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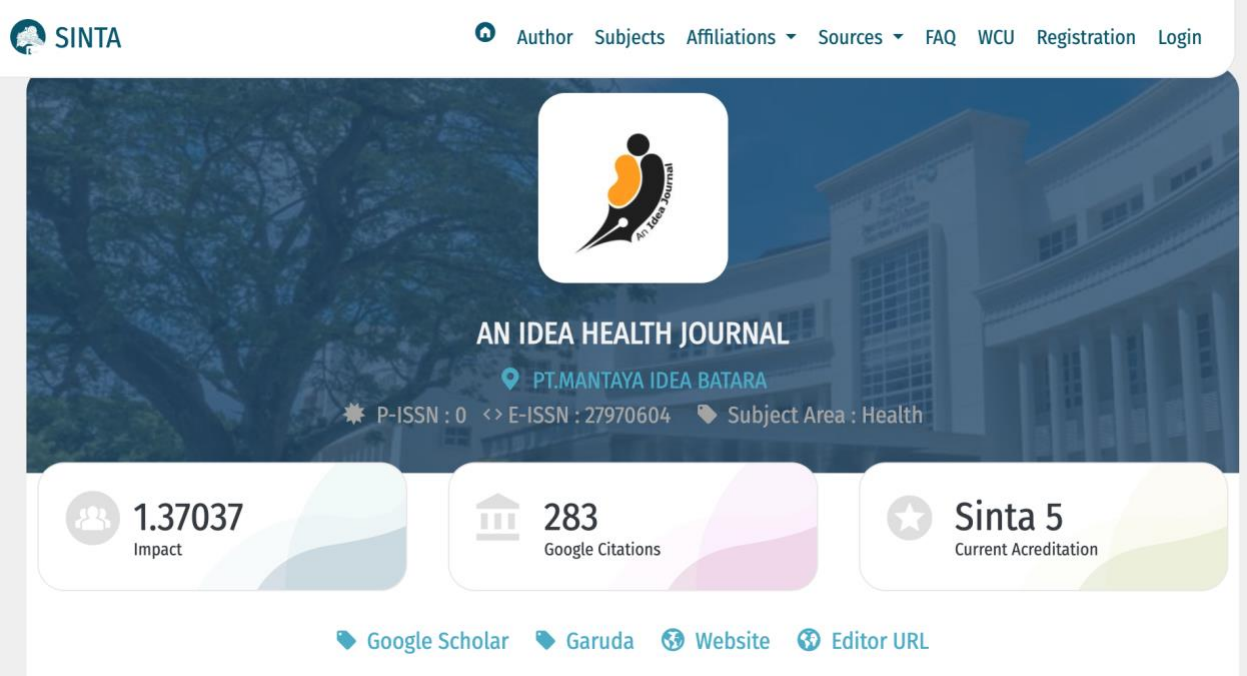

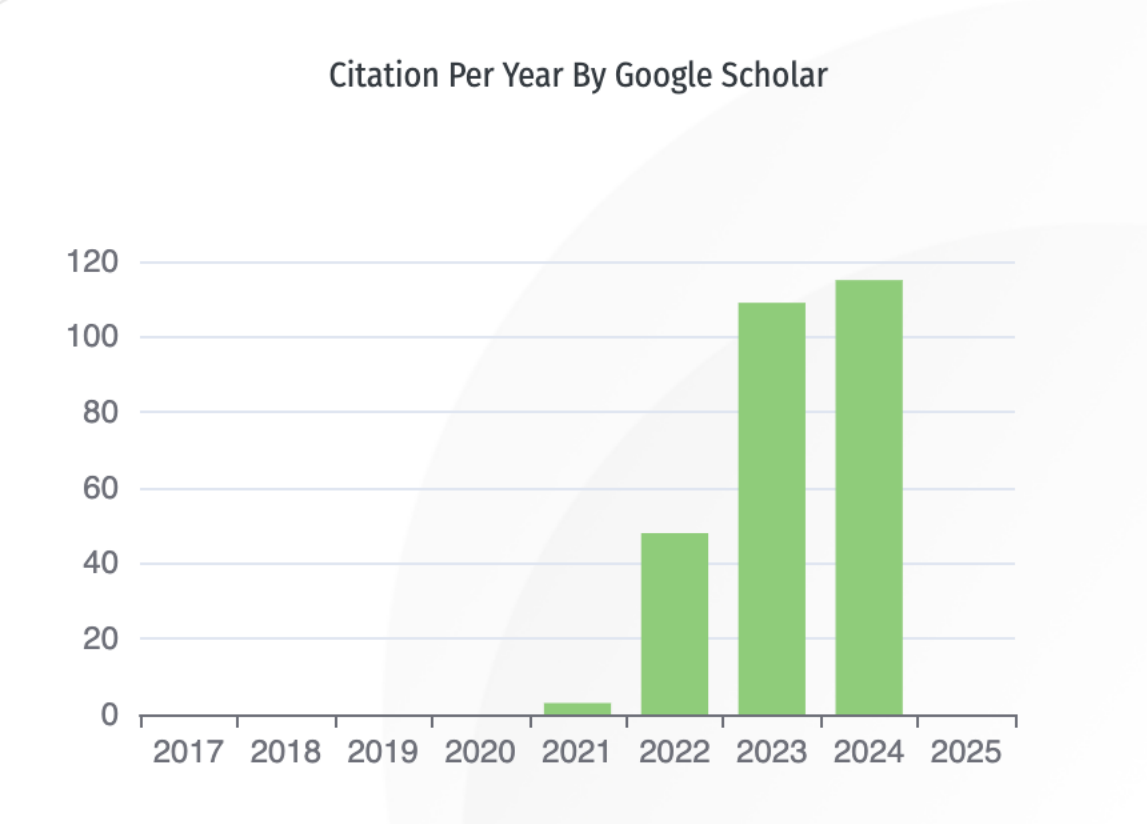

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Relationship between Sex, Fiber Intake, Fluid Intake, Physical Activity and Functional Constipation in Employees

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ABSTRACT

Constipation is a health problem that affects the quality of life of individuals. Gender, fiber intake, fluid intake and physical activity are factors that affect the incidence of constipation. Employees with busy or irregular working hours often have unhealthy lifestyles, including a low-fiber diet, low drinking water consumption and high sedentary behavior. This study aims to analyze the relationship between fiber intake, fluid intake, and physical activity with the incidence of constipation in employees. A total of 130 employees aged 20 – 60 years, who had no history of illness and medication that can cause constipation and were not pregnant, were included in this study. Fiber and fluid intake data were collected using the *Food Frequency Questionnaire* (FFQ) while data on physical activity was assessed using *the International Physical Activity Questionnaire* (IPAQ). The diagnosis of functional constipation was determined using the diagnostic criteria from ROME III. The analysis was carried out using the Chi-square test and the significance level was 95%. This study found a relationship between fiber intake, fluid intake, and physical activity with the incidence of functional constipation ($p=0.03$; $p=0.05$; $p<0.001$), but did not find a relationship between sex and the incidence of functional constipation ($p=0.18$). Functional constipation in employees can be affected by fiber intake, fluid intake and physical activity of the employee, but not by gender

PENDAHULUAN

Constipation is infrequent or difficult bowel movements.(1) Functional constipation, also known as idiopathic chronic constipation, is constipation that occurs without an anatomical or physiological cause and lasts at least 2 days a week for at least 3 months, and does not meet the criteria for irritable bowel syndrome (IBS).(2) This condition can decrease the quality of life of individuals, which will eventually have a negative impact on social life and professionalism, as well as increase the economic burden of the individual.(3) The global prevalence of constipation is 10.4%, higher in the older adult age group at 19.2%.(4,5) This is not much different from the prevalence of functional constipation, which affects 10-17% of the world's population with the highest incidence in women and the elderly.(3)

Lifestyles such as diet and physical activity are factors that are said to increase constipation events.(6) In Indonesia, the population with the consumption of less than 5 servings of fruits and vegetables per day is 95.5% and physical activity of less than 150 minutes per week is 33.5%.(7) In addition, the average fluid intake is also still low.(8) Adequate fiber and fluid intake and high physical activity can lower the risk of constipation events.(9–11) Nevertheless, some studies convey different findings. Research by Muawanah and Nindya showed that fiber and fluid intake were not associated with the incidence of constipation.(12) This is different from the research by Wirdayana and Rahmad which stated that fiber intake was related to the incidence of constipation, while fluid intake was not related to the incidence of constipation.(13) Another study by Dias et al., which examined the relationship between physical activity and constipation, found that physical activity was not associated with functional constipation events. (14) Lai et al. assessed the influence of individual physical activity on the effectiveness of healthy food consumption in influencing the incidence of constipation. The results of the study showed that individuals with *a high Healthy Eating Index* score 2015 (HEI-2015) in the group with high physical activity had a low risk of constipation, while in the low physical activity group, there was no effect of the HEI-2015 score on the risk of constipation. (15)

Company employees are one type of job that is widely found in society. This type of work is a type of work with a fairly high level of *sedentary behavior*). (16) In addition, unhealthy eating behavior can be found in employees due to irregular work schedules, especially in employees who work using shift systems.(17) In this study, the subjects are employees in one company who partly work in the office and some have field duties. This study aimed to analyze the relationship between gender, fiber intake, fluid intake, physical activity, and the incidence of functional constipation.

METHODS

This study was observational research *using a cross-sectional* approach. The inclusion criteria in this study were company employees/employees aged 20-60 years, while the exclusion criteria were respondents who were taking medications that can cause constipation, were suffering from diseases that can cause constipation, and were pregnant. The selection of 130 research respondents was carried out using *simple random sampling*. Fiber and fluid intake was assessed using the Food Frequency Questionnaire (FFQ). In the FFQ used, there were 27 food items assessed, consisting of 7 types of carbohydrates (white rice, white bread, noodles, sweet potatoes, cassava, corn, and potatoes), 5 types of fruits (guava, star fruit, apple grapes, and bananas), 9 types of vegetables (cucumbers, chickpeas, cassava leaves, spinach, kale, tomatoes, carrots, sweet potato leaves, and long beans), as well as 6 types of vegetable proteins (tofu, tempeh, red beans, peanuts, mung beans, and tolo beans). The food models were used as a reference for respondents to estimate the size of the portion they consumed at each meal. Calculation of the amount of fiber and water from food consumed by respondents was carried out using the nutrisurvey 2007.exe program. Fluid intake is calculated based on the amount of fluid from food added to fluid intake in a day. Physical activity was assessed using *The International Physical Activity Questionnaire* (IPAQ*), a short last 7 days self-administered format*. The IPAQ includes 7 questions to measure the vigorous, moderate, and light physical activity that respondents have done in the last 7 days. Functional constipation was assessed using the diagnostic criteria of *ROME III*. Fecal consistency was measured based on the Bristol scale. All data were analyzed using the Chi-square test with a confidence level of 95% ($\alpha = 0.05$). This research has passed the ethical clearance from the Faculty of Medicine, Universitas Trisakti Number 36/KER-Fk/III/2015.

RESULT AND DISCUSSION

RESULTS

Table 1. showed that 53 respondents (40.77%) experienced constipation, most of whom were male, as many as 80 people (61.54%), 80 people (86%) had insufficient fiber intake, 119 people (91.54%) had adequate fluid intake, and 51 people (39.23%) had moderate physical activity.

Constipation is more often experienced by females (48%) than males (36.25%), respondents with low fiber intake (47.67%) than respondents with adequate fiber intake (27.27%), respondents with insufficient fluid intake (72.73%) than respondents with adequate fluid intake (37.82%), and respondents with low physical activity (64.29%) than respondents with moderate (39.22%) and high (16.22%) physical activity. (Table 2.)

Respondent Characteristics

Table 1 Distribution of Respondent Characteristics

Characteristic	N	%
Functional Constipation		
No	77	59,23
Yes	53	40,77
Gender		
Female	50	38,46
Male	80	61,54
Fiber intake		
Inadequate	86	66,15
Adequate	44	33,85
Fluid intake		
Inadequate	11	8,46
Adequate	119	91,54
Physical Activity		
Low	42	32,31
Moderate	51	39,23

High	37	28,46

Analysis of the Relationship between Sex, Fiber Intake, Fluid Intake, Physical Activity, and Constipation

Table 2. Relationship between Sex, Fiber Intake, Fluid Intake, Physical Activity, and Constipation

Variable	Functional Constipation		p value
	Yes n (%)	No n (%)	
Gender			
Female	24 (48,00)	26 (52,00)	0,18
Male	29 (36,25)	51 (63,75)	
Fiber intake			
Inadequate	41 (47,67)	45 (52,33)	0,03*
Adequate	12 (27,27)	32 (72,73)	
Fluid intake			
Inadequate	8 (72,73)	3 (27,27)	0,05*
Adequate	45 (37,82)	74 (62,18)	
Physical activity			
Low	27 (64,29)	15 (35,71)	<0,001*
Moderate	20 (39,22)	31 (60,78)	
High	6 (16,22)	31 (83,78)	

*p<0,05; Chi-Square test

DISCUSSION

Functional Constipation

Data on the incidence of functional constipation in Indonesia are not yet available. However, there is data regarding the prevalence of constipation in one area in Indonesia from previous study. From the research results, it can be seen that as many as 29.1% of individuals from the adult population living in the East Ciputat area, South Tangerang experience functional constipation.(18) These results are similar to a study in Spain which revealed that the prevalence of functional constipation in individuals > 70 years old was 26,8% (19), and another study in Nigeria which stated that as many as 27% of individuals aged 10 to 18 years suffer from functional constipation.(20) The findings of various previous studies in various countries provide lower results compared to the findings in this study. One of the things that may affect is the difference in the characteristics of the subjects who are the respondents to the study. In this study, respondents were aged 20 – 60 and worked in one office. This is different from the previous research by Nisa which was conducted on subjects who had very varied jobs, ranging from *sedentary* to *non-sedentary*. Age and ethnicity are factors that affect the incidence of constipation.(21)

Gender and Constipation

The results of this study show that women (48%) experienced constipation more than men (36,25%). A higher incidence rate in women is likely to occur due to hormonal influences.(22) In addition, there are other factors that can affect this, including the nerves of the pelvic floor muscles that are damaged due to the delivery process or surgery and genital prolapse.(23) A review conducted by Chu et al., showed that from various studies on constipation, the prevalence of constipation was higher in women with a ratio of 1.4 : 1 to 1 for women compared to men.(21) In another review by McCrea, it was also stated that a larger ratio of female and male constipation was found in studies that used the self-reported method of subjects/*self-reported* (mean=2.65) compared to those that used the Rome criterion (mean=1.75).(24)

Fiber Intake and Constipation

This study shows that the group with low fiber intake is more likely to experience constipation than group with adequate fiber intake. Claudina et al. said that adolescents consume an average of 19.92 grams of fiber daily.(9) A similar result was also found by Soviana E et al, that the average fiber intake in DM patients aged 45-65 years is 14.33 grams daily.(25) Another study by Bardosono et al. found that adults in Indonesia only feed 3.3 – 27.4 grams of fiber a day, while based on the nutritional adequacy rate (AKG) it is recommended for fiber intake of 30 – 32 grams per day for women and 36 – 37 grams per day for men. (26) This shows that based on the results of the

current study and previous studies, Indonesians do not consume sufficient amounts of fiber. The low fiber intake of the Indonesian people is mainly due to a shift in food habits with an increase in the consumption of fast food that is low in fiber.(27)

The results of this study indicate that in the group of subjects who consumed less fiber, the incidence of constipation (52.33%) was not much different from those who did not experience constipation (47.67%). However, in the group with adequate fiber intake, most subjects did not experience constipation (72.73%). Fiber intake plays a role in the ability of feces to bind water in the colon so that the volume of feces increases.(28) Adding as much as 1 gram of fiber daily can reduce the incidence of constipation by 1.8%. (29) The results of this study showed that there was a relationship between fiber intake and the incidence of constipation. These findings are supported by previous research by Ng et al., which used the *Agachan Constipation Score Questionnaire*. The study found a negative correlation between the amount of fiber intake and constipation scores in men and women of various age levels. These results show that high fiber intake has a protective effect against constipation events.(30) Another study by Li et al. found that increased fiber intake was associated with improved stool consistency in subjects with high physical activity, but was not associated with changes in bowel frequency in different physical activity groups. (31) The results of the study showed that the amount of fiber intake consumed did not have the same effect on constipation in each subject and only affected constipation caused by poor stool consistency. Ibrahim et al. stated that there was no association between fibrous food consumption habits and functional constipation.(32) The different findings in this study may be due to differences in the instruments for assessing constipation, the type and amount of food in the food questionnaire, and *the software* used to calculate the amount of fiber. In addition, in the research of Ibrahim et al., almost all respondents had a healthy lifestyle (97.5%), which was assessed based on exercise habits and the consumption of fruits, vegetables, and water.

Fluid Intake and Constipation

Most of the respondents in this study had adequate fluid intake. In this study, the cut-off used for fluid intake adequacy was the recommended fluid intake of 1500 – 2000 mL daily. Previous research by Putri and Mulyani in various rural and urban areas in Indonesia, showed that most of the population in urban and rural areas was in a mild dehydration status. (33) This shows that the fluid intake of the Indonesian people is still lacking. Similar results were presented by Claudina et al., who found that most of the respondents were in the category of inadequate fluid intake. (9) These different findings are likely because the limits used to determine fluid adequacy from previous studies are not the same as those used in this study.

Fluid intake affects the consistency of stool. In hard stools, the water content is around 72%, while in soft stools, the water content is at least 76%.(28) Hard stools are one of the symptoms of constipation. (34) In addition, softer stools lead to increased *propulsive* bowel movements, resulting in increased colon transit time and frequency of defecation. (35) This study showed that the group with inadequate fluid intake experienced more constipation (72.73%), while in the group with adequate fluid intake, most of the subjects did not experience constipation (62.18%). The results of this study found that there was a relationship between fluid intake and constipation. Dupont et al.'s research on patients with functional constipation showed that low mineral water consumption and/or high mineral water with a mineral content of 2513 mg/L decreased the incidence of functional constipation.(36). The study by Ng et al. found different results from this study. Ng et al stated that fluid intake did not correlate with the incidence of constipation in adolescent, adult, and childbearing age subjects, while in elderly subjects, a significant weak correlation was found between fluid intake and constipation events. However, in the analysis of all subjects, there was a significant weak correlation ($r=0.245$; $p=0.000$) (30), which was similar to the findings in this study. In contrast to the results of research by Shen et al., fluid intake is a risk factor for constipation when the analysis is carried out without involving other factors. Further analysis using multivariate logistic regression involving various other factors found that there was no relationship between water consumption and constipation. Other factors included in the analysis included gender, ethnicity, education, marital status, income, smoking habits, body mass index, depression, dental health, fiber intake, fat, carbohydrates, protein, sugar, and alcohol consumption. The results showed that the amount of water consumption was not a risk factor for constipation events.(37)

Physical Activity and Constipation

In this study, the physical activity of most respondents was in the category of moderate physical activity (39.23%), although this value was not too different from the low physical activity group (32.31%). These findings are in line with those presented by Strain et al. who stated that globally there are 31.3% of individuals with less physical activity. (38) Office workers are often too lazy to move or do certain physical activities while working behind a desk.(39) Research by Rosenkranz et al. found that office workers spend more than 78% of their working time sitting.(16) In this study, it was found that the number was slightly larger in patients with moderate activity compared to less activity, probably because the respondents in this study worked in a company that had a field assignment system for their workers, so some workers did physical activity for enough time at work. In addition, it can also be observed that there is a fairly large percentage of respondents with high physical activity. This is possible because the physical activity measured in this study is not only when the respondents are working in the office, but also when the respondents are outside the office. One of the factors that can motivate individuals to do physical activity is knowledge about the risk of health problems that occur due to low physical activity.(40) However, the magnitude of the respondents' motivation regarding this has not been assessed in this study.

Physical activity improves bowel movements.(41) This study found that most of the subjects with low physical activity experienced constipation (64.29%), while in the group of subjects with moderate physical activity (60.78%) and high physical activity (83.78%) most of the respondents did not experience constipation ($p<0.001$). Research by Huang et al found that minimal physical activity and *sedentary behavior* were associated with constipation. The number of unhealthy lifestyle subjects (exercise < 1 hour/day, activities other than exercise <1 hour/day, and *sedentary behavior* > 4 hours/day) had a higher risk of constipation (OR=1.88; 95%CI; 1.60 - 2.20).(42) Tantawy et al. conducted a comparative study of 2 groups of obese female subjects with chronic constipation. The first group received physical activity interventions and low-calorie diets, while the second group only received low-calorie diet interventions. The results of the study showed that in the first group, there was a 33.8% improvement in *the Patient Assessment of Constipation – Symptom* (PAC-SYM) score compared to 21.8% in the second group.(43)

This showed that physical activity increased the improvement of abdominal, rectal, and fecal symptoms in subjects with functional constipation. Different results were obtained from research conducted by Wilson. In the study, the relationship between various types of physical activity was analyzed, including recreational *activity*, work-related physical activity, and transportation-related physical activity with constipation based on the frequency of bowel movements and fecal consistency. Wilson revealed that after a multivariate analysis taking into account age, sex, education, ethnicity, marital status, health status, body mass index, fiber intake, and fluid intake, there was no meaningful type of physical activity that could be used to predict the incidence of constipation ($p>0.05$).(44) One of the factors that may cause the difference in the results of this study from the previous studies is the difference in the instruments used in the two studies. The research conducted by Wilson connected each type of physical activity according to the division of categories in the *Global Physical Activity Questionnaire* (GPAQ) with constipation, while in this study, there was no distinction between the types of physical activity carried out by the respondents. This study has not assessed several other factors that can affect the incidence of constipation. Being overweight, insufficient nutritional knowledge, low-calorie consumption, and mental statuses such as stress and depression are suspected to have a role in increasing the incidence of constipation.(6,45) Further research that takes into account factors that have not yet been studied can provide more definitive information regarding the influence of sex factors, fiber intake, fluid intake, and physical activity on constipation.

CONCLUSION

High fiber intake, adequate fluid intake, and moderate to high physical activity are factors related to a lower incidence of constipation in employees. These three factors have a meaningful relationship with functional constipation. These findings show that high fiber intake, fluid intake, and physical activity have the potential to reduce the incidence of functional constipation.

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Relationship between Sex, Fiber Intake, Fluid Intake, Physical Activity and Functional Constipation in Employees

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ABSTRACT

Constipation is a health problem that affects the quality of life of individuals. Gender, fiber intake, fluid intake and physical activity are factors that affect the incidence of constipation. Employees with busy or irregular working hours often have unhealthy lifestyles, including a low-fiber diet, low drinking water consumption and high sedentary behavior. This study aims to analyze the relationship between fiber intake, fluid intake, and physical activity with the incidence of constipation in employees. A total of 130 employees aged 20 – 60 years, who had no history of illness and medication that can cause constipation and were not pregnant, were included in this study. Fiber and fluid intake data were collected using the *Food Frequency Questionnaire* (FFQ) while data on physical activity was assessed using *the International Physical Activity Questionnaire* (IPAQ). The diagnosis of functional constipation was determined using the diagnostic criteria from ROME III. The analysis was carried out using the Chi-square test and the significance level was 95%. This study found a relationship between fiber intake, fluid intake, and physical activity with the incidence of functional constipation ($p=0.03$; $p=0.05$; $p<0.001$), but did not find a relationship between sex and the incidence of functional constipation ($p=0.18$). Functional constipation in employees can be affected by fiber intake, fluid intake and physical activity of the employee, but not by gender

PENDAHULUAN

Constipation is infrequent or difficult bowel movements.(1) Functional constipation, also known as idiopathic chronic constipation, is constipation that occurs without anatomical or physiological cause and lasts at least 2 days a week for at least 3 months, and does not meet the criteria for irritable bowel syndrome (IBS).(2) This condition can decrease the quality of life of individuals, which will eventually have a negative impact on social life and professionalism, as well as increase the economic burden of the individual.(3) The global prevalence of constipation is 10.4%, higher in the older adult age group at 19.2%.(4,5) This is not much different from the prevalence of functional constipation, which affects 10-17% of the world's population with the highest incidence in women and the elderly.(3)

Lifestyles such as diet and physical activity are factors that are said to increase constipation events.(6) In Indonesia, the population with the consumption of less than 5 servings of fruits and vegetables per day is 95.5% and physical activity of less than 150 minutes per week is 33.5%.(7) In addition, the average fluid intake is also still low.(8) Adequate fiber and fluid intake and high physical activity can lower the risk of constipation events.(9–11) Nevertheless, some studies convey different findings. Research by Muawanah and Nindya showed that fiber and fluid intake were not associated with the incidence of constipation.(12) This is different from the research by Wirdayana and Rahmad which stated that fiber intake was related to the incidence of constipation, while fluid intake was not related to the incidence of constipation.(13) Another study by Dias et al., which examined the relationship between physical activity and constipation, found that physical activity was not associated with functional constipation events. (14) Lai et al. assessed the influence of individual physical activity on the effectiveness of healthy food consumption in influencing the incidence of constipation. The results of the study showed that individuals with *a high Healthy Eating Index* score 2015 (HEI-2015) in the group with high physical activity had a low risk of constipation, while in the low physical activity group, there was no effect of the HEI-2015 score on the risk of constipation. (15)

Company employees are one type of job that is widely found in society. This type of work is a type of work with a fairly high level of *sedentary behavior*). (16) In addition, unhealthy eating behavior can be found in employees due to irregular work schedules, especially in employees who work using shift systems.(17) In this study, the subjects are employees in one company who partly work in the office and some have field duties. This study aimed to analyze the relationship between gender, fiber intake, fluid intake, physical activity, and the incidence of functional constipation.

METHODS

This study was observational research *using a cross-sectional* approach. The inclusion criteria in this study were company employees/employees aged 20-60 years, while the exclusion criteria were respondents who were taking medications that can cause constipation, were suffering from diseases that can cause constipation, and were pregna[9] The selection of 130 research respondents was carried out using *simple random sampling*. Fiber and fluid intake was assessed using the Food Frequency Questionnaire (FFQ). In the FFQ used, there were 27 food items assessed, consisting of 7 types of carbohydrates (white rice, white bread, noodles, sweet potatoes, cassava, corn, and potatoes), 5 types of fruits (guava, star fruit, apple grapes, and bananas), 9 types of vegetables (cucumbers, chickpeas, cassava leaves, spinach, kale, tomatoes, carrots, sweet potato leaves, and long beans), as well as 6 types of vegetable proteins (tofu, tempeh, red beans, peanuts, mung beans, and tolo beans). The food models were used as a reference for respondents to estimate the size of the portion they consumed at each meal. Calculation of the amount of fiber and water from food consumed by respondents was carried out using the nutrisurvey 2[11]7.exe program. Fluid intake is calculated based on the amount of fluid from food added to fluid intake in a day. Physical activity was assessed using *The International Physical Activity Questionnaire* (IPAQ), *a short last 7 days self-administered format*. The IPAQ includes 7 questions to measure the vigorous, moderate, and light physical activity that respondents have done in the last 7 days. Functional constipation was [1]sessed using the diagnostic criteria of *ROME III*. Fecal consistency was measured based on the Bristol scale. All data were analyzed using the Chi-square test with a confidence level of 95% ($\alpha = 0.05$). This research has passed the ethical clearance from the Faculty of Medicine, Universitas Trisakti Number 36/KER-Fk/III/2015.

RESULT AND DISCUSSION

RESULTS

Table 1. showed that 53 respondents (40.77%) experienced constipation, most of whom were male, as many as 80 people (61.54%), 80 people (86%) had insufficient fiber intake, 119 people (91.54%) had adequate fluid intake, and 51 people (39.23%) had moderate physical activity.

Constipation is more often experienced by females (48%) than males (36.25%), respondents with low fiber intake (47.67%) than respondents with adequate fiber intake (27.27%), respondents with insufficient fluid intake (72.73%) than respondents with adequate fluid intake (37.82%), and respondents with low physical activity (64.29%) than respondents with moderate (39.22%) and high (16.22%) physical activity. (Table 2.)

Respondent Characteristics

Table 1 Distribution of Respondent Characteristics

Characteristic	N	%
Functional Constipation		
No	77	59,23
Yes	53	40,77
Gender		
Female	50	38,46
Male	80	61,54
Fiber intake		
Inadequate	86	66,15
Adequate	44	33,85
Fluid intake		
Inadequate	11	8,46
Adequate	119	91,54
Physical Activity		
Low	42	32,31
Moderate	51	39,23

High	37	28,46

Analysis of the Relationship between Sex, Fiber Intake, Fluid Intake, Physical Activity, and Constipation

Table 2. Relationship between Sex, Fiber Intake, Fluid Intake, Physical Activity, and Constipation

Variable	Functional Constipation		p value
	Yes n (%)	No n (%)	
Gender			
Female	24 (48,00)	26 (52,00)	0,18
Male	29 (36,25)	51 (63,75)	
Fiber intake			
Inadequate	41 (47,67)	45 (52,33)	0,03*
Adequate	12 (27,27)	32 (72,73)	
Fluid intake			
Inadequate	8 (72,73)	3 (27,27)	0,05*
Adequate	45 (37,82)	74 (62,18)	
Physical activity			
Low	27 (64,29)	15 (35,71)	<0,001*
Moderate	20 (39,22)	31 (60,78)	
High	6 (16,22)	31 (83,78)	

*p<0,05; Chi-Square test

DISCUSSION

Functional Constipation

Data on the incidence of functional constipation in Indonesia are not yet available. However, there is data regarding the prevalence of constipation in one area in Indonesia from previous study. From the research results, it can be seen that as many as 29.1% of individuals from the adult population living in the East Ciputat area, South Tangerang experience functional constipation.(18) These results are similar to a study in Spain which revealed that the prevalence of functional constipation in individuals > 70 years old was 26,8% (19), and another study in Nigeria which stated that as many as 27% of individuals aged 10 to 18 years suffer from functional constipation.(20) The findings of various previous studies in various countries provide lower results compared to the findings in this study. One of the things that may affect is the difference in the characteristics of the subjects who are the respondents to the study. In this study, respondents were aged 20 – 60 and worked in one office. This is different from the previous research by Nisa which was conducted on subjects who had very varied jobs, ranging from *sedentary* to *non-sedentary*. Age and ethnicity are factors that affect the incidence of constipation.(21)

Gender and Constipation

The results of this study show that women (48%) experienced constipation more than men (36,25%). A higher incidence rate in women is likely to occur due to hormonal influences.(22) In addition, there are other factors that can affect this, including the nerves of the pelvic floor muscles that are damaged due to the delivery process or surgery and genital prolapse.(23) A review conducted by Chu et al., showed that from various studies on constipation, the prevalence of constipation was higher in women with a ratio of 1.4 : 1 to 1 for women compared to men.(21) In another review by McCrea, it was also stated that a larger ratio of female and male constipation was found in studies that used the self-reported method of subjects/*self-reported* (mean=2.65) compared to those that used the Rome criterion (mean=1.75).(24)

Fiber Intake and Constipation

This study shows that the group with low fiber intake is more likely to experience constipation than group with adequate fiber intake. Claudina et al. said that adolescents consume an average of 19.92 grams of fiber daily.(9) A similar result was also found by Soviana E et al, that the average fiber intake in DM patients aged 45-65 years is 14.33 grams daily.(25) Another study by Bardosono et al. found that adults in Indonesia only feed 3.3 – 27.4 grams of fiber a day, while based on the nutritional adequacy rate (AKG) it is recommended for fiber intake of 30 – 32 grams per day for women and 36 – 37 grams per day for men. (26) This shows that based on the results of the

current study and previous studies, Indonesians do not consume sufficient amounts of fiber. The low fiber intake of the Indonesian people is mainly due to a shift in food habits with an increase in the consumption of fast food that is low in fiber.(27)

The results of this study indicate that in the group of subjects who consumed less fiber, the incidence of constipation (52.33%) was not much different from those who did not experience constipation (47.67%). However, in the group with adequate fiber intake, most subjects did not experience constipation (72.73%). Fiber intake plays a role in the ability of feces to bind water in the colon so that the volume of feces increases.(28) Adding as much as 1 gram of fiber daily can reduce the incidence of constipation by 1.8%. (29) The results of this study showed that there was a relationship between fiber intake and the incidence of constipation. These findings are supported by previous research by Ng et al., which used the *Agachan Constipation Score Questionnaire.* The study found a negative correlation between the amount of fiber intake and constipation scores in men and women of various age levels. These results show that high fiber intake has a protective effect against constipation events.(30) Another study by Li et al. found that increased fiber intake was associated with improved stool consistency in subjects with high physical activity, but was not associated with changes in bowel frequency in different physical activity groups. (31) The results of the study showed that the amount of fiber intake consumed did not have the same effect on constipation in each subject and only affected constipation caused by poor stool consistency. Ibrahim et al. stated that there was no association between fibrous food consumption habits and functional constipation.(32) The different findings in this study may be due to differences in the instruments for assessing constipation, the type and amount of food in the food questionnaire, and *the software* used to calculate the amount of fiber. In addition, in the research of Ibrahim et al., almost all respondents had a healthy lifestyle (97.5%), which was assessed based on exercise habits and the consumption of fruits, vegetables, and water.

Fluid Intake and Constipation

Most of the respondents in this study had adequate fluid intake. In this study, the cut-off used for fluid intake adequacy was the recommended fluid intake of 1500 – 2000 mL daily. Previous research by Putri and Mulyani in various rural and urban areas in Indonesia, showed that most of the population in urban and rural areas was in a mild dehydration status. (33) This shows that the fluid intake of the Indonesian people is still lacking. Similar results were presented by Claudina et al., who found that most of the respondents were in the category of inadequate fluid intake. (9) These different findings are likely because the limits used to determine fluid adequacy from previous studies are not the same as those used in this study.

Fluid intake affects the consistency of stool. In hard stools, the water content is around 72%, while in soft stools, the water content is at least 76%.(28) Hard stools are one of the symptoms of constipation. (34) In addition, softer stools lead to increased *propulsive* bowel movements, resulting in increased colon transit time and frequency of defecation. (35) This study showed that the group with inadequate fluid intake experienced more constipation (72.73%), while in the group with adequate fluid intake, most of the subjects did not experience constipation (62.18%). The results of this study found that there was a relationship between fluid intake and constipation. Dupont et al.'s research on patients with functional constipation showed that low mineral water consumption and/or high mineral water with a mineral content of 2513 mg/L decreased the incidence of functional constipation.(36). The study by Ng et al. found different results from this study. Ng et al stated that fluid intake did not correlate with the incidence of constipation in adolescent, adult, and childbearing age subjects, while in elderly subjects, a significant weak correlation was found between fluid intake and constipation events. However, in the analysis of all subjects, there was a significant weak correlation (r=0.245; p=0.000) (30), which was similar to the findings in this study. In contrast to the results of research by Shen et al., fluid intake is a risk factor for constipation when the analysis is carried out without involving other factors. Further analysis using multivariate logistic regression involving various other factors found that there was no relationship between water consumption and constipation. Other factors included in the analysis included gender, ethnicity, education, marital status, income, smoking habits, body mass index, depression, dental health, fiber intake, fat, carbohydrates, protein, sugar, and alcohol consumption. The results showed that the amount of water consumption was not a risk factor for constipation events.(37)

Physical Activity and Constipation

In this study, the physical activity of most respondents was in the category of moderate physical activity (39.23%), although this value was not too different from the low physical activity group (32.31%). These findings are in line with those presented by Strain et al. who stated that globally there are 31.3% of individuals with less physical activity. (38) Office workers are often too lazy to move or do certain physical activities while working behind a desk.(39) Research by Rosenkranz et al. found that office workers spend more than 78% of their working time sitting.(16) In this study, it was found that the number was slightly larger in patients with moderate activity compared to less activity, probably because the respondents in this study worked in a company that had a field assignment system for their workers, so some workers did physical activity for enough time at work. In addition, it can also be observed that there is a fairly large percentage of respondents with high physical activity. This is possible because the physical activity measured in this study is not only when the respondents are working in the office, but also when the respondents are outside the office. One of the factors that can motivate individuals to do physical activity is knowledge about the risk of health problems that occur due to low physical activity.(40) However, the magnitude of the respondents' motivation regarding this has not been assessed in this study.

Physical activity improves bowel movements.(41) This study found that most of the subjects with low physical activity experienced constipation (64.29%), while in the group of subjects with moderate physical activity (60.78%) and high physical activity (83.78%) most of the respondents did not experience constipation ($p<0.001$). Research by Huang et al found that minimal physical activity and *sedentary behavior* were associated with constipation. The number of unhealthy lifestyle subjects (exercise < 1 hour/day, activities other than exercise <1 hour/day, and *sedentary behavior* > 4 hours/day) had a higher risk of constipation (OR=1.88; 95%CI; 1.60 - 2.20).(42) Tantawy et al. conducted a comparative study of 2 groups of obese female subjects with chronic constipation. The first group received physical activity interventions and low-calorie diets, while the second group only received low-calorie diet interventions. The results of the study showed that in the first group, there was a 33.8% improvement in *the Patient Assessment of Constipation – Symptom* (PAC-SYM) score compared to 21.8% in the second group.(43)

This showed that physical activity increased the improvement of abdominal, rectal, and fecal symptoms in subjects with functional constipation. Different results were obtained from research conducted by Wilson. In the study, the relationship between various types of physical activity was analyzed, including recreational activity, work-related physical activity, and transportation-related physical activity with constipation based on the frequency of bowel movements and fecal consistency. Wilson revealed that after a multivariate analysis taking into account age, sex, education, ethnicity, marital status, health status, body mass index, fiber intake, and fluid intake, there was no meaningful type of physical activity that could be used to predict the incidence of constipation ($p>0.05$).(44) One of the factors that may cause the difference in the results of this study from the previous studies is the difference in the instruments used in the two studies. The research conducted by Wilson connected each type of physical activity according to the division of categories in the *Global Physical Activity Questionnaire* (GPAQ) with constipation, while in this study, there was no distinction between the types of physical activity carried out by the respondents. This study has not assessed several other factors that can affect the incidence of constipation. Being overweight, insufficient nutritional knowledge, low-calorie consumption, and mental statuses such as stress and depression are suspected to have a role in increasing the incidence of constipation.(6,45) Further research that takes into account factors that have not yet been studied can provide more definitive information regarding the influence of sex factors, fiber intake, fluid intake, and physical activity on constipation.

CONCLUSION

High fiber intake, adequate fluid intake, and moderate to high physical activity are factors related to a lower incidence of constipation in employees. These three factors have a meaningful relationship with functional constipation. These findings show that high fiber intake, fluid intake, and physical activity have the potential to reduce the incidence of functional constipation.

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