledge, attitude and practice related to dietary iron. Females were found to have better knowledge (Odds Ratio (OR): 2.99, 95%CI: 1.46, 6.13), attitude (OR: 2.84, 95% CI: 1.32, 6.14) and practice (OR: 2.29, 95%CI: 1.13, 4.65) towards dietary iron compared to males. On the other hand, no significant associations were detected between the sociodemographic variables with dietary knowledge, attitude and practice among the caregivers.

Regarding the associations between medical history and treatment history variables with knowledge, attitude and practice towards dietary iron. The caregivers with children on iron chelators were found to have three and a half times greater odds of good attitude (OR: 3.58, 95%CI: 1.14, 11.24), and three times higher odds of good practice (OR: 3.19, 95%CI: 1.17, 8.71) compared to those without children on iron chelators. Apart from that, there were no significant

Table I: Sociodemographic characteristics of the respondents

Variables	Adult Patients (n=137)	Caregivers (n=123)
	Mean (95% CI) Frequency (%)	Mean (95% CI) Frequency (%)
Age (years)	27.02 (25.56-28.48)	41.24 (39.84-42.64)
Gender		
Male	51 (37.2)	39 (31.7)
Female	86 (62.8)	84 (68.3)
Ethnicity		
Malay	132 (96.4)	111 (90.2)
Non-Malay	5 (3.6)	12 (9.8)
Education		
Primary and lower	11 (8.1)	18 (14.9)
Secondary and higher	124 (91.9)	103 (85.1)
Employment		
Yes	66 (48.5)	52 (42.6)
No	70 (51.5)	70 (57.4)

Table II: Mean and frequency distribution of medical history and treatment history variables

Variables	Adult patients (n=137)	Children of caregivers (n=123)
	Mean (95% CI) Frequency (%)	Mean (95% CI) Frequency (%)
Age first diagnosed (years)	5.59 (4.28-6.89)	2.45 (2.04-2.85)
Age first transfusion (years)	7.24 (5.67-8.81)	2.96 (2.49-3.43)
Duration since 1st transfusion (years)	19.44 (18.04-20.84)	8.17 (7.22-9.11)
Frequency of transfusion (weeks)	5.61 (4.97-6.25)	4.21 (3.92-4.50)
Age started iron chelators (years)	17.70 (15.70-19.82)	6.50 (5.61-7.39)
Duration of treatment (years)	7.81 (6.40-9.21)	3.92 (3.15-4.68)
On iron chelators		
Yes	111 (81.6)	103 (83.7)
No	25 (18.4)	20 (16.3)
On vitamins		
Yes	62 (45.9)	61 (50.0)
No	73 (54.1)	61 (50.0)
Complications		
Yes	23 (17.4)	14 (11.9)
No	109 (82.6)	104 (88.1)

Table III: Distribution of respondents' knowledge on dietary iron and its relation to health

Assessment items	Adult patients (n=137)	Caregivers (n=123)	Chi-square	p-value
	N (%)	N (%)		
Ever heard of dietary iron.	129 (94.2)	121 (98.4)	3.11	0.078
Ever heard of iron chelators.	128 (93.4)	114 (92.7)	0.06	0.813
Know the importance of iron chelators.	120 (87.6)	112 (92.6)	2.16	0.339
Know that it was harmful to take more iron.	122 (90.4)	108 (88.5)	7.29	0.026
Aware of dietary iron could affect their health	98 (72.6)	101 (83.5)	7.80	0.020
Aware of dietary iron was bad for their health	97 (70.8)	94 (78.3)	4.58	0.101
Know that iron overload could affect the liver	123 (90.4)	113 (92.6)	3.31	0.191
Know that iron overload could affect the heart	113 (83.1)	106 (86.9)	2.20	0.332
Understand that blood transfusion could increase body iron level	102 (74.5)	92 (75.4)	1.47	0.479
Know that iron overload could cause diabetes mellitus	63 (46.0)	41 (33.6)	15.94	< 0.001

N: Number of respondents who gave a positive response.

Table IV: Distribution of respondents' knowledge on dietary factors affecting iron absorption

Assessment items	Adult patients (n=137)	Caregivers (n=123)	Chi-square	p-value
	N (%)	N (%)		
Part A (Multiple selection questions)				
Correctly selected the following foods that have high iron content out of 14 options.				
- Liver	128 (93.4)	114 (92.7)	0.06	0.813
- Beef	117 (85.4)	114 (92.7)	3.47	0.063
- Oyster	101 (73.7)	102 (82.9)	3.21	0.073
- Clam	104 (75.9)	91 (74.0)	0.13	0.720
Correctly selected the following drinks that inhibit iron absorption out of 16 options.				
- Tea	100 (73.0)	86 (69.9)	0.31	0.583
- Milk	68 (49.6)	57 (46.3)	0.28	0.596
- Coffee	60 (43.8)	47 (38.2)	0.83	0.361
- Ice cream float	8 (5.8)	6 (4.9)	0.12	0.732
Correctly selected the following foods that reduce iron absorption out of 15 options.				
- Egg	43 (31.4)	40 (32.5)	0.04	0.845
- Cheese	18 (13.1)	18 (14.6)	0.12	0.727
- Ice cream	18 (13.1)	8 (6.5)	3.17	0.075
Correctly selected the following foods to be avoided while having meals out of 10 options.				
- Watermelon	41 (29.9)	37 (30.1)	< 0.01	0.978
- Orange	60 (43.8)	35 (28.5)	6.58	0.010
- Lemon juice	51 (37.2)	35 (28.5)	2.25	0.133
- Papaya	53 (38.7)	36 (29.3)	2.55	0.110
Part B (Multiple Choice Questions)				
Correctly identified iron cookware as the utensil that could increase iron content of foods.	66 (48.2)	63 (51.6)	0.31	0.578
Correctly identified vitamin C as a vitamin that could enhance iron absorption.	67 (48.9)	69 (57.0)	1.70	0.192
Correctly identified breakfast cereal as food that was commonly fortified with iron.	81 (59.1)	89 (72.4)	5.01	0.025

N: Number of respondents who correctly responded.

associations found between the remaining variables pertaining to medical history and treatment history with knowledge, attitude and practice towards dietary iron among both categories of respondents.

There were significant associations between knowledge on thalassemia with knowledge on dietary iron and practice among the adult patients. Those patients who achieved satisfactory scores on knowledge on thalassemia had five times (OR: 5.27, 95%CI: 2.38, 11.66) and two times (OR: 2.18, 95%CI: 1.06, 4.48) higher odds of having satisfactory knowledge on dietary iron and good practice respectively compared to those with unsatisfactory thalassemia knowledge. However, among the caregivers, only practice related to dietary iron was found to have a significant association with knowledge on thalassemia. Those caregivers with satisfactory knowledge on thalassemia had two and a half times (OR: 2.49, 95%CI: 1.03, 6.00) higher odds of good practice towards dietary iron compared to those with unsatisfactory thalassemia knowledge.

Based on multivariable logistic regression analysis, the adult patients with satisfactory knowledge on thalassemia had four times higher odds of having satisfactory knowledge on dietary iron compared to those with unsatisfactory thalassemia knowledge (OR: 3.94, 95%CI: 1.61, 9.65). Whereas among the caregivers, those with thalassemia children on vitamins were found to have three and a half times greater odds of having satisfactory dietary knowledge compared to those with children not taking vitamin supplements (OR: 3.42, 95%CI: 1.39, 8.44). Regarding attitude and practice towards dietary iron, none of the independent variables with p-value less than 0.25 from univariable analysis included in the multivariable logistic regression analysis were found to have a significant relationship.

Kendall's rank correlation test showed that there were significant positive correlations between knowledge on dietary iron with attitude and practice among the adult patients as well as the caregivers with p<0.05. Moreover, the interrelationships between attitude and practice were also found to be significantly correlated among both categories of respondents with p<0.0001.

Table V: Distribution of respondents' attitude and practice towards dietary iron

	Adult patients (n=137)	Caregivers (n=123)	Chi-square	p-value
	Freq (%)	Freq (%)		
Attitude				
Concerned about iron content of foods				
Yes	114 (83.8)	117 (95.1)	8.55	0.003
No	22 (16.2)	6 (4.9)		
Have the intention of reducing iron intake				
Yes	128 (94.1)	121 (98.4)	3.15	0.076
No	8 (5.9)	2 (1.6)		
Willing to take iron chelator regularly				
Yes	126 (92.6)	118 (97.5)	3.17	0.075
No	10 (7.4)	3 (2.5)		
Feeling of worry while being served with high iron diet				
Yes	116 (85.3)	113 (91.9)	2.73	0.099
No	20 (14.7)	10 (8.1)		
Interested in reading more about iron content of foods				
Yes	127 (92.7)	119 (96.8)	2.08	0.149
No	10 (7.3)	4 (3.2)		
Interested in learning more about the effects of dietary factors on iron absorption				
Yes	130 (94.9)	121 (98.4)	2.35	0.125
No	7 (5.1)	2 (1.6)		
Practice				
Avoid taking foods high in iron content				
Yes	114 (84.4)	110 (90.2)	1.87	0.171
No	21 (15.6)	12 (9.8)		
Avoid taking vitamin supplements containing iron				
Yes	108 (80.0)	109 (88.6)	3.58	0.059
No	27 (20.0)	14 (11.4)		
Check the labels of food products for iron content				
Yes	92 (67.6)	108 (88.5)	16.08	< 0.001
No	44 (32.4)	14 (11.5)		
Take into consideration what foods would best be taken together while having meals in order to minimize iron absorption.				
Yes	115 (84.6)	114 (93.4)	5.09	0.024
No	21 (15.4)	8 (6.6)		

DISCUSSION

To our knowledge, this is the first study assessing the knowledge, attitude and practice (KAP) related to dietary iron among patients with thalassemia and their caregivers.

Our findings showed that despite the mean percentage scores on knowledge on thalassemia disorder of the adult patients (83.8%) and their caregivers (87.7%) were high, their scores on overall knowledge on dietary iron were just 59.5% and 59.6% respectively. Majority of the respondents apart from having the knowledge of foods high in iron content such as liver, beef, oyster and clam, and the inhibitory effects of tea on iron absorption, their awareness of dietary factors such as milk, coffee, egg, cheese, vitamin C and fruits that influence the absorption of iron was inadequate. These findings revealed the gaps in knowledge that needs to be addressed.

The current study showed that our female patients had a significantly higher likelihood of having satisfactory knowledge, good attitude and good practice related to dietary iron compared to males. The caregivers were found to have significantly higher awareness of iron fortification of breakfast cereals compared to adult patients. This might be ascribable to the fact that majority of the caregivers participated in this study were female caregivers of patients, and breakfast is usually prepared by the female caregivers in the local context. This finding might imply that female caregivers were more dedicated in acquiring information as to what types of breakfasts would be best for their children. Besides, caregivers with children on iron chelators had significantly higher likelihood of possessing good attitude and good practice compared to those with children not taking iron chelators. It was possible that they might have been receiving dietary advice as they purchased the iron chelators.

In addition to that, there were significantly better attitude and practice towards dietary iron among the caregivers compared to the adult patients. These differences might indicate that caregivers were more concerned with the health of their children than the patients care for themselves.

The level of knowledge on thalassemia was significantly associated with the level of knowledge and practice related to dietary iron among the adult patients. Those who obtained satisfactory scores on knowledge on thalassemia had a higher probability of achieving satisfactory dietary knowledge and practice scores. Perhaps it was because as they learned about thalassemia disorder, they also acquired some information and advice regarding dietary iron. Knowledge on thalassemia was found to be the only predictor of knowledge on dietary iron among the adult patients, whereas usage of vitamins by the thalassemia children was identified to be the only predictor of knowledge on dietary iron among the caregivers. As commercially available vitamin supplements are commonly added with iron, the caregivers may have been told to be aware of the potential danger of taking excessive iron.

The limitations of this study was its non-probability sampling design and thus the results should be interpreted with caution. As majority of the respondents were members of thalassemia societies, therefore, some degree of selection bias such as membership bias was inevitable.

CONCLUSION

In conclusion, our results showed that knowledge on dietary iron among the thalassemia patients and their caregivers was inadequate despite having good knowledge on thalassemia as well as good attitude and good practice towards dietary iron. Healthcare providers must play an active role in enhancing the knowledge of patients and their caregivers on dietary iron. Patients who come to hospitals for blood transfusions should be arranged to get advice and counselling from the dietitians. Special video programs about dietary iron should be made and broadcasted in the thalassemia daycare units. Posters should be displayed in the transfusion wards and leaflets should be distributed to the patients to heighten their awareness of dietary iron. Thalassemia societies must help in distributing booklets and leaflets and organizing lectures and seminars that focused on dietary iron for their members so as to enable them to choose a healthy and balanced diet for their condition.

ACKNOWLEDGEMENT

I would like to thank the Royal College of Surgeons in Ireland for funding the publication of this manuscript. I gratefully acknowledge the thoughtful discussion and constructive inputs made by lecturers and colleagues during the research process. I would like to extend my appreciation to all the

committee members of the thalassemia societies for their help in the data collecting process. And last but not least, much appreciation is due to all the respondents who participated in the study.

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