Summer 8-12-2021

Pancreatic Enzyme Dosing and Gastrointestinal Symptoms in Children with Cystic Fibrosis

Lauren Dreyer
University of Kansas

Heather Thomas
University of Nebraska Medical Center

Pancreatic Enzyme Dosing and Gastrointestinal Symptoms in Children with Cystic Fibrosis

Lauren Dreyer[1], Barb Bice, M.S. ,R.D.[2], Chinenye Dike, M.D.[3], Heather Thomas, M.D.[4]

[1]University of Kansas, [2]University of Nebraska Medical Center, and [3]Children's Hospital Research Institute

ABSTRACT

The aim of this study is to determine if higher than the recommended dosing for pancreatic enzyme replacement therapy (PERT) improves GI symptoms in children with Cystic fibrosis. Children with CF and exocrine pancreatic insufficiency (EPI) were categorized into two groups based on PERT dosing: less than 10,000 lipase units/kg/day, or greater than 10,000 lipase units/kg/day.

Methods:

142 pediatric CF patients from the Nebraska Regional CF Center were included in the retrospective evaluation. Patients were split into two different groups based on their pancreatic enzyme dosing. Group 1 was greater than 10,000 lipase units/kg/day of enzymes, and group 2 was less than 10,000 lipase units/kg/day.

Results:

The p-value of the results was 0.5992, meaning that there was no statistical difference between the GI symptoms for those who take less or greater than 10,000 lipase units/kg/day of enzymes. The group that takes greater than 10,000 lipase units/kg/day are 1.194 times more likely to experience GI symptoms compared to the group with less than 10,000 lipase units per day.

Conclusion:

Based on the analysis that was completed on the data, there is no statistical significance between those that take greater or less than 10,000 lipase units/kg/day of pancreatic enzymes.

BACKGROUND

Cystic fibrosis (CF) is a genetic disease caused by a defect in the CFTR gene on chromosome seven[3]. Complications that may occur from Cystic fibrosis are asthma, Cystic fibrosis-Related Diabetes (CFRD), sinusitis and liver disease, among others[3]. Patients may experience impaired lung function, pancreatic insufficiency, and gastrointestinal problems[3]. Pancreatic enzyme replacement therapy (PERT) is the treatment for those who are pancreatic insufficient[4]. About 85% of those with Cystic fibrosis have pancreatic insufficiency[4]. Pancreatic insufficiency infers that a patient does not have full function of the pancreas to be able to digest food properly to turn into nutrients[2]. This means that patients need to take a medication called pancreatic enzymes in order to help the pancreas turn food into nutrients for the body, which is needed for proper growth[2]. Patients need to take a specific dosage per meal depending on their age, weight, amount of fat in the meal, and gastrointestinal symptoms to keep their body healthy[2]. Enzyme management is very important so that patients do not have side effects of malabsorption, such as poor weight gain, or gastrointestinal symptoms, such as increased frequencies of stools, oily stools and/or floating stools, foul smelling stools, and loose stools[3]. A patient should not exceed 10,000 lipase units per kilogram per day[2]. Fibrosing colonopathy is the risk factor associated with dosing higher than the 10,000 lipase units/kg/day[1]. This dosing avoids the risk associated with the fibrosing colonopathy, but higher dosing may not lead to fewer symptoms or a better outcome of their diagnosed CF[1].

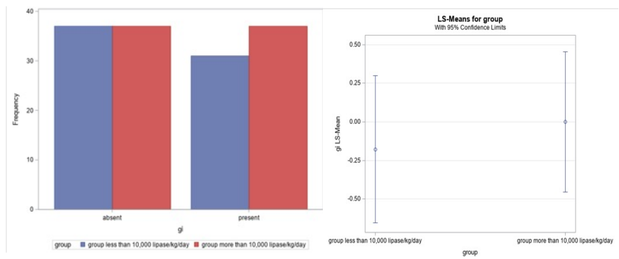
METHODS

A retrospective chart review study was conducted of 142 patients with Cystic fibrosis that are patients at Children's Hospital and Medical Center in Omaha, NE. Patients between the ages of 0 to 21 years were included in the study. Patients that were older than 21 or had not been seen by a Pulmonologist in over a year were excluded from the study, due to not having any updated information about their enzyme dosing or GI symptoms. This study contained two distinct groups: patients that take less than 10,000 lipase units/kg/day of pancreatic enzymes (group 1), and those that take greater than 10,000 lipase units/kg/day of pancreatic enzymes (group 2). Their charts were analyzed to see if they had severe GI symptoms due to their enzyme dosing to help with pancreatic insufficiency. The chart review and data collection for the study was done by looking at the first CF clinic visit of 2021 and comparing the GI symptoms noted at that visit to the symptoms noted 6 months prior to that date. Variables looked at in the study included enzyme name and dosage, lipase units/kg/meal, lipase units/kg/day, proton pump inhibitor (PPI) and dosage, CFTR modulators, weight for length (WFL) percentile, BMI percentile, and z-scores. Several GI symptoms including steatorrhea, diarrhea, bloating, abdominal pain, poor weight gain, and constipation were also analyzed. Data was collected and analyzed in an Excel spreadsheet.

Enzyme Total	#delF508/ delF508	# other mutation	Average age	# males	# females	# above 50% BMI	# below 50% BMI	Avg lipase/kg/ day	Total # patients
>10,000	58	16	9.9	47	27	53	21	12,672.2	74
<10,000	35	33	12.2	33	35	48	20	7341	68

RESULTS

group	GI symptoms					
	absent		present		Total	
	n	%	n	%	n	%
group less than 10,000 lipase/kg/day	37	26.06	31	45.59	68	47.89
group more than 10,000 lipase/kg/day	37	26.06	37	26.06	74	52.11



Analysis of Maximum Likelihood Estimates

Parameter	DF	Estimate	SE	Pr > ChiSq	Odds Ratio	Odds CI	
group Greater vs less	1	0.0885	0.1683	0.5992	1.194	0.617	2.309

DISCUSSION

It is very important for patients with Cystic fibrosis to take their medications for them to stay healthy and avoid hospitalizations, as well as keep internal organs healthy and sufficient so that patients can live their longest life possible. Cystic fibrosis is a life-shortening genetic disease, and these medications are necessary to keep patients healthy. Pancreatic enzymes are important for those who have pancreatic insufficiency, so that they can have the help their pancreas needs in order to digest foods and turn them into nutrients. The research for this project entailed looking at the patient's enzyme dose and any noted GI symptoms at that visit. We then reviewed the chart for the 6 months prior to that visit for any GI symptoms the patient was having. This was used to determine if patients on higher than the recommended enzyme dosing had more or fewer GI symptoms than patients on lower enzyme dose. Enzymes are used to help with digesting foods and helping the pancreas turn the food into nutrients, so enzymes and GI symptoms are correlated. The null hypothesis of this study is there is no difference of GI symptoms between the group with less than 10,000 lipase units/kg/day and the group with greater than 10,000 lipase units/kg/day.

After the data was analyzed, it was determined that 45.6% of patients who take less than 10,000 units of enzymes per day experience GI symptoms, while 26.1% of those who take greater than 10,000 units of enzymes per day experience symptoms. There are 37 patients who take greater than 10,000 units a day that have symptoms, and 31 of those with less than 10,000 units that experience GI effects. The data analysis concluded that the p value for the study was 0.5992, meaning that there was no statistical difference between those who take less or greater than 10,000 units per day of enzymes. The odds ratio was calculated to be 1.194. Although this is not statistically significant, the group with greater than 10,000 lipase units/kg/day of enzymes was 1.194 more likely to experience GI symptoms compared to the group with less than 10,000 lipase units/kg/day.

CONCLUSION

Pancreatic enzymes are very important for patients with pancreatic insufficiency. The data that was collected in this study was important for determining how many units of enzymes each patient takes per day and if their dosage correlates with their GI symptoms. The null hypothesis of this study was accepted, and there was no statistical significance found between the two groups. Based on these results, it can be concluded that one group did not experience a significant difference in GI symptoms compared to the other. If a future study were to be conducted, it can be suggested that more samples should be used to examine further GI symptom relationships.

REFERENCES

[1]Borowitz D, Gelfond D, Maguiness K, Heubi JE, Ramsey B. Maximal daily dose of pancreatic enzyme replacement therapy in infants with cystic fibrosis: A reconsideration. *Journal of Cystic Fibrosis*. 2013;12(6):784-785. doi:10.1016/j.jcf.2013.05.011

[2]Hazle L, Chin M. *Managing Nutrition Problems-For Parents of Children with Cystic Fibrosis*. 2010;3.

[3]Schindler T, Michel S, Wilson AW. Nutrition Management of Cystic Fibrosis in the 21st Century. *Nutrition in Clinical Practice*. 2015;30(4):488-500. doi:10.1177/0884533615591604

[4]Singh VK, Schwarzenberg SJ. Pancreatic insufficiency in Cystic Fibrosis. *Journal of Cystic Fibrosis*. 2017;16. doi:10.1016/j.jcf.2017.06.011