



RESEARCH PAPER

INVESTIGATION OF THE PHARMACOLOGIC MECHANISMS INVOLVED IN THE ACTION OF BERBERINE AS A POTENTIAL TREATMENT FOR ALZHEIMER'S DISEASE: NETWORK PHARMACOLOGY-BASED APPROACH

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Alzheimer's disease (AD) is a neurodegenerative disorder characterized by significant memory loss and mental health decline. Berberine, a key active component of the ancient Chinese herb *Coptis chinensis*, has potential therapeutic effects against AD. To explore this, we utilized the HERB and SwissTargets prediction databases to identify AD-related targets associated with berberine. These targets were used to construct a protein interaction network and were analyzed through gene ontology (GO) and the Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway analyses. Additionally, berberine's targets against tau and A β pathology in AD were identified using the AlzData database and further validated through molecular docking studies. Following screening and removal of duplicates, 27 berberine-related targets for AD were identified. GO biological process analysis revealed a significant upregulation in the cellular response to chemical stress (GO:0062197) among these targets. KEGG pathway enrichment analysis showed the highest enrichment in the AD pathway (hsa05010), with APP, BID, CASP3, CASP8, CYCS, GSK, and TNF emerging as key protein targets. Molecular docking analysis confirmed that these genes exhibited strong binding interactions and favorable binding energies with berberine. In conclusion, network pharmacology methods demonstrated that berberine may exert therapeutic effects in AD by modulating multiple targets and pathways, suggesting its potential as a multi-target drug in treating this complex disorder. This study highlights the importance of further research into berberine's clinical applications for AD.

Key words: Alzheimer's disease, Berberine, Network Pharmacology, Molecular docking, Alkaloid.

INTRODUCTION

Alzheimer's disease (AD) is the most common type of dementia seen in senior people. It affects more than 47 million individuals around the globe, and Alzheimer's Disease International expects that this figure will rise to 81.1 million by the year 2040. It is anticipated that by the

year 2050, India will have one of the oldest populations in the world, with the percentage of individuals aged 60 or older growing from 15% now to 36.5% then [1-3]. In the meanwhile, it has been estimated that there are now more than 9 million people living with AD in India.