




## 学位論文審査の結果の要旨

令和 2022 年 11 月 28 日

審査委員	主査	西山 成		
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願出者	専攻	医学	部門	
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論文題目	A pilot study on the effect of D-allulose on postprandial glucose levels in patients with type 2 diabetes mellitus during Ramadan fasting			
学位論文の審査結果	<input checked="" type="radio"/> 合格	<input type="radio"/> 不合格	(該当するものを○で囲むこと。)	

## [ 要 旨 ]

Extensive studies have reported that D-allulose provides several health benefits, particularly the suppression of an increase in postprandial glucose levels. The present study investigates whether the supplementation with 8.5 g D-allulose before carbohydrate intake during *iftar* (breaking fast at sunset) will reduce postprandial blood glucose. This study was conducted for 10 consecutive days in the fasting month of Ramadan; 5 days of control and 5 days of consumption. During the consumption period, 8.5 g of D-allulose was consumed by the participants before *iftar* meal (breaking the fast at sunset). We used a flash continuous glucose monitoring device to measure the glucose level throughout study period. This study was conducted at a tertiary government hospital in Malaysia. The study findings suggest that supplementation with 8.5 g of D-allulose has the potential to improve postprandial hyperglycemia in patients with T2DM after *iftar* during Ramadan. Further studies among a larger sample size of participants are needed.

This doctoral dissertation review committee on this study was held on November 24, 2022. The results of this study show high scientific value as they provide new insights into the effect of D-allulose on the real-calorie intake consumed by Muslims with T2DM during Ramadan. It also gives support to previous D-allulose studies. The committee concluded that the thesis was worthy for awarded a doctoral dissertation.

In the examination, the examiners asked the following questions, and responses to the questions are given at each.

Prof. Wada asked the following questions and the responses are given below.

**Question 1.** Twelve (12) diabetic patients are taking various anti-diabetic drugs. Will there be any impact on this clinical research?

*Answer:* During Ramadan, anti-diabetic drugs' timing and dose intake are changed according following the guideline of Management of diabetes during Ramadan. It might have some impact to clinical research in Ramadan period which might possibly related due to other factors such as high calorie foods intake, reduce in physical activity etc.

*Question 2.* Why is the protocol not using data from the last 2 days of the 2 weeks of blood glucose monitoring with FGM?

*Answer:* Some studies reported higher mean absolute relative different during 24 hours after sensor insertion than in the following days, which might due to temporary local trauma at the application site which affects interstitial fluid glucose concentration. It suggested that at least 70% or ~10 days of CGM wear adds confidence that the data.

**Prof Nakamura asked the following questions and the responses are given below.**

*Question 1:* Regarding the protocol of taking D-allulose before meals, what happens when patients take it with meals?

*Answer:* To my knowledge, no published data reported the effect of D-allulose when taking with meals. Therefore, further studies are required to explore on this aspect.

*Question 2:* It is known that taking dietary fiber before a meal slightly lowers blood sugar levels. What is the difference with D-allulose?

*Answer:* Taking dietary fiber prior a meal slightly lowers the blood sugar levels. However, D-allulose shows better effect compared than dietary fiber.

**Prof. Nishiyama asked the following questions and the responses are given below.**

*Question 1:* Postprandial hyperglycemia is a risk factor for cardiovascular disease in diabetic patients. Does postprandial hyperglycemia observed during Ramadan be a risk factor for cardiovascular disease?

*Answer:* There were consistent data of previous prospective studies revealed that postprandial hyperglycemia is a risk factor for cardiovascular disease. However, there is no published data on the postprandial hyperglycemia during Ramadan would be a risk factor for cardiovascular disease. This might be because of a short duration of Ramadan would not directly show the risk for cardiovascular disease. In this presentation I have to be more careful in discussion this aspect.

*Question 2.* Are there any attempts to provide Ramadan meals containing D-allulose?

*Answer:* Many people in Malaysia have no knowledge about D-allulose, therefore the benefits of D-allulose should be first introduced before it can be applied to the Ramadan meals.

#### **Designated Discussant**

*Question 1.* Why did you use 3.5g? *Answer:* A ratio of 1:15 of D-allulose to carbohydrate intake is sufficient to show its effectiveness. 2) A maximum D-allulose amount for non-side effect (0.5-0.6g/kg body weight). 3) The amount of 3.5g not yet investigate.

The student had clearly responded to all questions from the examiners. The committee concluded the student demonstrated the ability and sufficient knowledge and was awarded a Doctoral of Medicine degree.

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(備考) 要旨は、1, 500字以内にまとめてください。