

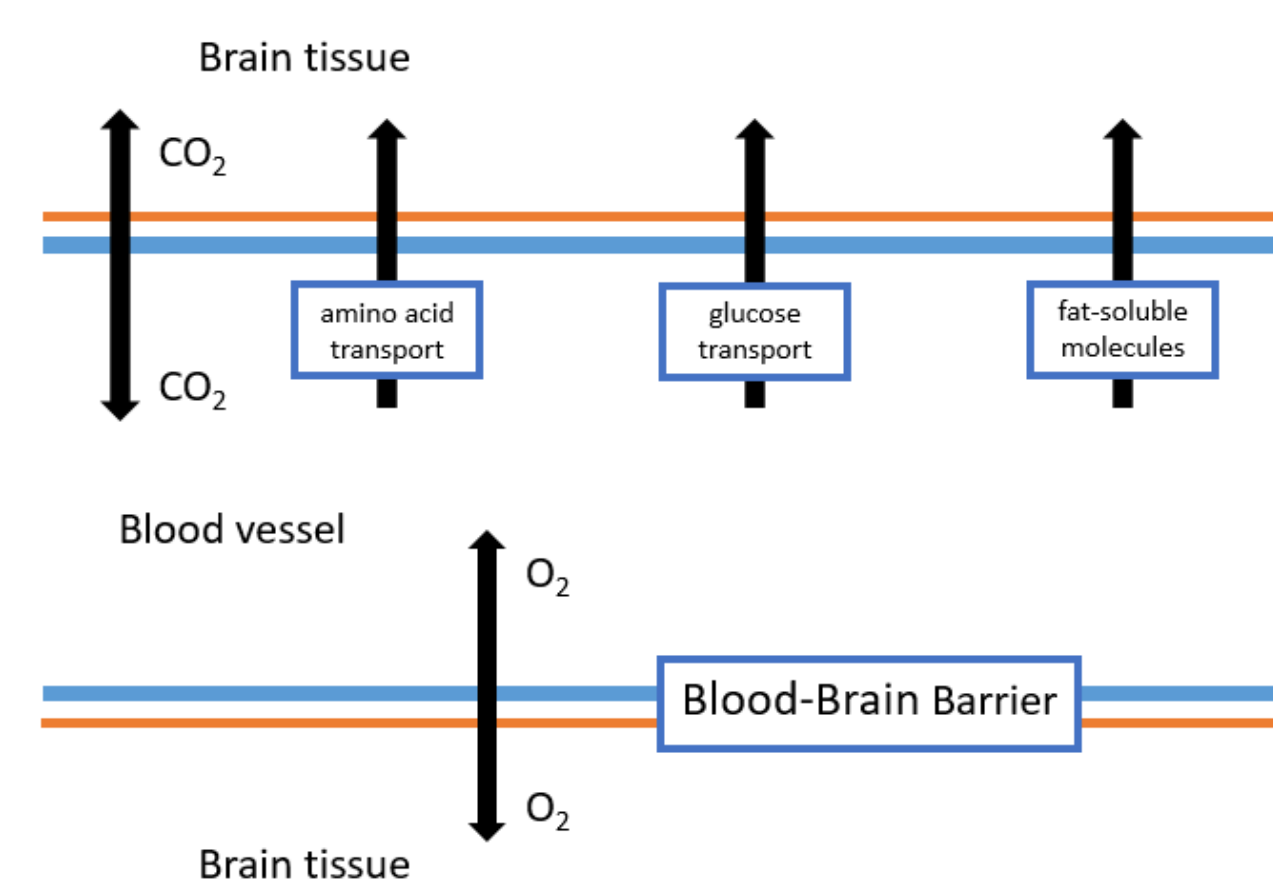
Background

The blood-brain barrier—a tight layer of cells that protects the brain from foreign substances— regulates ion, molecule, and cell movement, which poses an issue for drug delivery.

Neurodegenerative diseases, such as Alzheimer's and Parkinson's, affect millions worldwide. Existing approaches for drug delivery to the brain fail to overcome the blood-brain barrier, which is designed to protect the brain from foreign substances. In these diseases, the blood-brain barrier is dysfunctional and induces the failure of protein transports throughout the brain.

Nanoparticles can help overcome this issue, as they are small molecules (on the scale of nanometers) that have the potential to enhance precision, reduce side effects, and optimize therapeutic outcomes.

Improving the precision of these molecular tools comes with a caveat—there are many biological barriers that could prevent clinical progress. Developing one effective platform, such as nanoparticles, could lead to some clinical therapeutics.¹ Tested medicinal nanoparticles have the unique properties of controlled drug release and improved targeting efficiency, which can help deliver drugs precisely through the blood-brain barrier.² Thus, nanomedicine is a promising avenue of neuropharmacology to treat neurodegenerative diseases.



Results

Bibliometric analysis narrowed down the top 100 most-cited articles on nanoparticle drug delivery research for neurodegenerative diseases, with the keywords “nanoparticle,” “blood-brain barrier,” and “drug delivery” used most frequently. Most of the authors hailed from the United States, India, and China.

Senior Author Distribution

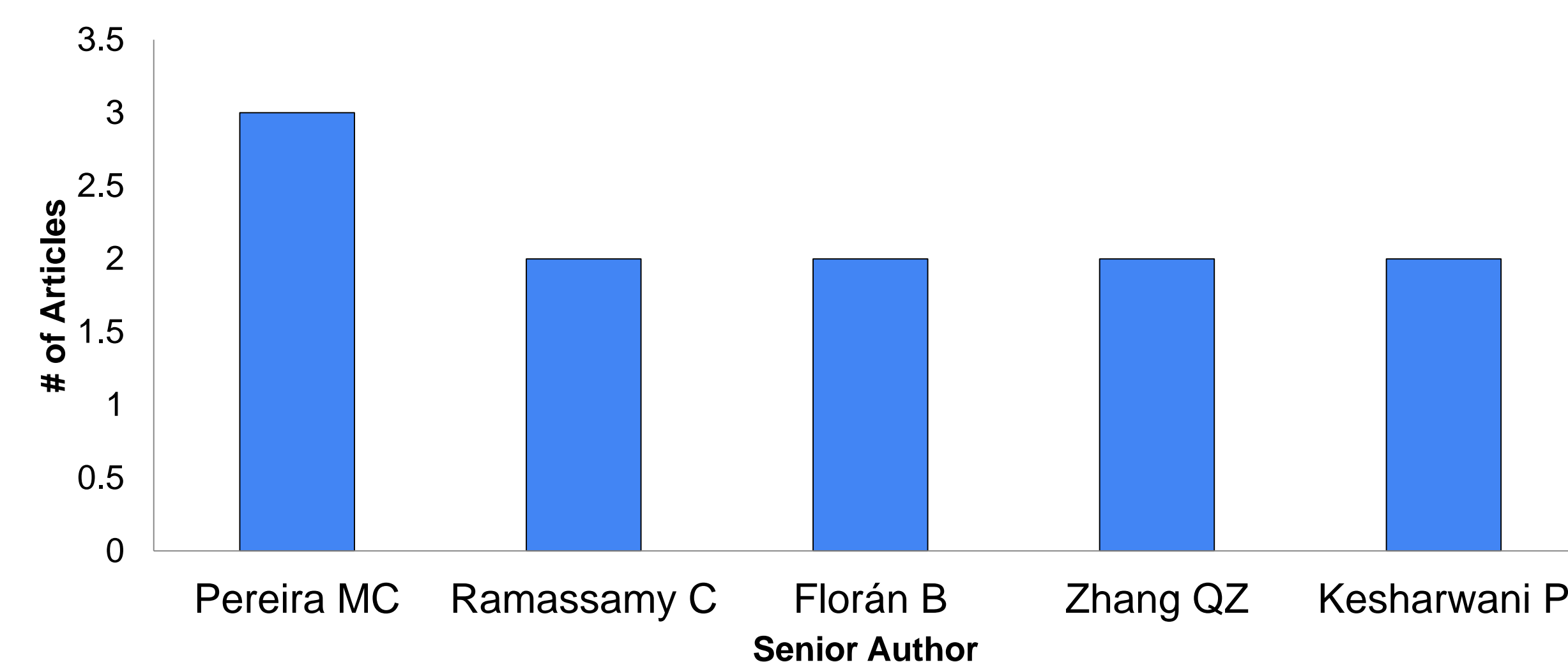


Figure 2. Senior authors with two or more papers of the 100-most cited articles on nanoparticles and neurodegenerative diseases

Senior Author Institution Distribution

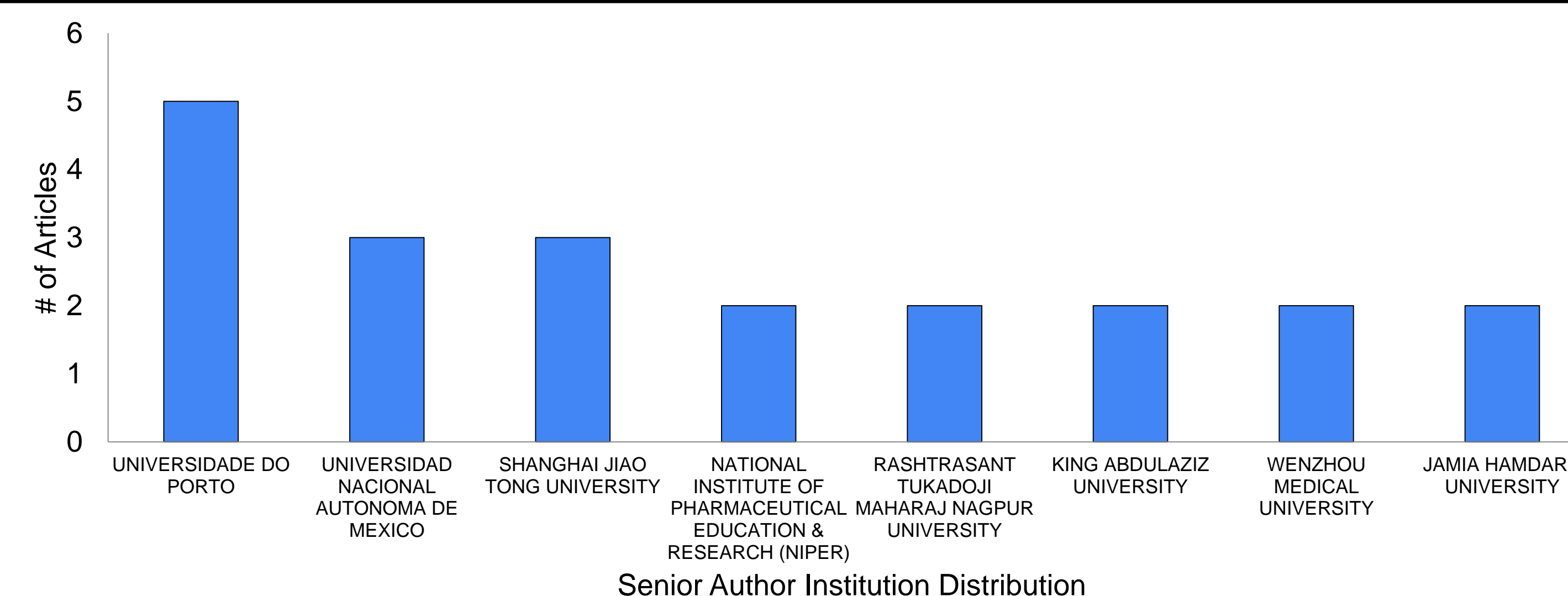


Figure 3. Senior authors' institutions with two or more papers of the 100-most cited articles on nanoparticles and neurodegenerative diseases

Journal Distribution

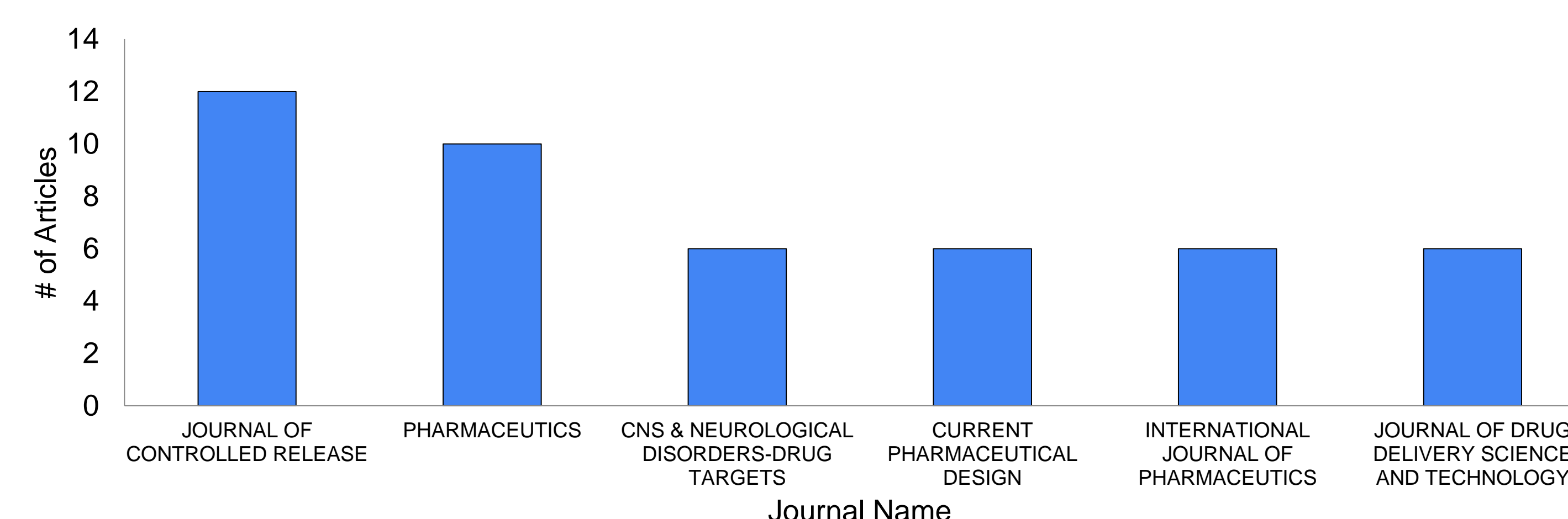


Figure 4. Journals with six or more papers of the 100-most cited articles on nanoparticles and neurodegenerative diseases

Top Article Topics

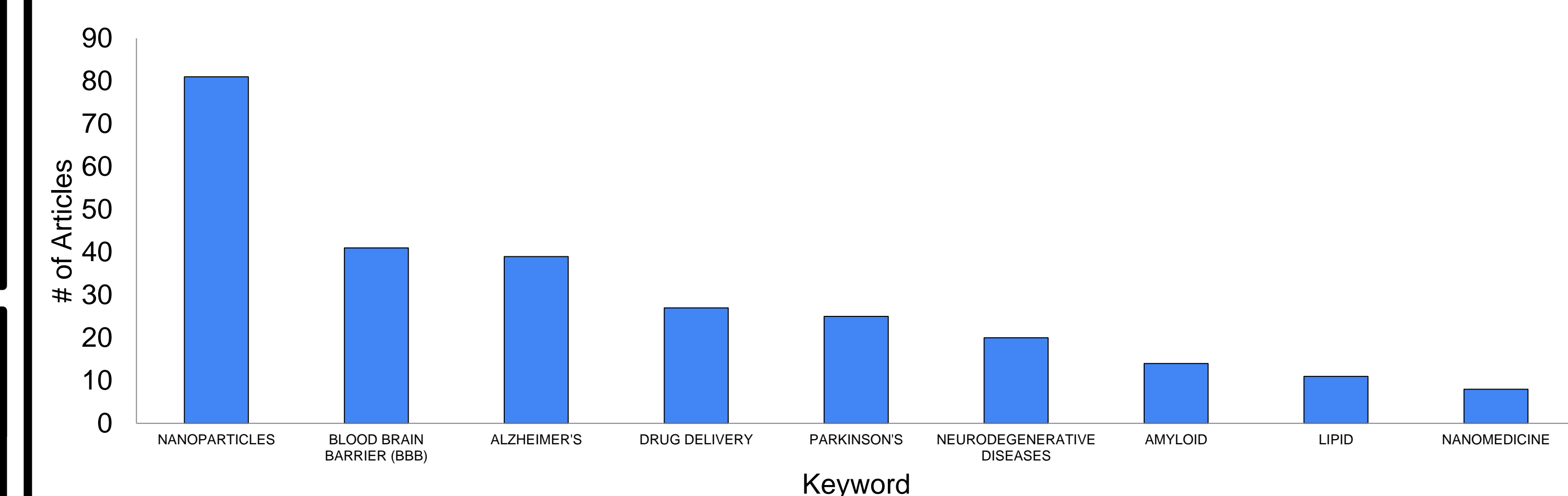


Figure 5. The top article topics of the 100-most cited articles on nanoparticles and neurodegenerative diseases

Conclusion

We conducted this study to highlight the promising use of nanoparticles in treating neurodegenerative diseases and examine the existing literature surrounding this novel treatment.

There is currently a global movement at the forefront of scientific innovation working to provide solutions to combat neurodegenerative diseases. In recent years, researchers have studied the use of nanoparticles as a drug delivery method to treat neurodegenerative diseases. This is a new frontier, allowing for more effective treatments for these ailments. While challenges like neuroinflammation persist, low cytotoxicity and high drug-binding capacity of nanoparticles contribute to their significance in modern medicine.

Research conducted between 2005 and 2022 reveal the potential of lipid nanoparticles to target areas related to Alzheimer's and Parkinson's. As ongoing research uncovers the intricacies of these mechanisms, there is optimism that these degenerative disorders can be tackled through the use of nanoparticles. Future work can implement similar research methods to explore the precision of drug delivery engineering, nanoparticle applications in treating other diseases and vaccine delivery, and strategies to combat neuroinflammation for improved nanoparticle delivery.

Acknowledgements & References

Thank you to Think Neuro, Kaiser Permanente Bernard J. Tyson School of Medicine, and Clarivate for their support during this research, as well as each researcher's home institutions.

References:

1. *Nature*, **2021**, 20, 101-124.
2. *Pharmaceutics*, **2018**, 10(8), 269.

Applications:

- Web of Science Database
- R-Studio Application
- Biblioshiny

Web of Science Search

A methodical bibliometric approach guided the data extraction for this study. After sourcing 484 texts from the keywords “Nanoparticle Brain (Alzheimer's OR Parkinson's)” on Web of Science (WOS), we focused on 126 English-language articles within WOS's “Pharmacology Pharmacy” category.

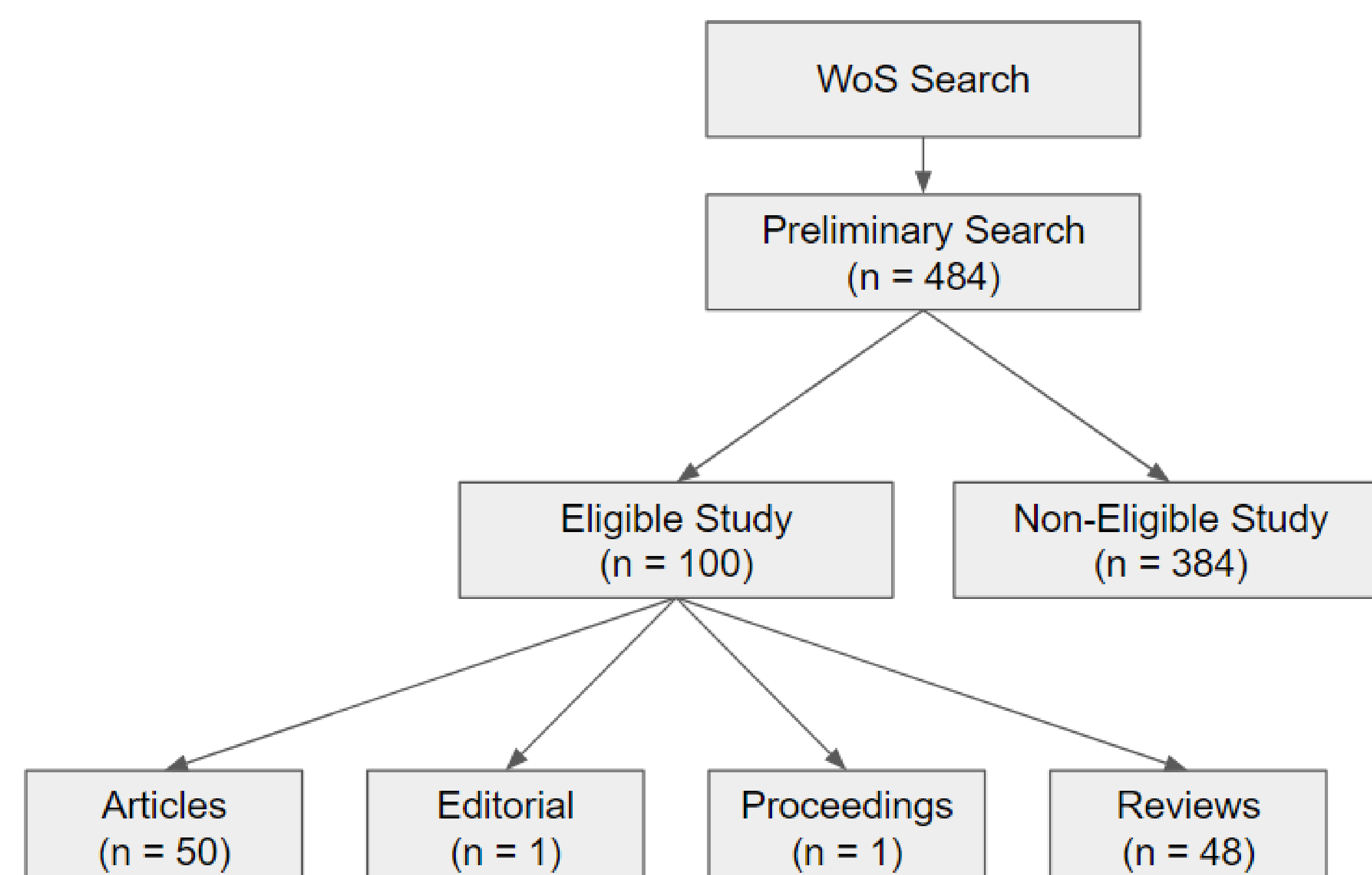


Figure 1. Flow diagram of the literature search process, outlining the number of studies that were identified, included, and excluded at each stage.