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RESEARCH ARTICLE

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Assessing Healthcare Providers' Knowledge of Deferasirox at District Hospitals in Kedah State, Malaysia

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Abstract

Background: Knowledge on Deferasirox among healthcare providers is essential in managing thalassemia patient that require this iron chelator. This study is conducted to assess the knowledge of healthcare providers on Deferasirox at the district hospital in Kedah using a newly developed questionnaire. **Methods:** The questionnaire consisted of 25 questions was developed via content and face validation, and was assessed for its internal consistency reliability using Cronbach's alpha coefficient. The newly developed questionnaire was then tested (pilot study) to measure the knowledge level of healthcare providers on Deferasirox in five district hospitals in Kedah state. The association between the level of knowledge and respondents' characteristics were also measured. **Results:** Cronbach's alpha for the new questionnaire was 0.820. A total of 93 respondents participated in the pilot study. The majority of the healthcare providers (54.8%) has a moderate level of knowledge of Deferasirox. Respondents age group (p=0.002), duration of working experience (p=0.005), and type of occupation (p<0.001) were significantly associated with the level of knowledge. Overall, the pharmacist has a better knowledge level. Respondents within the older age group, working experience of less than a year and more than ten years, and staff nurses displayed a low level of knowledge. **Conclusion:** Future training on the use of Deferasirox should be targeted to the group of staff with the low level of knowledge. Knowledge sharing among the staff can be implemented to reduce the knowledge gap. The pharmacist can play a vital role in the medication counselling regarding Deferasirox with the patients in district hospitals.

Key words: Deferasirox, Iron chelator, Knowledge, Healthcare provider, Questionnaire.

INTRODUCTION

Thalassemia is the commonest inherited hemolytic anemia worldwide. It is estimated that more than 300 million people were a carrier of this haemoglobin disorder and majority of it were living in Southeast Asia region.[1] According to the Malaysia Thalassemia Registry, there were 6,088 cases of thalassemia reported in the year 2014.[2] Among the 14 states in Malaysia, Sabah has the highest number of thalassemia case, which is about 1,536 cases. The majority of the thalassemia patients requires a regular blood transfusion, and another therapeutic option is the use of haemopoietic stem cell transplantation. In Malaysia however, the choice for transplantation is not widely available and left the majority of patients to depend on blood transfusion.[3]

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Chronically transfused patients are unable to eliminate the excess iron that was released from the breakdown of transfused red blood cells.[1,4] Hence, the excess iron will deposit in different organs as hemosiderin and ferritin, especially in the heart and liver.[5] Accumulation of toxic quantities of iron will then lead to complications such as heart failure, diabetes, hypothyroidism and liver disease. Iron overload in chronically transfused patients has high morbidity and mortality rate.[4,5] Thus, it is vital to prescribe an iron chelating drug to these regular blood recipients to prevent the effects of iron accumulation. One of the chelating drug available in Malaysia is Deferasirox.[1]

Deferasirox is an orally active chelator that is selective for iron (as Fe3+ ion).[1-5] It is mainly metabolized by glucuronidation followed by hepatobiliary excretion into the faeces with the mean elimination half-life of about 8-16 hours.[5] Thalassemia patient should take this iron chelator based on the individual counselling information or otherwise the efficacy of the drug may reduce and lead to iron overload. Thus, the knowledge of healthcare providers regarding Deferasirox is essential for them to be able to disseminate the information on this medicine to the patients. The amount of information given to the patients later will influence their adherence to the medication.[6,7]

Knowledge on Deferasirox also plays a major role in managing thalassemia patients that require a regular blood transfusion. Despite the importance of having adequate knowledge, only a few studies were conducted on assessing knowledge of Deferasirox among healthcare providers locally. Most of the studies conducted were emphasized more about the efficacy and adverse effects of the medicine. Therefore, this study is carried out to assess the knowledge of healthcare providers on Deferasirox at the district hospital in Kedah using a newly developed questionnaire.

MATERIAL AND METHODS

The conduct of this study was approved by the Medical Research and Ethics Committee, Ministry of Health Malaysia (NMRR-16-795-30514). Various procedures (discussed below) were utilized in developing the questionnaire.

Development of the 'Knowledge Evaluation on Deferasirox' Questionnaire (KEDQ): An early draft of questionnaires developed based on the review of the available literature. Information from the literature reviews was used to generate items/questions. A list of 25 draft items was generated covering the essential information that needed by the healthcare provider when handling and prescribing Deferasirox. The first draft of the questionnaire was then discussed among member of experts, including senior pharmacists and clinicians. Obtaining experts feedback and opinions have been shown to augment content validity. The questionnaire was later tested for face validity to determine the perception of respondents on the appropriateness of the questions. To carry out this step, the questionnaire was pre-tested to seven healthcare providers (doctors, pharmacist and nursing staffs). Modifications were done according to their feedback, and final version of the questionnaire was generated.

The final version of the questionnaire contained 25 questions with four answer option. The questionnaires were then administered (pilot test) to the health care providers who involved in the management of thalassemia patient in five district hospitals in Kedah state. Those staff who did not engage in the management of thalassemia patient will be excluded. As all the 25 items had four options for the answer, the minimum sample size required was 75.[8] We have added 10% from the current sample to incorporate missing values or non-response items. Therefore, the minimum respondent needed for the pilot study was 83.

To measure the reliability of this newly develop questionnaires, the authors used internal consistency methods.[9] The internal consistency reliability of all items in the final model of the questionnaire was later evaluated using the Cronbach's alpha coefficient. A coefficient of 0.7 or higher signifies that the questionnaire is internally consistent.[10,11]

Pilot Study: Data from the pilot study were then analyzed to evaluate the knowledge of health care provider in the district hospitals regarding Deferasirox using IBM SPSS Statistics for Windows Version 20.0 (IBM Corp., Armonk, NY, USA). For each question that correctly answered, respondent was given one point. The maximum score was 25 for all correct answers, and the minimum score was 0. As per authors consensus, the level of respondents' knowledge on Deferasirox was divided into 'Good Knowledge' if respondent scored 20 to 25 points, 'Moderate Knowledge' (11-19 points), and 'Low Knowledge' for the total score of less than 11. Respondents' demographic data such as age was reported as a mean and standard deviation, other variables presented as frequency and percentage. A Fisher exact test was used for assessment of the association between level of knowledge and different categorical variables. The statistical significance was based on a p-value less than 0.05.

Table 1: Response of study participants to all KEDQ questions.

Questions	Right answer (%)	Wrong answer (%)
Q1. Dosage form of Deferasirox	78 (83.9)	15 (16.1)
Q2. Brand name for Deferasirox	75 (80.6)	18 (19.4)
Q3. Pharmaceutical company that manufactured Deferasirox	46 (49.5)	47 (50.5)
Q4. Storage condition (temperature) for Deferasirox	45 (48.4)	48 (51.6)
Q5. How to administer Deferasirox?	38 (40.9)	55 (50.1)
Q6. Type of fluid that can be used to administer Deferasirox	81 (87.1)	12 (12.9)
Q7. Dosing frequency of Deferasirox	63 (67.7)	30 (32.3)
Q8. Which strength of Deferasirox is available in Ministry of Health Malaysia formulary?	45 (48.4)	48 (51.6)
Q9. Colour of Deferasirox	53 (57.0)	40 (43.0)
Q10. Recommended initial dose of Deferasirox for non-regularly transfused patients aged 2 years and older	45 (48.4)	48 (51.6)
Q11. Recommended initial dose of Deferasirox for regularly transfused patients aged 2 years and older	41 (44.1)	52 (55.9)
Q12. Recommended maximum dose of Deferasirox for patients 2 years of age and older with severe chronic iron overload	35 (37.6)	58 (62.4)
Q13. Choose the correct statement regarding the dose adjustment in liver impairment.	50 (53.8)	43 (46.2)
Q14. Choose the correct statement regarding the dose adjustment in renal impairment	45 (48.4)	48 (51.6)
Q15. pregnancy risk category for Deferasirox	41 (44.1)	52 (55.9)
Q16. Which of the following cannot be taken together with Deferasirox	58 (62.4)	35 (37.6)
Q17. All of the following statement is true regarding contraindication use of Deferasirox, except:	32 (34.4)	61 (65.6)
Q18. Deferasirox is contraindicated in patients with creatinine clearance less than:	49 (52.7)	44 (47.3)
Q19. How frequent that we need to monitor serum creatinine during the first month after initiation or modification of therapy?	28 (30.1)	65 (69.9)
Q20. All of the following statement is true regarding the side effect of Deferasirox, except:	36 (38.7)	57 (61.3)
Q21. The following adverse reaction has been reported in patients receiving Deferasirox, except:	32 (34.4)	61 (65.6)
Q22. The following is true for Deferasirox, except:	35 (37.6)	58 (62.4)
Q23. Which of the following is the correct pharmacokinetic profile for Deferasirox?	20 (21.5)	73 (78.5)
Q24. Percentage of systemic exposure of Deferasirox in children less than 6 years old compared with adults	14 (15.1)	79 (84.9)
Q25. Antidote for Deferasirox overdose	53 (57.0)	40 (43.0)

RESULTS

The reliability of the newly developed questionnaire consisted of 25-items/questions denotes a good internal consistency with Cronbach's alpha value of 0.820. The deletion of any one item did not result in a higher alpha value. The response of study participants to all KEDQ questions is presented in Table 1. Based on this questionnaire, the level of knowledge on Deferasirox can be assessed by summing the respondents' scores. Higher total scores reflect a better knowledge among the healthcare providers.

A total of 93 respondents answered the questionnaire. The majority of them were female (78.5%) and between

Table 2: Demographic characteristics of respondents (n=93).

Characteristics	n	%	mean	SD
Age (years)			32.0	6.63
Age group (years)				
21 – 30	52	55.9		
31 – 40	28	30.1		
41 – 50	12	12.9		
More than 50	1	1.1		
Gender				
Male	20	21.5		
Female	73	78.5		
Occupation				
Doctor	17	18.3		

Pharmacist	31	33.3
Staff nurse	45	48.4
Working experience (years)		
Less than 1 year	1	1.1
1 - 5 years	49	52.7
6 - 10 years	21	22.5
11 - 15 years	8	8.6
More than 15 years	14	15.1
Level of knowledge		
Low	34	36.6
Moderate	51	54.8
Good	8	8.6

n = Frequency; SD = Standard Deviation

21 and 30 years old (55.9%). Most of the respondents were staff nurses (48.4%) and had been working since 1-5 years (52.7%). Further analyses indicate that more than half of our studied population had a moderate level of knowledge on Deferasirox. Table 2 summarized the respondents' characteristics participated in the pilot study. The association between the level of knowledge with respondents' characteristics were presented in Table 3. The Fisher's exact test indicates that the level of knowledge was significantly associated with respondent age group (p=0.002), occupation (p<0.001) and working experience (p=0.005). Gender of respondents did not significantly associate with the level of knowledge.

Table 3. Association between level of knowledge and respondents' characteristics.

	Level of Knowledge			p value [a]
Characteristics	**Low**	**Moderate**	**Good**	
	n (%)	**n (%)**	**n (%)**	
Age group (years)				**0.002**
21 – 30	11 (21.2)	35 (67.3)	6 (11.5)	
31 – 40	12 (42.9)	14 (50.0)	2 (7.1)	
41 – 50	10 (83.3)	2 (16.7)	0	
More than 50	1 (100)	0	0	
Gender				**0.093**
Male	5 (25.0)	15 (75.0)	0	
Female	29 (39.7)	36 (49.3)	8 (11.0)	
Occupation				**<0.001**
Doctor	5 (29.4)	11 (64.7)	1 (5.9)	
Pharmacist	1 (3.2)	23 (74.2)	7 (22.6)	
Staff nurse	28 (62.2)	17 (37.8)	0	
Working experience (years)				**0.005**
Less than 1 year	0	1 (100)	0	
1 - 5 years	13 (26.5)	30 (61.2)	6 (12.2)	
6 - 10 years	5 (23.8)	14 (66.7)	2 (9.5)	
11 - 15 years	4 (50)	4 (50)	0	
More than 15 years	12 (85.7)	2 (14.3)	0	

n = Frequency; a = Fishers' exact test

DISCUSSION

The assessment tool to measure the level of knowledge on Deferasirox is lacking in the literature. The present study formulated and developed the 'Knowledge Evaluation on Deferasirox' Questionnaire (KEDQ) through several processes. Specifically, the content validity of the initial draft of the questionnaire was assessed by several expert members; the face validity by administering the questionnaire to a sample of pre-identified healthcare providers; and the final questionnaire reliability of measuring the internal consistency. Using the above step-by-step process, the authors believed that the KEDQ would be a valid and reliable assessment tool for assessing healthcare providers' knowledge on Deferasirox. The authors nevertheless encourage future studies to use the similar questions in other population to measure the usefulness of the questionnaire.

By using this newly developed questionnaire, our study revealed that healthcare providers in district hospitals

in Kedah state had low to moderate knowledge on Deferasirox. Only a small percentage of respondents (8.6%) achieved a good knowledge level. Further analysis indicates that the respondents within the age group of 21-30 years old had a better knowledge compared to the older age colleagues. The younger healthcare provider may frequently update their knowledge on thalassemia management via internet access and attend related courses, which lead to better understanding of Deferasirox. Knowledge sharing between the younger and older age group of health staff can reduce this knowledge gap. Foss *et al*.[12] agreed that knowledge sharing among staff is important to the Organization as it converts individual knowledge into organizational knowledge, and ultimately lead to the organizational success.[13]

Duration of working experience also influenced the level of knowledge on Deferasirox among the healthcare providers. Our study showed that those respondents working less than a year and more than ten years had a lower level of knowledge compared to those with working experience of 1-10 years. The authors recommended that future training related to the use of Deferasirox should be targeted to these junior and more senior group of staff.

Our study also revealed that pharmacists had significantly better overall knowledge on Deferasirox compared to other groups of healthcare providers. Despite dealing directly with patients, staff nurses had a low level of knowledge on this iron chelator. This finding signifies the need to expand the role of the pharmacist to assist in medication counselling to the patients, especially in district hospitals where's the number of staff is limited. A report by the World Health Organization has shown that a pharmacist does have a role in assuring the effectiveness of medications and help to prevent harm from incorrect use.[14] As mentioned earlier, knowledgeable healthcare providers can disseminate adequate information to the patient and will increase their adherence to the medication.

The current study has a limitation. The data for study analysis was collected from five district hospitals in a single state which could limit the generalization of the study findings to other population. Involvement of healthcare providers from other tertiary hospitals may give a better picture of the overall knowledge performance of healthcare providers on Deferasirox and should be the area for future study.

CONCLUSION

In conclusion, the present study has developed a reliable assessment tool to measure the knowledge of healthcare providers on Deferasirox. In the studied population, the majority of the respondents have a moderate level of knowledge on this iron chelator. Respondents within the older age group, working experience of less than a year and more than ten years, and staff nurses displayed a low level of knowledge. Future training on the use of Deferasirox should be targeted to this group of staff. Additionally, knowledge sharing among the staff can be implemented to reduce the knowledge gap. The pharmacist, on the other hand, has a better knowledge level and are recommended to play more role in the medication counselling regarding the Deferasirox with the patients in district hospitals.

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CONFLICT OF INTEREST

All authors declare that they have no conflict of interest to disclose.

ABBREVIATION USED MISSING

NMRR: National Medical Research Register; **SPSS:** Statistical Package for the Social Sciences; **KEDQ:** Knowledge Evaluation on Deferasirox Questionnaire;

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