Research Article

Habitual Dietary Fibre Intake and Lifestyle Characteristics in Relation to Functional Constipation Among Adults in Malaysia

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ABSTRACT

The World Health Organization (WHO) and the Food and Agriculture Organization (FAO) recommend consuming at least 25 g of dietary fibre daily. Adults with low fibre intake have an increased constipation risk. However, little research has been done on the habitual dietary fibre intake and lifestyle characteristics of functional constipation in Malaysian adults. Thus, the purpose of this study is to determine the dietary fibre intake, lifestyle characteristics, and functional constipation of adults in Malaysia, as well as the association between habitual dietary fibre intake, lifestyle characteristics, and functional constipation. About 318 adults between the ages of 18 and 59 participated and were asked to complete an online questionnaire consisting of three major parts. The components are as follows: i) the assessment of dietary fibre intake by using a semi-quantitative dietary fibre food frequency questionnaire; ii) the assessment of lifestyle factors; and iii) the determination of functional constipation via the Wexner Constipation Scoring System. SPSS 25 was used to analyse the data at a significance level of 0.05. The results indicated that the majority of adults consumed dietary fibre in amounts less than 25 g per day (84.6%). About 97.5% of adults have a healthy lifestyle, and only 2.8% of adults in this study faced constipation. There was no significant association between habitual dietary fibre intake and lifestyle characteristics (p=0.614) or between habitual dietary fibre intake and functional constipation among adults in Malaysia (p=0.147). Continued efforts are needed to increase dietary fibre intake among the adult population.

Key words: Dietary fibre intake, functional constipation, lifestyle characteristics, Malaysia

INTRODUCTION

Dietary fibres are portions of food, notably carbohydrates, that cannot be digested by the digestive enzymes secreted by the human small intestine (Mudgil & Barak, 2019). Dietary fibre is derived from the part of plants that remains undigested in the intestine. However, some of it may be degraded by bacteria in the lower stomach. The amount and type of fibre produced by various plant species vary. Pectin, gum, mucilage, cellulose, hemicellulose, and lignin are all types of fibre (Dhingra *et al*., 2012). Daily consumption of at least 25 g is suggested by both the World Health Organization (WHO) and the Food and Agriculture Organization (FAO) (Ljubicic *et al*., 2017). According to Stephen *et al*. (2017), insoluble fibres, such as those found in wheat, bran, vegetables, and fruits, have been linked to a variety of health advantages, including hunger control, a lower risk of developing type 2 diabetes, and constipation prevention.

A "lifestyle" is a way of life established by a society, culture, group, or individual. This describes how a person spends their time and includes patterns of behaviour, engagement, consumption, work, activity, and interest. According to Lipton (2021), there are five attributes of a healthy life: motion, breathing, assimilation of nutrients, elimination of waste and toxins, and reproduction. Smoking, poor nutrition, physical inactivity, and obesity are all common lifestyle features or habits among persons with significant

chronic illnesses. According to Li *et al*. (2021), infrequent bowel motions, hard or lumpy stools, prolonged straining, and/or inadequate evacuation feelings are all symptoms of functional constipation (FC), a common functional gastrointestinal disorder (FGID). All symptoms of this condition are diagnosed using the Rome criteria. It also has a detrimental influence on people's quality of life, productivity loss owing to mental discomfort, and financial hardship for someone seeking therapy. FC affects between 1.9 and 27.2% of the global population, with 17.1% in Europe, 15.3% in Oceania, and 1.9 to 27.2% in North America. A new epidemiological survey conducted in the United States, Canada, and the United Kingdom found that 7.8% of adults have FC.

The prevalence of irritable bowel syndrome (IBS) based on the Rome III criteria was 10.9%, with 20% of these having IBS with predominant constipation (IBS-C) (Patimah *et al*., 2017). There is increasing concern that people in Malaysia have constipation, lumpy and hard stool (93.1%), and straining (79.3%) (Jayasimhan *et al*., 2013). There has been little research into the relationship between dietary fibre deficiency and constipation in Malaysian adults. Mazlyn *et al*. (2013) point out that the prevalence rate of constipation in Malaysia has not been examined. Leung *et al*. (2011) pointed out that even though the causes of functional constipation are unknown, a low-fibre diet, dehydration, a low total calorie intake, a lack of physical activity, and stress may all contribute to the condition, but it is still debatable. Thus, due to all the noted problems, this study must be carried out among adults in Malaysia. This study should be conducted to determine whether dietary fibre intake influences the status of constipation among Malaysian adults. Therefore, the goal of this study is to determine the dietary fibre intake, lifestyle characteristics, and functional constipation of adults and to determine the association between habitual dietary fibre intake, lifestyle characteristics, and functional constipation among adults in Malaysia.

MATERIALS AND METHODS

A cross-sectional study was conducted between July and October 2021 through convenience sampling among 318 Malaysian adults aged 18 and 59 via an online survey involving the East Coast (Kelantan, Terengganu, Pahang), South Coast (Johor), West Coast (Perak, Selangor), and North Coast (Kedah, Penang) states. All these locations were selected due to their availability to reach the respondent and because convenient sampling was used, which is a sort of sampling that is unlikely or non-random to target people who fulfil particular practical criteria such as easy accessibility, geographical closeness, availability at a specified time, or readiness to take part

(Dörnyei, 2007). The minimum sample size for this study was calculated using the Cochran formula using the maximum variability, which is equal to 25% (Macêdo *et al*., 2020). With a 95% confidence level, the desired precision of ±5% precision, and adding 10% attrition, the minimum sample size required is 316. Respondents must have internet access and be from specific states. Most adults have experience with and know how to use Google Forms, which will make it easier for them to answer the questions in the questionnaire. The questionnaire was distributed to respondents along with an informed consent form. Informed consent was obtained from the respondents before data collection.

The online survey used was composed of three main parts: i) the assessment of dietary fibre intake by using a semi-quantitative dietary fibre food frequency questionnaire (FFQ); ii) the assessment of lifestyle factors, and iii) the determination of functional constipation via the Wexner Constipation Scoring System (WCSS). The questionnaire was written in both English and Bahasa Malaysia. The semi-quantitative dietary fibre Food Frequency Questionnaire (FFQ) was adapted from Ng *et al*. (2010). It has 30 food items, including cereals and cereal products (like bread and capati), vegetable sources (like celery, spinach, lettuce, carrot, potato, round cabbage, cauliflower, broccoli, tomato, cucumber, ulam-ulam, and long beans), and fruit sources (like banana, apples, watermelon, mandarin oranges, mango, pear, dates, grape, guava, durian, corn, jackfruit, pineapple, dragon fruit, mangosteen, and honeydew). There were five options in the frequency section: "0 times per day," "1 time per day," "2 times per day," "3 times per day," and "more than 3 times per day". The score for each food item was calculated using the formula devised by the Wessex Institute of Public Health (1995); Amount of food (g/day) = Frequency of intake (the conversion factor) × serving size × total number of servings × weight of food in one serving. The amount of food (g/day) was derived from the Nutritionist Pro program version 5.3.0 (Axxya Systems LLC, Redmond, WA) based on the Malaysian Food Composition to determine dietary fibre intake. The weight of food in one serving was taken from the Malaysian Food Composition Database (MyFCD) (https://myfcd.moh.gov.my/).

Assessment of lifestyle characteristics is used to assess lifestyle characteristics among adults by using four questions (Dubasi *et al*., 2019). The first question asks about how many times you exercise in a week; the second question asks about how many times you drink water in a day; the third question asks about how many times you consume fruits and vegetables in a week, and the last question asks about how many times you

experience constipation in a week. The scoring for lifestyle characteristics was 0 to 6 (moderate lifestyle) and 7 to 12 (healthy lifestyle). If a person has a score of 10, it indicates that he lives a healthy lifestyle.

Assessment of functional constipation is used to assess functional constipation among adults by using the Wexner Constipation Scoring System (WCSS) (Agachan *et al*., 1996). The WCSS test was chosen because it is validated and suitable for this study. The Cronbach's alpha was 0.66, and the reliability coefficient was 0.61 (Mirbehresi *et al*., 2020). WCSS processes data with adequate convergent validity compared with an instrument of proven sensitivity. It consists of eight items: frequency of bowel movements, painful evacuation, incomplete evacuation, abdominal pain, length of time per try, kind of defecation aid, unsuccessful evacuation attempts per 24 h, and duration of constipation. The score was accessed by adding each score. A score of more than 15 was the definition of the symptom "constipation." The scoring range for constipation was 0 to 14 (normal) and 15 to 30 (constipation).

Statistical Package for Social Sciences (SPSS) version 25 was used to record and analyse the data, with a significance level of *p*<0.05. A normality test was conducted before data analysis. The Fisher's exact test was used to test the association between habitual dietary fibre intake, lifestyle characteristics, and functional constipation is given that the data is categorical and had an expected count of less than 5 for more than 20%.

RESULTS AND DISCUSSION

Sociodemographic profile of respondents

The majority of respondents are female (63.8%, *n*=203), between the ages of 18 and 25 (96.9%, *n*=309), Malay (94.0%, *n*=299), single (96.9%, *n*=308), and have monthly family incomes of less than MYR4,850 (80.8%, *n*=257) (Table 1).

Main food groups contributing to a habitual daily intake of dietary fibre

Table 2 shows the daily dietary fibre intake of 318 respondents. The bread was the most frequently consumed dietary fibre food by respondents who ate it more than three times per day (3.5%, *n*=11). Cucumbers (2.2%, *n*=7), bananas (2.2%, *n*=7), and apples (2.2%, *n*=7) came in second and third place, respectively.

The median total daily intake of dietary fibre among respondents was 12.02 g/day, as shown in Table 3. The majority of respondents consumed less than 25 g of dietary fibre per day (84.6%, *n*=269), which did not meet the World Health Organization (WHO) and Food and Agriculture Organization

(FAO) recommendations of 25 g/day (Ljubicic *et al*., 2017). This result was slightly higher compared to a study conducted by Daud *et al*. (2018) in Malaysia. Daud's study showed that the average dietary fibre intake of the rural population was 7.8±3.5 g/day and that of the urban population was 6.9±3.5 g/day. Another study by Ng (1997) found that, according to available local data, the average urban Malaysian diet contains just approximately 180 g of vegetables and fruits, as well as 13–16 g of total dietary fibre. This overall fibre consumption is, of course, significantly below the recommendation of 25 per day, owing in part to the fact that Malaysian adults consume a low intake of fruits and vegetables. According to the Malaysia National Health and Morbidity Survey 2019, 94.9% of adults do not eat the 5 servings of fruits and vegetables per day that are advised (Institute for Public Health, 2020). The percentage of adults eating less than 5 servings of fruits and vegetables has increased significantly from 92.5% in 2011 to 94.0% in 2015 to 94.9% in 2019 (Institute for Public Health, 2020). The primary downside of not adhering to the recommended fruit and vegetable consumption is that it increases the chance of developing a variety of non-communicable diseases. According to Pem and Jeewon (2015), fibres present in fruits and vegetables have been demonstrated to delay intestinal transit rates by producing bulk, allowing for more gradual nutrient absorption, and thereby reducing constipation. Low vegetable and fruit consumption (less than 5 servings per day) are linked to lower income and unhealthy behaviours. In a previous study conducted by Shahar *et al*. (2019), low socioeconomic level (SES) was linked to poorer dietary fibre consumption in both urban and rural settings. Perhaps that is one of the plausible reasons for these respondents' low intake of dietary fibre due to their monthly income being in the B40 group (i.e., the bottom 40% of the Malaysian household income). This was seconded by Storey and Anderson (2014), who stated that adult dietary fibre consumption is affected by lower family income.

Lifestyle characteristics of respondents

In this study, approximately 60.7% of the adults exercised less than twice a week. In terms of daily water consumption, the majority of respondents (50.9%) consumed water 3-5 times per day, followed by more than 8 times per day (44.7%) and less than 2 times per day (4.4%). In terms of weekly fruit and vegetable consumption, approximately 44% of respondents consumed fruits and vegetables every day. About 85.5% of those who responded to the survey said they had trouble going to the bathroom less than twice a week, compared to 3.5% and 11% who said they had constipation every day and 3 to 4 times a week, respectively.

Table 1. Sociodemographic profile of respondents (*n*=318)

Demographic characteristics	Frequency	Percentage	Median (IQR)
	n	*%*	
Gender			
Male	115	36.2	
Female	203	63.8	
Age			
18-25 years	308	96.9	
26-33 years	6	1.9	
42-49 years	2	0.6	22 (1)
50-57 years	2	0.6	
Ethnicity			
Malay	299	94.0	
Chinese	13	4.1	
Indian	5	1.6	
Others	1	0.3	
Marital status			
Single	308	96.9	
Married	10	3.1	
Monthly household income*			
<MYR4,850	257	80.8	
MYR4,851-MYR10,970	50	15.7	
>MYR10,971	11	3.5	

*Household is based on Household Income and Basic Amenities Survey Report 2019, Department of Statistic Malaysia.
Mean is used when data are normally distributed; the median is used when data are not normally distributed.
IQR: interquartile range; MYR: Malaysian Ringgit

Table 2. Main food groups contributing to a habitual daily intake of dietary fibre (*n*=318)

Frequency of daily intake of dietary fibre	0 times/day	1 time/day	2 times/day	3 times/day	>3 times/day
	n(%)	*n(%)*	*n(%)*	*n(%)*	*n(%)*
Bread	65(20.4)	169(53.1)	52(16.4)	21(6.6)	11(3.5)
Capati	261(82.1)	46(14.5)	9(2.8)	2(0.6)	0(0.0)
Celery	217(68.2)	77(24.2)	19(6.0)	4(1.3)	1(0.3)
Spinach	161(50.6)	114(35.8)	36(11.3)	5(1.6)	2(0.6)
Lettuce	102(32.1)	147(46.2)	52(16.4)	12(3.8)	5(1.6)
Carrot	82(25.8)	150(47.2)	70(22.0)	11(3.5)	5(1.6)
Potato	87(27.4)	166(52.2)	51(16.0)	10(3.1)	4(1.3)
Round cabbage	85(26.7)	151(47.5)	66(20.8)	10(3.1)	6(1.9)
Cauliflower	101(31.8)	140(44.0)	59(18.6)	13(4.1)	5(1.6)
Broccoli	134(42.1)	129(40.6)	44(13.8)	8(2.5)	3(0.9)
Tomato	111(34.9)	138(43.4)	51(16.0)	14(4.4)	4(1.3)
Cucumber	94(29.6)	135(42.5)	63(19.8)	19(6.0)	7(2.2)
Ulam-ulam	127(39.9)	123(38.7)	43(13.5)	19(6.0)	6(1.9)
Bean strings	157(49.4)	115(36.2)	35(11.0)	10(3.1)	1(0.3)
Banana	93(29.2)	139(43.7)	61(19.2)	18(5.7)	7(2.2)
Apples	100(31.4)	148(46.5)	53(16.7)	10(3.1)	7(2.2)
Watermelon	120(37.7)	132(41.5)	50(15.7)	12(3.8)	4(1.3)
Mandarin orange	147(46.2)	126(39.6)	36(11.3)	7(2.2)	2(0.6)
Mango	124(39.0)	133(41.8)	47(14.8)	12(3.8)	2(0.6)
Pear	178(56.0)	101(31.8)	31(9.7)	7(2.2)	1(0.3)
Dates	176(55.3)	97(30.5)	35(11.0)	9(2.8)	1(0.3)
Grape	134(42.1)	127(39.9)	45(14.2)	8(2.5)	4(1.3)
Guava	162(50.9)	121(38.1)	26(8.2)	9(2.8)	0(0.0)
Durian	161(50.6)	114(35.8)	25(7.9)	16(5.0)	2(0.6)
Corn	148(46.5)	132(41.5)	27(8.5)	9(2.8)	2(0.6)
Jackfruit	163(51.3)	117(36.8)	28(8.8)	7(2.2)	3(0.9)
Pineapple	168(52.8)	115(36.2)	25(7.9)	7(2.2)	3(0.9)
Dragon fruit	172(54.1)	115(36.2)	18(5.7)	7(2.2)	6(1.9)
Mangosteen	161(50.6)	116(36.5)	24(7.5)	14(4.4)	3(0.9)
Honeydew	163(51.3)	113(35.5)	30(9.4)	9(2.8)	3(0.9)

Table 3. Average daily intake of dietary fibre (*n*=318)

Total and categorization of daily dietary fibre intake	Frequency Percentage		Median (IQR)
	n	%	
Total daily intake of dietary fibre (g)			12.02 (14.7)
Categorization of daily intake of dietary fibre			
Less than 25 g/day	269	84.6	
More than or equal to 25 g/day	49	15.4	

Mean is used when data are normally distributed; the median is used when data are not normally distribute
IQR: interquartile range

Most of the respondents scored 9 for total lifestyle characteristics, which is a healthy lifestyle, as shown in Table 4. Only 2.5% of the respondents have been considered to have a moderate lifestyle, compared to 97.5% of the respondents who have a healthy lifestyle. In a previous study by Li *et al.* (2018), each aspect of a healthy lifestyle was linked to a higher risk of death from all causes, including cancer and cardiovascular disease. Low-risk lifestyle characteristics were linked to a lower risk of cause-specific death in both men and women. In this study, only 15.1% of adults exercised more than three times per week. These findings are consistent with those of the World Health Organization (2020), which discovered that 28% of adults worldwide aged 18 and up were not physically active enough in 2016 (men 23% &

women 32%). This means they do not meet the global suggestion of 150 min of moderate-intensity physical activity per week or 75 min of vigorous-intensity physical activity per week. A possible explanation for this might be that the majority of adults don't have enough time to exercise. Adults aged 18 to 64 should engage in 150-300 min of moderate-intensity aerobic physical activity per week, 75-150 min of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous-intensity exercise.

Functional constipation of respondents

Table 5 shows the functional constipation of the respondents in this study. The majority of respondents (65.7%, *n*=209) have 1-2 times

Table 4. Lifestyle characteristics of the respondents (*n*=318)

Lifestyle characteristics	Frequency	Percentage	Median(IQR)
	n	%	
Total lifestyle characteristics score	-	-	9(2)
Categorization of lifestyle characteristics scores			
Moderate lifestyle (0 – 6 points)	8	2.5	
Healthy lifestyle (7 – 12 points)	310	97.5	
Exercise in a week			
Less than 2 times	193	60.7	
3 times	77	24.2	
More than 3 times	48	15.1	
Daily water intake			
Less than 2 times	14	4.4	
3-5 times	162	50.9	
More than 8 times	142	44.7	
Intake of fruits and vegetables in a week			
Everyday	140	44.0	
3-4 times	137	43.1	
Less than 2 times	41	12.9	
Constipation experience in a week			
Everyday	11	3.5	
3-4 times	35	11.0	
Less than 2 times	272	85.5	

Mean is used when data are normally distributed; the median is used when data are not normally distributed.
IQR: interquartile range

Table 5. Functional constipation of the respondents (*n*=318)

Functional constipation characteristics	Frequency	Percentage	Median (IQR)
	n	%	
Total functional constipation score			7(4)
Categorization of functional constipation scores			
Normal (0 – 15 points)	309	97.2	
Constipation (16 – 30 points)	9	2.8	
Frequency of bowel movements			
1-2 times per day	209	65.7	
2 times per week	83	26.1	
Once per week	18	5.7	
Less than once per week	6	1.9	
Less than once per month	2	0.6	
Difficulty (painful evacuation effort)			
Never	60	18.9	
Rarely	156	49.1	
Sometimes	91	28.6	
Usually	10	3.1	
Always	1	0.3	
Completeness (feeling incomplete evacuation)			
Never	66	20.8	
Rarely	150	47.2	
Sometimes	89	28.0	
Usually	12	3.8	
Always	1	0.3	
Pain (abdominal pain)			
Never	28	8.8	
Rarely	124	39.0	
Sometimes	137	43.1	
Usually	24	7.5	
Always	5	1.6	
Time (min in lavatory per attempt)			
Less than 5	90	28.3	
5-10	162	50.9	
10-20	45	14.2	
20-30	14	4.4	
More than 30	7	2.2	
Assistance (type of assistance) during bowel movement			
Without assistance	292	91.8	
Stimulative laxatives	19	6.0	
Digital assistance or enema	7	2.2	
Failure (unsuccessful attempts for evacuation per 24 h)			
Never	241	75.8	
1-3	65	20.4	
3-6	9	2.8	
6-9	2	0.6	
More than 9	1	0.3	
History (duration of constipation in a year)			
0	158	49.7	
1-5	127	39.9	
5-10	15	4.7	
10-20	14	4.4	
More than 20	4	1.3	

Mean is used when data are normally distributed; the median is used when data are not normally distributed.
IQR: interquartile range

per day frequency of bowel movements, rarely experienced difficulty or painful evacuation effort, rarely felt incomplete evacuation, occasionally experienced abdominal pain, mostly spend 5-10 min in the restroom per attempt, mostly do not require assistance during bowel movements, mostly did not experience unsuccessful attempts for evacuation per 24 h, and surprisingly almost 50% do not have a history of bowel movements.

On the functional constipation scale, most of the people who answered the survey scored a 7, which means they are normal and don't have any functional constipation. Approximately 97.2% of the respondents reported not having functional constipation (*n*=309). Sacomori *et al.* (2014) point out that constipation has been found to interfere with the daily lives of adult women, with approximately 80% of patients reporting a medium-to-high level of interference. Many constipated people downplay their discomfort, believing that their bowel movements are normal and that they can treat their constipation on their own. In 2018, Bamisaye and Adepoju point out that the majority (83.3%) of respondents reported constipation and difficulty passing bowel movements, with 83.3% taking 5–10 min with intense pressing down and pain, as well as problematic or small/hard defecation (56.9%). The majority of respondents in this study were aged 18 to 25, showing that they are young adults, while constipation is more prevalent in older people. These findings are most likely related to McCrea *et al.* (2009) and Mounsey *et al.* (2015), where both prior studies discovered that the prevalence of constipation appeared to gradually increase beyond the age of 50, with the highest increase happening after the age of 70. Constipation, for example, had a prevalence rate of 2.6 % to 28.4 % before the age of 50, but after 70 years, rates ranged from 7.7 % to 42.8 %. Constipation is common in people over 60, with up to 50% of nursing home patients experiencing symptoms. Constipation affects 16% of people on a long-term basis, and the elderly are more likely to have it.

Association between daily intake of dietary fibre, lifestyle characteristics and functional constipation among respondents

Fisher's's exact test revealed that there is no significant association between daily fibre consumption and lifestyle characteristics (*p*=0.614) (Table 6). The association between daily fibre consumption and functional constipation was not significant (*p*=0.147). Several studies found a significant association between habitual dietary fibre intake, lifestyle characteristics, and functional constipation (Müller-Lissner, 2009; Shen *et al.*, 2019; Ilyas *et al.*, 2021). The results contradicted these findings. However, the results of this study shed light on the dietary fibre intake habits of Malaysian adults. This study's findings may aid health-related authorities in raising public awareness about dietary fibre consumption. The empirical findings of this study enable the Malaysian government to recognise the low intake of dietary fibre among Malaysian adults and devise an intervention to address this issue that is inclusive of all socioeconomic backgrounds.

Table 6. Association of daily intake of dietary fibre, lifestyle characteristics, and functional constipation (*n*=318)

Nutritional status	Daily intake of dietary fibre		Fisher's's Exact test *p*-value
	≥ 25 g/day	≥ 25 g/day	
	n	*n*	
Lifestyle characteristics			
Moderate lifestyle	8	0	0.614[a]
Healthy lifestyle	261	49	
Functional constipation			
Normal	263	46	0.147[b]
Constipation	6	3	

[a]1 cells (25.0%) have an expected count of less than 5. The minimum expected count is 1.23. Thus, using Fisher's exact test.
[b]1 cells (25.0%) have an expected count of less than 5. The minimum expected count is 1.39. Thus, using Fisher's exact test.

CONCLUSION

The purpose of this study was to determine the dietary fibre intake, lifestyle characteristics, and functional constipation of adults. The majority of adults in Malaysia (84.6%) consume less than 25 g of dietary fibre per day, which is considered a low intake of dietary fibre. Approximately 97.5% of adults in Malaysia lead a healthy lifestyle, with constipation affecting only 2.8%. There was no significant association between daily dietary fibre intake, lifestyle factors, and functional constipation in this study. This study's data can be used to provide the Malaysian government with baseline information regarding dietary fibre intake, lifestyle characteristics, and functional constipation among Malaysian adults.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICAL STATEMENT

The ethical approval for this research was received from the Human Ethics Board of Committees at Universiti Malaysia Terengganu with reference number: UMT/JKEPM/2021/75.

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