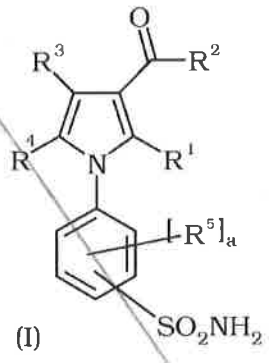
CLAIMS

1. A compound of formula I, its tautomeric forms, its stereoisomers, its analogues, its prodrugs, its isotopically substituted analogues, its metabolites, its sulfoxides, its N-oxides, its pharmaceutically acceptable salts, its polymorphs, its solvates, its optical isomers, its clathrates or its co-crystals,



(I)

wherein,

R^1 is selected from the group consisting of hydrogen, halogen, substituted- or unsubstituted- alkyl, substituted- or unsubstituted- alkenyl, substituted- or unsubstituted- alkynyl, perhaloalkyl, and substituted- or unsubstituted- cycloalkyl;

R^2 is selected from the group consisting of substituted- or unsubstituted- alkyl, $(R^6)(R^7)N$-, $(R^6)N(OR^{7a})$-, and $R^{6a}O$-;

R^3 is selected from the group consisting of substituted- or unsubstituted- alkyl, substituted- or unsubstituted- alkenyl, substituted- or unsubstituted- alkynyl, substituted- or unsubstituted- cycloalkyl;

R^4 is selected from the group consisting of substituted- or unsubstituted- aryl, substituted- or unsubstituted- heteroaryl;

$[R^5]_a$ is 'a' times repetition of 'R^5' groups, each R^5 is independently selected from the group consisting of halo, substituted- or unsubstituted-alkyl, R^8O-; 'a' is an integer selected from 0, 1, and 2;

wherein, R^6 and R^7 are independently selected from hydrogen, substituted- or unsubstituted- alkyl, $R^9C(=O)$-, R^9SO_2-; such that when R^2 is $(R^6)(R^7)N$-, R^6 and R^7 together with the nitrogen atom to which they are attached may form a 3 to 10 member substituted- or unsubstituted-heterocycle containing one to three hetero atoms/groups selected from the group consisting of S, N, O the said heterocycle may be saturated or unsaturated, monocyclic or bicyclic or spiro, or the said heterocycle may contain an alkylene bridge;

R^{6a} is selected from hydrogen and substituted- or unsubstituted- alkyl;

R^{7a} is selected as substituted- or unsubstituted- alkyl;

wherein R^8 is selected from hydrogen, substituted- or unsubstituted-alkyl, and perhaloalkyl;

wherein, R^9 is independently selected from the group consisting of hydrogen, substituted- or unsubstituted- alkyl, substituted- or unsubstituted- aryl, substituted- or unsubstituted- heteroaryl, substituted- or unsubstituted- cycloalkyl, and substituted- or unsubstituted- heterocyclyl;

wherein,

the "alkyl", "alkenyl", and "alkynyl" are substituted with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, cycloalkyl, $R^{10a}SO_2$-, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

the "cycloalkyl" is substituted with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10}A^1$-,

$R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

the "aryl" is substituted with 1 to 3 substituents selected independently from the group consisting of halogen, nitro, cyano, hydroxy, C_1 to C_6 alkyl, C_2 to C_6 alkenyl, C_2 to C_6 alkynyl, C_3 to C_6 cycloalkyl, 3- to 6-membered heterocycle, C_1 to C_6 perhaloalkyl, alkyl-O-, alkenyl-O-, alkynyl-O-, perhaloalkyl-O-, alkyl-N(alkyl)-, alkyl-N(H)-, H_2N-, alkyl-SO_2-, perhaloalkyl-SO_2-, alkyl-C(=O)N(alkyl)-, alkyl-C(=O)N(H)-, alkyl-N(alkyl)C(=O)-, alkyl-N(H)C(=O)-, $H_2NC(=O)$-, alkyl-N(alkyl)SO_2-, alkyl-N(H)SO_2-, H_2NSO_2-;

the "heterocyclyl" is substituted on ring carbons with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

the "heterocyclyl" is substituted on ring nitrogen(s) with one or more substituents selected from the group consisting of aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10a}OC(=O)$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-;

the "heteroaryl" is substituted with 1 to 3 substituents selected independently from the group consisting of halogen, nitro, cyano, hydroxy, C_1 to C_6 alkyl, C_2 to C_6 alkenyl, C_2 to C_6 alkynyl, C_3 to C_6 cycloalkyl, 3- to 6- membered heterocycle, C_1 to C_6 perhaloalkyl, alkyl-O-, alkenyl-O-, alkynyl-O-, perhaloalkyl-O-, alkyl-N(alkyl)-, alkyl-N(H)-, H_2N-, alkyl-SO_2-, perhaloalkyl-SO_2-, alkyl-C(=O)N(alkyl)-, alkyl-C(=O)N(H)-, alkyl-N(alkyl)C(=O)-, alkyl-N(H)C(=O)-, $H_2NC(=O)$-, alkyl-N(alkyl)SO_2-, and alkyl-N(H)SO_2-, H_2NSO_2-;

the "3- to 10- membered heterocyclic ring" is substituted with 1 to 3 substituents selected from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-,

$R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

wherein,

A^1 is selected from the group consisting of O and S;

R^{10} is selected from hydrogen, alkyl, alkenyl, alkynyl, aryl, heteroaryl, cycloalkyl or heterocyclyl; and

R^{10a} is selected from the group consisting of alkyl, alkenyl, alkynyl, perhaloalkyl, aryl, heteroaryl, cycloalkyl or heterocyclyl.

2. The compound of formula I, its tautomeric forms, its stereoisomers, its analogues, its prodrugs, its isotopically substituted analogues, its metabolites, its sulfoxides, its N-oxides, its pharmaceutically acceptable salts, its polymorphs, its solvates, its optical isomers, its clathrates or its co-crystals, as claimed in claim 1, wherein R^1 is selected as substituted- or unsubstituted- alkyl.

3. The compound of formula I, its tautomeric forms, its stereoisomers, its analogues, its prodrugs, its isotopically substituted analogues, its metabolites, its sulfoxides, its N-oxides, its pharmaceutically acceptable salts, its polymorphs, its solvates, its optical isomers, its clathrates or its co-crystals, as claimed in any one of claims 1 or 2, wherein R^2 is selected as substituted- or unsubstituted- alkyl.

4. The compound of formula I, its tautomeric forms, its stereoisomers, its analogues, its prodrugs, its isotopically substituted analogues, its metabolites, its sulfoxides, its N-oxides, its pharmaceutically acceptable salts, its polymorphs, its solvates, its optical isomers, its clathrates or its co-crystals, as claimed in any one of claims 1-3, wherein R^3 is selected substituted- or unsubstituted- alkyl.

5. The compound of formula I, its tautomeric forms, its stereoisomers, its analogues, its prodrugs, its isotopically substituted analogues, its metabolites, its sulfoxides, its N-oxides, its pharmaceutically acceptable salts, its polymorphs, its solvates, its optical isomers, its clathrates or its co-crystals, as claimed in any one of claims 1-4, wherein R^4 is selected as substituted- or unsubstituted- aryl.

6. The compound of formula I, its tautomeric forms, its stereoisomers, its analogues, its prodrugs, its isotopically substituted analogues, its metabolites, its sulfoxides, its N-oxides, its pharmaceutically acceptable salts, its polymorphs, its solvates, its optical isomers, its clathrates or its co-crystals, as claimed in any one of claims 1-5, wherein 'a' is selected as 0.

7. The compound of formula I, its tautomeric forms, its stereoisomers, its analogues, its prodrugs, its isotopically substituted analogues, its metabolites, its sulfoxides, its N-oxides, its pharmaceutically acceptable salts, its polymorphs, its solvates, its optical isomers, its clathrates or its co-crystals, as claimed in any one of claims 1-6, wherein R^1 is selected as substituted- or unsubstituted- alkyl; R^2 is selected as substituted- or unsubstituted- alkyl; R^3 is selected substituted- or unsubstituted- alkyl; R^4 is selected as substituted- or unsubstituted- aryl; and 'a' is selected as 0.

8. The compound of formula I, its tautomeric forms, its stereoisomers, its analogues, its prodrugs, its isotopically substituted analogues, its metabolites, its sulfoxides, its N-oxides, its pharmaceutically acceptable salts, its polymorphs, its solvates, its optical isomers, its clathrates or its co-crystals, as claimed in any one of claims 1-7, wherein the compound is selected from-

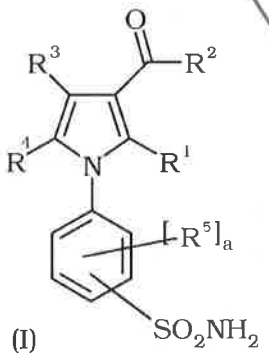
4-(2-(4-chlorophenyl)-3,5-dimethyl-4-propionyl-1*H*-pyrrol-1-yl) benzenesulfonamide; and

4-(2-(4-chlorophenyl)-3-ethyl-5-methyl-4-propionyl-1H-pyrrol-1-yl)benzenesulfonamide.

9. A pharmaceutical composition comprising a compound of any one claims 1-8 and a pharmaceutically acceptable carrier.

10. A method of preventing or treating a disease or its symptoms or a disorder mediated partially or completely by nicotinic acetylcholine receptors, said method comprising administering to a subject having or susceptible to said disease or its symptoms or disorder with a therapeutically effective amount of a compound of any one of claims 1-8.

11. A method of treating a disease or disorder or condition mediated partially or completely by nicotinic acetylcholine receptors in a subject in need thereof, comprising administering to the subject a therapeutically effective amount of a compound of formula I, its tautomeric forms, its stereoisomers, its analogues, its prodrugs, its isotopically substituted analogues, its metabolites, its sulfoxides, its N-oxides, its pharmaceutically acceptable salts, its polymorphs, its solvates, its optical isomers, its clathrates or its co-crystals,



(I)

wherein,

R^1 is selected from the group consisting of hydrogen, halogen, substituted- or unsubstituted- alkyl, substituted- or unsubstituted-

alkenyl, substituted- or unsubstituted- alkynyl, perhaloalkyl, and substituted- or unsubstituted- cycloalkyl;

R^2 is selected from the group consisting of substituted- or unsubstituted-alkyl, $(R^6)(R^7)N$-, $(R^6)N(OR^{7a})$-, and $R^{6a}O$-;

R^3 is selected from the group consisting of substituted- or unsubstituted-alkyl, substituted- or unsubstituted- alkenyl, substituted- or unsubstituted- alkynyl, substituted- or unsubstituted- cycloalkyl;

R^4 is selected from the group consisting of substituted- or unsubstituted-aryl, substituted- or unsubstituted- heteroaryl;

$[R^5]_a$ is 'a' times repetition of 'R^5' groups, each R^5 is independently selected from the group consisting of halo, substituted- or unsubstituted-alkyl, R^8O-; 'a' is an integer selected from 0, 1, and 2;

wherein, R^6 and R^7 are independently selected from hydrogen, substituted- or unsubstituted- alkyl, $R^9C(=O)$-, R^9SO_2-; such that when R^2 is $(R^6)(R^7)N$-, R^6 and R^7 together with the nitrogen atom to which they are attached may form a 3 to 10 member substituted- or unsubstituted-heterocycle containing one to three hetero atoms/groups selected from the group consisting of S, N, O the said heterocycle may be saturated or unsaturated, monocyclic or bicyclic or spiro, or the said heterocycle may contain an alkylene bridge;

R^{6a} is selected from hydrogen and substituted- or unsubstituted- alkyl;

R^{7a} is selected as substituted- or unsubstituted- alkyl;

wherein R^8 is selected from hydrogen, substituted- or unsubstituted-alkyl, and perhaloalkyl;

wherein, R^9 is independently selected from the group consisting of hydrogen, substituted- or unsubstituted- alkyl, substituted- or unsubstituted- aryl, substituted- or unsubstituted- heteroaryl, substituted- or unsubstituted- cycloalkyl, and substituted- or unsubstituted- heterocyclyl;

wherein,

the "alkyl", "alkenyl", and "alkynyl" are substituted with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, cycloalkyl, $R^{10a}SO_2$-, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

the "cycloalkyl" is substituted with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

the "aryl" is substituted with 1 to 3 substituents selected independently from the group consisting of halogen, nitro, cyano, hydroxy, C_1 to C_6 alkyl, C_2 to C_6 alkenyl, C_2 to C_6 alkynyl, C_3 to C_6 cycloalkyl, 3- to 6-membered heterocycle, C_1 to C_6 perhaloalkyl, alkyl-O-, alkenyl-O-, alkynyl-O-, perhaloalkyl-O-, alkyl-N(alkyl)-, alkyl-N(H)-, H_2N-, alkyl-SO_2-, perhaloalkyl-SO_2-, alkyl-C(=O)N(alkyl)-, alkyl-C(=O)N(H)-, alkyl-N(alkyl)C(=O)-, alkyl-N(H)C(=O)-, $H_2NC(=O)$-, alkyl-N(alkyl)SO_2-, alkyl-N(H)SO_2-, H_2NSO_2-;

the "heterocyclyl" is substituted on ring carbons with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

the "heterocyclyl" is substituted on ring nitrogen(s) with one or more substituents selected from the group consisting of aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10a}OC(=O)$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-;

the "heteroaryl" is substituted with 1 to 3 substituents selected independently from the group consisting of halogen, nitro, cyano, hydroxy, C_1 to C_6 alkyl, C_2 to C_6 alkenyl, C_2 to C_6 alkynyl, C_3 to C_6 cycloalkyl, 3- to 6- membered heterocycle, C_1 to C_6 perhaloalkyl, alkyl-O-, alkenyl-O-, alkynyl-O-, perhaloalkyl-O-, alkyl-N(alkyl)-, alkyl-N(H)-, H_2N-, alkyl-SO_2-, perhaloalkyl-SO_2-, alkyl-C(=O)N(alkyl)-, alkyl-C(=O)N(H)-, alkyl-N(alkyl)C(=O)-, alkyl-N(H)C(=O)-, $H_2NC(=O)$-, alkyl-N(alkyl)SO_2-, and alkyl-N(H)SO_2-, H_2NSO_2-;

the "3- to 10- membered heterocyclic ring" is substituted with 1 to 3 substituents selected from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, (R^{10})(alkyl)$NC(=O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, (R^{10})(alkyl)N-, $(R^{10})(H)NC(=A^1)N(H)$-, and (R^{10})(alkyl)$NC(=A^1)N(H)$-;

wherein,

A^1 is selected from the group consisting of O and S;

R^{10} is selected from hydrogen, alkyl, alkenyl, alkynyl, aryl, heteroaryl, cycloalkyl or heterocyclyl; and

R^{10a} is selected from the group consisting of alkyl, alkenyl, alkynyl, perhaloalkyl, aryl, heteroaryl, cycloalkyl or heterocyclyl.

12. The method of claim 11, wherein the disorder or condition or disease is selected from the group consisting of Alzheimer's disease, mild cognitive impairment, senile dementia, vascular dementia, dementia of Parkinson's disease, attention deficit disorder, attention deficit hyperactivity disorder, dementia associated with Lewy bodies, AIDS dementia complex, Pick's disease, dementia associated with Down's syndrome, Huntington's disease, cognitive deficits associated with traumatic brain injury, cognitive decline associated with stroke, poststroke neuroprotection, cognitive and sensorimotor gating deficits associated with schizophrenia, cognitive

deficits associated with bipolar disorder, cognitive impairments associated with depression, acute pain, post-surgical or post-operative pain, chronic pain, inflammation, inflammatory pain, neuropathic pain, smoking cessation, need for new blood vessel growth associated with wound healing, need for new blood vessel growth associated with vascularization of skin grafts, and lack of circulation, arthritis, rheumatoid arthritis, psoriasis, Crohn's disease, ulcerative colitis, pouchitis, inflammatory bowel disease, celiac disease, periodontitis, sarcoidosis, pancreatitis, organ transplant rejection, acute immune disease associated with organ transplantation, chronic immune disease associated with organ transplantation, septic shock, toxic shock syndrome, sepsis syndrome, depression, and rheumatoid spondylitis.

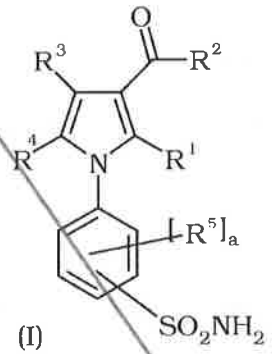
13. The method of claim 11, wherein the disease or disorder or condition is selected from the group classified or diagnosed as major or minor neurocognitive disorders, or disorders arising due to neurodegeneration.

14. The method of claim 11, comprising administering a compound of formula I in combination with or as adjunct to medications utilized in the treatment of attention deficit hyperactivity disorders, schizophrenia, cognitive disorders such as Alzheimer's disease, Parkinson's dementia, vascular dementia or dementia associated with Lewy bodies, or traumatic brain injury.

15. The method of claim 11, further comprising administering a compound of formula I in combination with or as an adjunct to acetylcholinesterase inhibitors, disease modifying drugs or biologics for neurodegenerative disorders, dopaminergic drugs, antidepressants, or a typical or an atypical antipsychotic.

16. Use of a compound of claim 1 for preventing or treating a disease or its symptoms or a disorder mediated partially or completely by nicotinic acetylcholine receptors.

17. Use of a compound of formula I, its tautomeric forms, its stereoisomers, its analogues, its prodrugs, its isotopically substituted analogues, its metabolites, its sulfoxides, its N-oxides, its pharmaceutically acceptable salts, its polymorphs, its solvates, its optical isomers, its clathrates or its co-crystals, for treating a disease or disorder or condition,



(I)

wherein,

R^1 is selected from the group consisting of hydrogen, halogen, substituted- or unsubstituted- alkyl, substituted- or unsubstituted- alkenyl, substituted- or unsubstituted- alkynyl, perhaloalkyl, and substituted- or unsubstituted- cycloalkyl;

R^2 is selected from the group consisting of substituted- or unsubstituted- alkyl, $(R^6)(R^7)N$-, $(R^6)N(OR^{7a})$-, and $R^{6a}O$-;

R^3 is selected from the group consisting of substituted- or unsubstituted- alkyl, substituted- or unsubstituted- alkenyl, substituted- or unsubstituted- alkynyl, substituted- or unsubstituted- cycloalkyl;

R^4 is selected from the group consisting of substituted- or unsubstituted- aryl, substituted- or unsubstituted- heteroaryl;

$[R^5]_a$ is 'a' times repetition of 'R^5' groups, each R^5 is independently selected from the group consisting of halo, substituted- or unsubstituted- alkyl, R^8O-; 'a' is an integer selected from 0, 1, and 2;

wherein, R^6 and R^7 are independently selected from hydrogen, substituted- or unsubstituted- alkyl, $R^9C(=O)$-, R^9SO_2-; such that when R^2 is $(R^6)(R^7)N$-, R^6 and R^7 together with the nitrogen atom to which they are attached may form a 3 to 10 member substituted- or unsubstituted- heterocycle containing one to three hetero atoms/groups selected from the group consisting of S, N, O the said heterocycle may be saturated or unsaturated, monocyclic or bicyclic or spiro, or the said heterocycle may contain an alkylene bridge;

R^{6a} is selected from hydrogen and substituted- or unsubstituted- alkyl;

R^{7a} is selected as substituted- or unsubstituted- alkyl;

wherein R^8 is selected from hydrogen, substituted- or unsubstituted- alkyl, and perhaloalkyl;

wherein, R^9 is independently selected from the group consisting of hydrogen, substituted- or unsubstituted- alkyl, substituted- or unsubstituted- aryl, substituted- or unsubstituted- heteroaryl, substituted- or unsubstituted- cycloalkyl, and substituted- or unsubstituted- heterocyclyl;

wherein,

the "alkyl", "alkenyl", and "alkynyl" are substituted with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, cycloalkyl, $R^{10a}SO_2$-, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

the "cycloalkyl" is substituted with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

the "aryl" is substituted with 1 to 3 substituents selected independently from the group consisting of halogen, nitro, cyano, hydroxy, C_1 to C_6 alkyl, C_2 to C_6 alkenyl, C_2 to C_6 alkynyl, C_3 to C_6 cycloalkyl, 3- to 6-membered heterocycle, C_1 to C_6 perhaloalkyl, alkyl-O-, alkenyl-O-, alkynyl-O-, perhaloalkyl-O-, alkyl-N(alkyl)-, alkyl-N(H)-, H_2N-, alkyl-SO_2-, perhaloalkyl-SO_2-, alkyl-C(=O)N(alkyl)-, alkyl-C(=O)N(H)-, alkyl-N(alkyl)C(=O)-, alkyl-N(H)C(=O)-, $H_2NC(=O)$-, alkyl-N(alkyl)SO_2-, alkyl-N(H)SO_2-, H_2NSO_2-;

the "heterocyclyl" is substituted on ring carbons with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, (R^{10})(alkyl)NC(O)-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, (R^{10})(alkyl)N-, $(R^{10})(H)NC(=A^1)N(H)$-, and (R^{10})(alkyl)$NC(=A^1)N(H)$-;

the "heterocyclyl" is substituted on ring nitrogen(s) with one or more substituents selected from the group consisting of aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10a}OC(=O)$-, $(R^{10})(H)NC(=O)$-, (R^{10})(alkyl)NC(=O)-;

the "heteroaryl" is substituted with 1 to 3 substituents selected independently from the group consisting of halogen, nitro, cyano, hydroxy, C_1 to C_6 alkyl, C_2 to C_6 alkenyl, C_2 to C_6 alkynyl, C_3 to C_6 cycloalkyl, 3- to 6- membered heterocycle, C_1 to C_6 perhaloalkyl, alkyl-O-, alkenyl-O-, alkynyl-O-, perhaloalkyl-O-, alkyl-N(alkyl)-, alkyl-N(H)-, H_2N-, alkyl-SO_2-, perhaloalkyl-SO_2-, alkyl-C(=O)N(alkyl)-, alkyl-C(=O)N(H)-, alkyl-N(alkyl)C(=O)-, alkyl-N(H)C(=O)-, $H_2NC(=O)$-, alkyl-N(alkyl)SO_2-, and alkyl-N(H)SO_2-, H_2NSO_2-;

the "3- to 10- membered heterocyclic ring" is substituted with 1 to 3 substituents selected from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, (R^{10})(alkyl)NC(=O)-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, (R^{10})(alkyl)N-, $(R^{10})(H)NC(=A^1)N(H)$-, and (R^{10})(alkyl)$NC(=A^1)N(H)$-;

wherein,

A^1 is selected from the group consisting of O and S;

R^{10} is selected from hydrogen, alkyl, alkenyl, alkynyl, aryl, heteroaryl, cycloalkyl or heterocyclyl; and

R^{10a} is selected from the group consisting of alkyl, alkenyl, alkynyl, perhaloalkyl, aryl, heteroaryl, cycloalkyl or heterocyclyl.

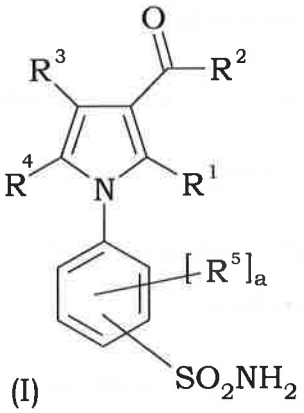
18. The use as claimed in claim 17, wherein the disease or disorder or condition is selected from the group classified or diagnosed as major or minor neurocognitive disorders, or disorders arising due to neurodegeneration.

19. The use as claimed in claim 17, which is in combination with or as adjunct to medications utilized in the treatment of attention deficit hyperactivity disorders, schizophrenia, cognitive disorders, Alzheimer's disease, Parkinson's dementia, vascular dementia or dementia associated with Lewy bodies, and traumatic brain injury.

20. The use as claimed in claim 17, which is in combination with or as an adjunct to acetylcholinesterase inhibitors, disease modifying drugs or biologics for neurodegenerative disorders, dopaminergic drugs, antidepressants, or a typical or atypical antipsychotic.

CLAIMS

1. A compound of formula I, its tautomeric form, its stereoisomer, or its pharmaceutically acceptable salt,



(I)

wherein,

R^1 is selected from the group consisting of hydrogen, halogen, substituted- or unsubstituted- alkyl, substituted- or unsubstituted- alkenyl, substituted- or unsubstituted- alkynyl, perhaloalkyl, and substituted- or unsubstituted- cycloalkyl;

R^2 is selected from the group consisting of substituted- or unsubstituted- alkyl, $(R^6)(R^7)N$-, $(R^6)N(OR^{7a})$-, and $R^{6a}O$-;

R^3 is selected from the group consisting of substituted- or unsubstituted- alkyl, substituted- or unsubstituted- alkenyl, substituted- or unsubstituted- alkynyl, substituted- or unsubstituted- cycloalkyl;

R^4 is selected from the group consisting of substituted- or unsubstituted- aryl, substituted- or unsubstituted- heteroaryl;

$[R^5]_a$ is 'a' times repetition of 'R^5' groups, each R^5 is independently selected from the group consisting of halo, substituted- or unsubstituted- alkyl, R^8O-; 'a' is an integer selected from 0, 1, and 2;

wherein, R^6 and R^7 are independently selected from hydrogen, substituted- or unsubstituted- alkyl, $R^9C(=O)$-, R^9SO_2-; such that when

R^2 is $(R^6)(R^7)N$-, R^6 and R^7 together with the nitrogen atom to which they are attached may form a 3 to 10 member substituted- or unsubstituted-heterocycle containing one to three hetero atoms/groups selected from the group consisting of S, N, O the said heterocycle may be saturated or unsaturated, monocyclic or bicyclic or spiro, or the said heterocycle may contain an alkylene bridge;

R^{6a} is selected from hydrogen and substituted- or unsubstituted- alkyl;

R^{7a} is selected as substituted- or unsubstituted- alkyl;

wherein R^8 is selected from hydrogen, substituted- or unsubstituted-alkyl, and perhaloalkyl;

wherein, R^9 is independently selected from the group consisting of hydrogen, substituted- or unsubstituted- alkyl, substituted- or unsubstituted- aryl, substituted- or unsubstituted- heteroaryl, substituted- or unsubstituted- cycloalkyl, and substituted- or unsubstituted- heterocyclyl;

wherein,

the "alkyl", "alkenyl", and "alkynyl" are substituted with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, cycloalkyl, $R^{10a}SO_2$-, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

the "cycloalkyl" is substituted with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

the "aryl" is substituted with 1 to 3 substituents selected independently from the group consisting of halogen, nitro, cyano, hydroxy, C_1 to C_6

alkyl, C_2 to C_6 alkenyl, C_2 to C_6 alkynyl, C_3 to C_6 cycloalkyl, 3- to 6-membered heterocycle, C_1 to C_6 perhaloalkyl, alkyl-O-, alkenyl-O-, alkynyl-O-, perhaloalkyl-O-, alkyl-N(alkyl)-, alkyl-N(H)-, H_2N-, alkyl-SO_2-, perhaloalkyl-SO_2-, alkyl-C(=O)N(alkyl)-, alkyl-C(=O)N(H)-, alkyl-N(alkyl)C(=O)-, alkyl-N(H)C(=O)-, $H_2NC(=O)$-, alkyl-N(alkyl)SO_2-, alkyl-N(H)SO_2-, H_2NSO_2-;

the "heterocyclyl" is substituted on ring carbons with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, (R^{10})(alkyl)NC(O)-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, (R^{10})(alkyl)N-, $(R^{10})(H)NC(=A^1)N(H)$-, and (R^{10})(alkyl)$NC(=A^1)N(H)$-;

the "heterocyclyl" is substituted on ring nitrogen(s) with one or more substituents selected from the group consisting of aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10a}OC(=O)$-, $(R^{10})(H)NC(=O)$-, (R^{10})(alkyl)NC(=O)-;

the "heteroaryl" is substituted with 1 to 3 substituents selected independently from the group consisting of halogen, nitro, cyano, hydroxy, C_1 to C_6 alkyl, C_2 to C_6 alkenyl, C_2 to C_6 alkynyl, C_3 to C_6 cycloalkyl, 3- to 6- membered heterocycle, C_1 to C_6 perhaloalkyl, alkyl-O-, alkenyl-O-, alkynyl-O-, perhaloalkyl-O-, alkyl-N(alkyl)-, alkyl-N(H)-, H_2N-, alkyl-SO_2-, perhaloalkyl-SO_2-, alkyl-C(=O)N(alkyl)-, alkyl-C(=O)N(H)-, alkyl-N(alkyl)C(=O)-, alkyl-N(H)C(=O)-, $H_2NC(=O)$-, alkyl-N(alkyl)SO_2-, and alkyl-N(H)SO_2-, H_2NSO_2-;

the "3- to 10- membered heterocyclic ring" is substituted with 1 to 3 substituents selected from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, (R^{10})(alkyl)NC(=O)-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, (R^{10})(alkyl)N-, $(R^{10})(H)NC(=A^1)N(H)$-, and (R^{10})(alkyl)$NC(=A^1)N(H)$-;

wherein,

A^1 is selected from the group consisting of O and S;

R^{10} is selected from hydrogen, alkyl, alkenyl, alkynyl, aryl, heteroaryl, cycloalkyl or heterocyclyl; and

R^{10a} is selected from the group consisting of alkyl, alkenyl, alkynyl, perhaloalkyl, aryl, heteroaryl, cycloalkyl or heterocyclyl.

2. The compound of formula I, its tautomeric form, its stereoisomer, or its pharmaceutically acceptable salt, as claimed in claim 1, wherein R^1 is selected as substituted- or unsubstituted- alkyl.

3. The compound of formula I, its tautomeric form, its stereoisomer, or its pharmaceutically acceptable salt, as claimed in any one of claims 1 or 2, wherein R^2 is selected as substituted- or unsubstituted- alkyl.

4. The compound of formula I, its tautomeric form, its stereoisomer, or its pharmaceutically acceptable salt, as claimed in any one of claims 1-3, wherein R^3 is selected substituted- or unsubstituted- alkyl.

5. The compound of formula I, its tautomeric form, its stereoisomer, or its pharmaceutically acceptable salt, as claimed in any one of claims 1-4, wherein R^4 is selected as substituted- or unsubstituted- aryl.

6. The compound of formula I, its tautomeric form, its stereoisomer, or its pharmaceutically acceptable salt, as claimed in any one of laims 1-5, wherein 'a' is selected as 0.

7. The compound of formula I, its tautomeric form, its stereoisomer, or its pharmaceutically acceptable salt, as claimed in any one of claims 1-6, wherein R^1 is selected as substituted- or unsubstituted- alkyl; R^2 is selected as substituted- or unsubstituted- alkyl; R^3 is selected substituted- or unsubstituted- alkyl; R^4 is selected as substituted- or unsubstituted- aryl; and 'a' is selected as 0.

8. The compound of formula I, its tautomeric form, its stereoisomer, or its pharmaceutically acceptable salt, as claimed in any one of claims 1-7, wherein the compound is selected from-

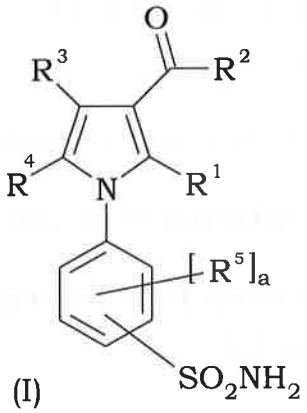
4-(2-(4-chlorophenyl)-3,5-dimethyl-4-propionyl-1*H*-pyrrol-1-yl) benzenesulfonamide; and

4-(2-(4-chlorophenyl)-3-ethyl-5-methyl-4-propionyl-1H-pyrrol-1-yl)benzenesulfonamide.

9. A pharmaceutical composition comprising a compound of any one claims 1-8 and a pharmaceutically acceptable carrier.

10. The use of a compound of claim 1 in a method of manufacturing a medicament for use in preventing or treating a disease or its symptoms or a disorder mediated partially or completely by nicotinic acetylcholine receptors.

11. The use of a compound of formula I, its tautomeric forms, its stereoisomers, or its pharmaceutically acceptable salt,



(I)

wherein,

R^1 is selected from the group consisting of hydrogen, halogen, substituted- or unsubstituted- alkyl, substituted- or unsubstituted-

alkenyl, substituted- or unsubstituted- alkynyl, perhaloalkyl, and substituted- or unsubstituted- cycloalkyl;

R^2 is selected from the group consisting of substituted- or unsubstituted-alkyl, $(R^6)(R^7)N$-, $(R^6)N(OR^{7a})$-, and $R^{6a}O$-;

R^3 is selected from the group consisting of substituted- or unsubstituted-alkyl, substituted- or unsubstituted- alkenyl, substituted- or unsubstituted- alkynyl, substituted- or unsubstituted- cycloalkyl;

R^4 is selected from the group consisting of substituted- or unsubstituted-aryl, substituted- or unsubstituted- heteroaryl;

$[R^5]_a$ is 'a' times repetition of 'R^5' groups, each R^5 is independently selected from the group consisting of halo, substituted- or unsubstituted-alkyl, R^8O-; 'a' is an integer selected from 0, 1, and 2;

wherein, R^6 and R^7 are independently selected from hydrogen, substituted- or unsubstituted- alkyl, $R^9C(=O)$-, R^9SO_2-; such that when R^2 is $(R^6)(R^7)N$-, R^6 and R^7 together with the nitrogen atom to which they are attached may form a 3 to 10 member substituted- or unsubstituted-heterocycle containing one to three hetero atoms/groups selected from the group consisting of S, N, O the said heterocycle may be saturated or unsaturated, monocyclic or bicyclic or spiro, or the said heterocycle may contain an alkylene bridge;

R^{6a} is selected from hydrogen and substituted- or unsubstituted- alkyl;

R^{7a} is selected as substituted- or unsubstituted- alkyl;

wherein R^8 is selected from hydrogen, substituted- or unsubstituted-alkyl, and perhaloalkyl;

wherein, R^9 is independently selected from the group consisting of hydrogen, substituted- or unsubstituted- alkyl, substituted- or unsubstituted- aryl, substituted- or unsubstituted- heteroaryl, substituted- or unsubstituted- cycloalkyl, and substituted- or unsubstituted- heterocyclyl;

wherein,

the "alkyl", "alkenyl", and "alkynyl" are substituted with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, cycloalkyl, $R^{10a}SO_2$-, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

the "cycloalkyl" is substituted with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

the "aryl" is substituted with 1 to 3 substituents selected independently from the group consisting of halogen, nitro, cyano, hydroxy, C_1 to C_6 alkyl, C_2 to C_6 alkenyl, C_2 to C_6 alkynyl, C_3 to C_6 cycloalkyl, 3- to 6-membered heterocycle, C_1 to C_6 perhaloalkyl, alkyl-O-, alkenyl-O-, alkynyl-O-, perhaloalkyl-O-, alkyl-N(alkyl)-, alkyl-N(H)-, H_2N-, alkyl-SO_2-, perhaloalkyl-SO_2-, alkyl-C(=O)N(alkyl)-, alkyl-C(=O)N(H)-, alkyl-N(alkyl)C(=O)-, alkyl-N(H)C(=O)-, $H_2NC(=O)$-, alkyl-N(alkyl)SO_2-, alkyl-N(H)SO_2-, H_2NSO_2-;

the "heterocyclyl" is substituted on ring carbons with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

the "heterocyclyl" is substituted on ring nitrogen(s) with one or more substituents selected from the group consisting of aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10a}OC(=O)$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-;

the "heteroaryl" is substituted with 1 to 3 substituents selected independently from the group consisting of halogen, nitro, cyano, hydroxy, C_1 to C_6 alkyl, C_2 to C_6 alkenyl, C_2 to C_6 alkynyl, C_3 to C_6 cycloalkyl, 3- to 6- membered heterocycle, C_1 to C_6 perhaloalkyl, alkyl-O-, alkenyl-O-, alkynyl-O-, perhaloalkyl-O-, alkyl-N(alkyl)-, alkyl-N(H)-, H_2N-, alkyl-SO_2-, perhaloalkyl-SO_2-, alkyl-C(=O)N(alkyl)-, alkyl-C(=O)N(H)-, alkyl-N(alkyl)C(=O)-, alkyl-N(H)C(=O)-, $H_2NC(=O)$-, alkyl-N(alkyl)SO_2-, and alkyl-N(H)SO_2-, H_2NSO_2-;

the "3- to 10- membered heterocyclic ring" is substituted with 1 to 3 substituents selected from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

wherein,

A^1 is selected from the group consisting of O and S;

R^{10} is selected from hydrogen, alkyl, alkenyl, alkynyl, aryl, heteroaryl, cycloalkyl or heterocyclyl; and

R^{10a} is selected from the group consisting of alkyl, alkenyl, alkynyl, perhaloalkyl, aryl, heteroaryl, cycloalkyl or heterocyclyl,

in a method of manufacturing a medicament for use in treating a disease or disorder or condition.

12. The use of compound formula I in a method of manufacturing a medicament for use in treating a disease or disorder or condition as claimed in claim 11, wherein the disorder or condition or disease is selected from the group consisting of Alzheimer's disease, mild cognitive impairment, senile dementia, vascular dementia, dementia of Parkinson's disease, attention deficit disorder, attention deficit hyperactivity disorder, dementia associated with Lewy bodies, AIDS dementia complex, Pick's

disease, dementia associated with Down's syndrome, Huntington's disease, cognitive deficits associated with traumatic brain injury, cognitive decline associated with stroke, poststroke neuroprotection, cognitive and sensorimotor gating deficits associated with schizophrenia, cognitive deficits associated with bipolar disorder, cognitive impairments associated with depression, acute pain, post-surgical or post-operative pain, chronic pain, inflammation, inflammatory pain, neuropathic pain, smoking cessation, need for new blood vessel growth associated with wound healing, need for new blood vessel growth associated with vascularization of skin grafts, and lack of circulation, arthritis, rheumatoid arthritis, psoriasis, Crohn's disease, ulcerative colitis, pouchitis, inflammatory bowel disease, celiac disease, periodontitis, sarcoidosis, pancreatitis, organ transplant rejection, acute immune disease associated with organ transplantation, chronic immune disease associated with organ transplantation, septic shock, toxic shock syndrome, sepsis syndrome, depression, and rheumatoid spondylitis.

13. The use of compound of formula I in a method of manufacturing a medicament for use in treating a disease or disorder or condition as calimed in claim 11, wherein the disease or disorder or condition is selected from the group classified or diagnosed as major or minor neurocognitive disorders, or disorders arising due to neurodegeneration.

14. The use of compound of formula I in a method of manufacturing a medicament for use in treating a disease or disorder or condition as claimed in claim 11, wherein the medicament is administered in combination with or as adjunct to medications utilized in the treatment of attention deficit hyperactivity disorders, schizophrenia, cognitive disorders.

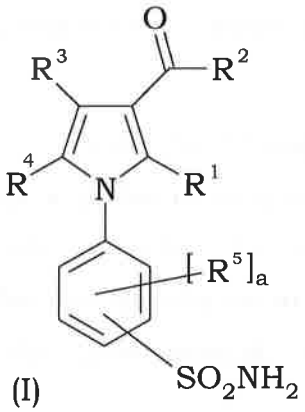
15. The use of compound of formula I in a method of manufacturing a medicament for use in treating a disease or disorder or condition as claimed in claim 14, wherein the other cognitive disorders are Alzheimer's

disease, Parkinson's dementia, vascular dementia or dementia associated with Lewy bodies, or traumatic brain injury.

16. The use of compound of formula I in a method of manufacturing a medicament for use in treating a disease or disorder or conditions as claimed in claim 11, wherein the medicament is administered in combination with or as an adjunct to acetylcholinesterase inhibitors, disease modifying drugs or biologics for neurodegenerative disorders, dopaminergic drugs, antidepressants, or a typical or an atypical antipsychotic.

17. A compound of claim 1 for use in a method of preventing or treating a disease or its symptoms or a disorder mediated partially or completely by nicotinic acetylcholine receptors.

18. A compound of formula I for use in a method of treating a disease or disorder or condition, comprising administration of a therapeutically effective amount of a compound of formula I, its tautomeric forms, its stereoisomers, or its pharmaceutically acceptable salt,



(I)

wherein,

R^1 is selected from the group consisting of hydrogen, halogen, substituted- or unsubstituted- alkyl, substituted- or unsubstituted-

alkenyl, substituted- or unsubstituted- alkynyl, perhaloalkyl, and substituted- or unsubstituted- cycloalkyl;

R^2 is selected from the group consisting of substituted- or unsubstituted-alkyl, $(R^6)(R^7)N$-, $(R^6)N(OR^{7a})$-, and $R^{6a}O$-;

R^3 is selected from the group consisting of substituted- or unsubstituted-alkyl, substituted- or unsubstituted- alkenyl, substituted- or unsubstituted- alkynyl, substituted- or unsubstituted- cycloalkyl;

R^4 is selected from the group consisting of substituted- or unsubstituted-aryl, substituted- or unsubstituted- heteroaryl;

$[R^5]_a$ is 'a' times repetition of 'R^5' groups, each R^5 is independently selected from the group consisting of halo, substituted- or unsubstituted-alkyl, R^8O-; 'a' is an integer selected from 0, 1, and 2;

wherein, R^6 and R^7 are independently selected from hydrogen, substituted- or unsubstituted- alkyl, $R^9C(=O)$-, R^9SO_2-; such that when R^2 is $(R^6)(R^7)N$-, R^6 and R^7 together with the nitrogen atom to which they are attached may form a 3 to 10 member substituted- or unsubstituted-heterocycle containing one to three hetero atoms/groups selected from the group consisting of S, N, O the said heterocycle may be saturated or unsaturated, monocyclic or bicyclic or spiro, or the said heterocycle may contain an alkylene bridge;

R^{6a} is selected from hydrogen and substituted- or unsubstituted- alkyl;

R^{7a} is selected as substituted- or unsubstituted- alkyl;

wherein R^8 is selected from hydrogen, substituted- or unsubstituted-alkyl, and perhaloalkyl;

wherein, R^9 is independently selected from the group consisting of hydrogen, substituted- or unsubstituted- alkyl, substituted- or unsubstituted- aryl, substituted- or unsubstituted- heteroaryl, substituted- or unsubstituted- cycloalkyl, and substituted- or unsubstituted- heterocyclyl;

wherein,

the "alkyl", "alkenyl", and "alkynyl" are substituted with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, cycloalkyl, $R^{10a}SO_2$-, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

the "cycloalkyl" is substituted with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

the "aryl" is substituted with 1 to 3 substituents selected independently from the group consisting of halogen, nitro, cyano, hydroxy, C_1 to C_6 alkyl, C_2 to C_6 alkenyl, C_2 to C_6 alkynyl, C_3 to C_6 cycloalkyl, 3- to 6-membered heterocycle, C_1 to C_6 perhaloalkyl, alkyl-O-, alkenyl-O-, alkynyl-O-, perhaloalkyl-O-, alkyl-N(alkyl)-, alkyl-N(H)-, H_2N-, alkyl-SO_2-, perhaloalkyl-SO_2-, alkyl-C(=O)N(alkyl)-, alkyl-C(=O)N(H)-, alkyl-N(alkyl)C(=O)-, alkyl-N(H)C(=O)-, $H_2NC(=O)$-, alkyl-N(alkyl)SO_2-, alkyl-N(H)SO_2-, H_2NSO_2-;

the "heterocyclyl" is substituted on ring carbons with 1 to 6 substituents selected independently from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

the "heterocyclyl" is substituted on ring nitrogen(s) with one or more substituents selected from the group consisting of aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10a}OC(=O)$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-;

the "heteroaryl" is substituted with 1 to 3 substituents selected independently from the group consisting of halogen, nitro, cyano, hydroxy, C_1 to C_6 alkyl, C_2 to C_6 alkenyl, C_2 to C_6 alkynyl, C_3 to C_6 cycloalkyl, 3- to 6- membered heterocycle, C_1 to C_6 perhaloalkyl, alkyl-O-, alkenyl-O-, alkynyl-O-, perhaloalkyl-O-, alkyl-N(alkyl)-, alkyl-N(H)-, H_2N-, alkyl-SO_2-, perhaloalkyl-SO_2-, alkyl-C(=O)N(alkyl)-, alkyl-C(=O)N(H)-, alkyl-N(alkyl)C(=O)-, alkyl-N(H)C(=O)-, $H_2NC(=O)$-, alkyl-N(alkyl)SO_2-, and alkyl-N(H)SO_2-, H_2NSO_2-;

the "3- to 10- membered heterocyclic ring" is substituted with 1 to 3 substituents selected from the group consisting of oxo, halogen, nitro, cyano, aryl, hereroaryl, alkyl, alkenyl, alkynyl, $R^{10a}C(=O)$-, $R^{10a}SO_2$-, $R^{10}A^1$-, $R^{10a}OC(=O)$-, $R^{10a}C(=O)O$-, $(R^{10})(H)NC(=O)$-, $(R^{10})(alkyl)NC(=O)$-, $R^{10a}C(=O)N(H)$-, $(R^{10})(H)N$-, $(R^{10})(alkyl)N$-, $(R^{10})(H)NC(=A^1)N(H)$-, and $(R^{10})(alkyl)NC(=A^1)N(H)$-;

wherein,

A^1 is selected from the group consisting of O and S;

R^{10} is selected from hydrogen, alkyl, alkenyl, alkynyl, aryl, heteroaryl, cycloalkyl or heterocyclyl; and

R^{10a} is selected from the group consisting of alkyl, alkenyl, alkynyl, perhaloalkyl, aryl, heteroaryl, cycloalkyl or heterocyclyl.

19. The compound of claim 18, wherein the disease or disorder or condition is selected from the group classified or diagnosed as major or minor neurocognitive disorders, or disorders arising due to neurodegeneration.

20. The compound of claim 18, for use in combination with or as adjunct to medications used in the treatment of attention deficit hyperactivity disorders, schizophrenia, cognitive disorders, Alzheimer's disease, Parkinson's dementia, vascular dementia or dementia associated with Lewy bodies, and traumatic brain injury.

21. The compound of claim 18, for use in combination with or as an adjunct to acetylcholinesterase inhibitors, disease modifying drugs or biologics for neurodegenerative disorders, dopaminergic drugs, antidepressants, or a typical or atypical antipsychotic.