

Abstract

Hypertension is a common condition that is often corresponded with other comorbidities and can result from various organ and gastrointestinal (GI) disorders. Hypertension clinical trials are abundant but are encompassed by numerous exclusion terms related to organ and GI disorders. Using data from clinicaltrials.gov, 1033 terms relating to hypertension and comorbidities were found. Of those terms, 183 terms related to organ and GI disorders with exclusion rates of 86.8% and 89.1% respectively. Given the prevalence of hypertension and corresponding comorbidities, research warrants an increase in the number of clinical trials in those with hypertension and organ or GI disorders to improve treatment knowledge in common comorbidities.

Background

Hypertension is one of the leading cardiovascular disease-related diagnoses worldwide. While common causes of hypertension are typically related to subpar nutrient intake and a sedentary lifestyle, hypertension can sometimes be caused by organ and gastrointestinal (GI) malfunctions. For example, non-alcoholic fatty liver disease (NAFLD) has been shown to be interdependent with hypertension and both conditions may be effectively treated simultaneously (Oikonomou et al., 2018, 979-985). Similarly, hypertension can be considered both a cause and effect of chronic kidney disease (CKD); treating hypertension in CKD patients has been shown to delay the progression of both diseases while simultaneously preventing the inheritance of other comorbidities (Pugh et al., 2019, 365-379).

The liver and kidneys are largely responsible for the removal of various substrates from the body, so it's understandable how these organs contribute to hypertension. For example, the kidneys regulate sodium retention and absorption which can contribute to hypertension in those with dysfunctional kidneys (Katsurada et al., 2022, 198-209). Additionally, the gastrointestinal system is also correlated with hypertension. Gastrointestinal disorders, which typically impact digestive processes, have been shown to potentially reduce the efficacy of hypertension treatments, though these shortcomings can be improved using specific delivery methods (Öztürk et al., 2019, 1730-1741). Similarly, digestive diseases such as celiac disease may degrade hepatic performance, causing hypertension and other comorbidities which can and should be treated (Hmimass et al., 2021, A148).

This study investigated the prevalence of inclusion and exclusion terms related to hypertension and miscellaneous conditions and comorbidities using the largest clinical trials repository in the United States, clinicaltrials.gov. Using all available trials, researchers of the current study found significant variance in the inclusion and exclusion term frequencies in organ and gastrointestinal conditions in hypertension clinical trials. Despite an abundance of research relating to such comorbid conditions, the vast majority of clinical trials excluded these terms in hypertension studies. Future hypertension clinical trials should be conducted while including common comorbidities related to the liver, kidneys, and gastrointestinal system.

Methods

Using Python3.9.10, the present study collected hypertension and miscellaneous comorbidity terms from the clinicaltrials.gov repository. The data analysis yielded 1033 terms relating to hypertension and miscellaneous comorbidities from 1990 to 2022.

Hypertension and comorbidity-related terms were collected, analyzed, and organized into subcategories and by clinical trial inclusion and exclusion frequency. Examples of miscellaneous comorbidity terms include obesity, osteoarthritis, intestinal disease, and celiac disease, amongst others. Upon further analysis, the comorbidities were subdivided into vital organ and gastrointestinal conditions.

Figure 1. Inclusion and exclusion frequencies of vital organ-related terms in hypertension clinical trials.

Vital Organ Conditions		
Condition	Inclusion	Exclusion
Liver failure	4	49
Fatty liver	5	14
Non-alcoholic fatty liver disease	3	5
Acute kidney injury	0	11
TOTALS	12	79

Figure 2. Comparison of inclusion and exclusion frequencies of diabetes-related terms in hypertension clinical trials.

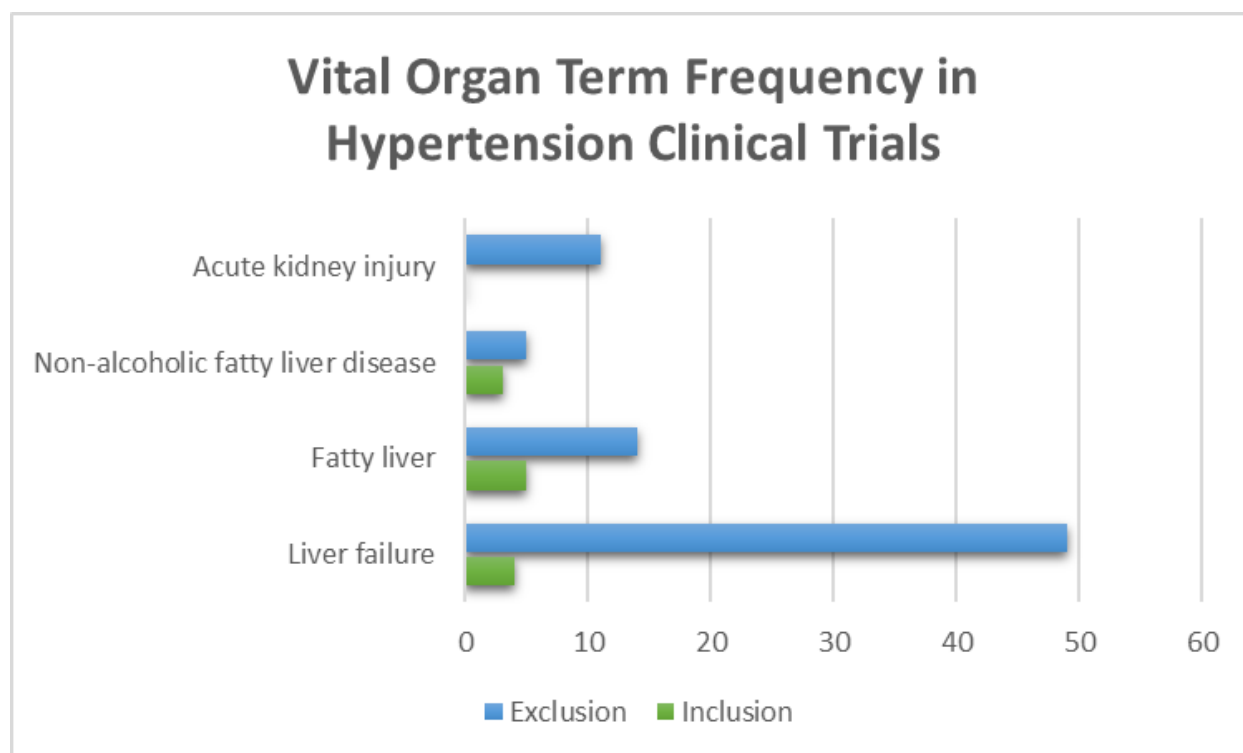
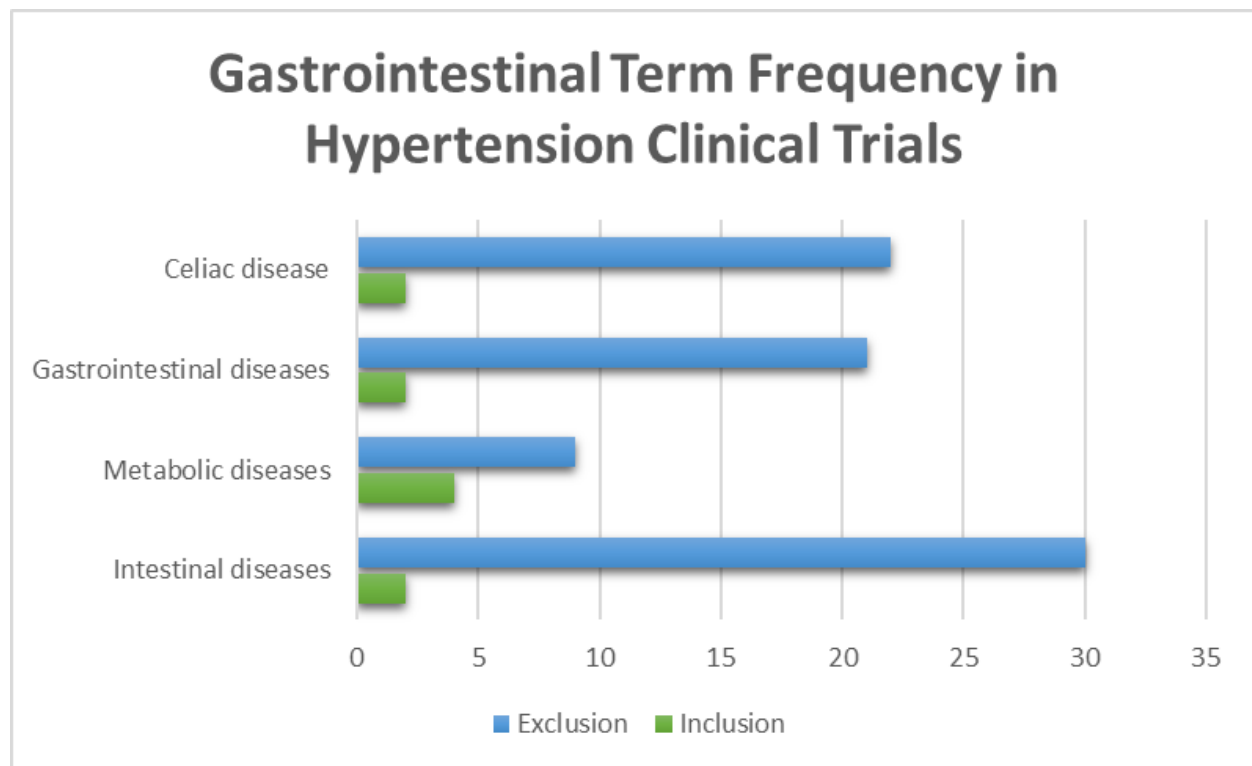


Figure 3. Inclusion and exclusion frequencies of gastrointestinal-related terms in hypertension clinical trials.

Digestive/Gastrointestinal Conditions		
Condition	Inclusion	Exclusion
Intestinal diseases	2	30
Metabolic diseases	4	9
Gastrointestinal diseases	2	21
Celiac disease	2	22
TOTALS	10	82

Figure 4. Comparison of inclusion and exclusion frequencies of gastrointestinal-related terms in hypertension clinical trials.



Results and Discussion

This study found overwhelming disparities in the inclusion and exclusion frequencies of vital organ and gastrointestinal conditions in hypertension clinical trials. Vital organ and gastrointestinal condition terms elicited 86.6% and 89.1% exclusion rates in hypertension clinical trials, respectively. Terms related to vital organ conditions, specifically conditions related to the kidney and liver, were 6.58 times more likely to be excluded from hypertension clinical trials. Similarly, GI-related terms were 8.17 times more likely to be excluded than included in hypertension clinical trials.

Hypertension is a common condition that is frequently associated with other comorbidities. Many corresponding conditions related to hypertension involve vital organs and the gastrointestinal system yet conditions related to each are commonly excluded from hypertension clinical trials. Vital organ and gastrointestinal dysfunction can exacerbate the symptoms and potentially decrease the efficacy of hypertension treatments and should thus be further addressed through clinical trials.

References

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