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MARKET ANALYSIS OF HERBAL FORMULATION AND EXPLORING THE POTENTIAL OF CATHARANTHUS ROSEUS PLANT EXTRACT FOR ACE INHIBITION AND ANTIOXIDANT PROPERTIES

Sanket Giri[1], Dr. Sarosha Khan[1], Rahela Anjum[2]

1. **Department of Biotechnology, School of Sciences, G.H. Raisoni University Saikheda.**
2. **Central India college of Pharmacy, Lonara, Nagpur.**

ABSTRACT:

The changing market perception of accepting herbal formulation as a safe alternative to chemical counterpart is revolutionizing the world due to ease of availability and minimum side effect along with associated therapeutic properties. The Market Research using secondary data collection and primary survey plays a very important role in anticipating the expected gaps between demand and supply and the market dynamics at large. The biggest advantage of primary data collection from a defined cohort is forecasting the potential market of new and novel drugs in time to come. The secondary data collected in the study has highlighted the growing consumer acceptance of herbal formulation, specifically in developing country like India due to diverse and proven efficacies associated with minimum side effect. A primary survey was conducted with medical professionals dealing with nootropic cases (cognitive and neurological cases), in which a set of Questions were asked. The Questionnaire was designed keeping in mind the thrust of the study to explore the perception of medical practitioners towards herbal formulation and the line of treatment they advise to their patients from the cohort of neurological disease suffering patients. The responses were diverse, and it was difficult to conclude any potential outcome due to the non-significant repletion of answers and low population size of respondents (8 in number). The plant Catharanthus roseus, well known for associated therapeutic properties, was used in this study. The dried plant material was used for phytochemical extraction in aqueous and non-polar (Hexane) solvents. The comparison of results has shown significantly higher antioxidant activities in aqueous extract than hexane extract. The ACE inhibition activities were drastically reduced with the extracts. The study further paved the way for characterization of phytoconstituents and their mechanism of action.

Keywords: Market Research, Catharanthus roseus, ACE inhibition, extraction, antioxidant

INTRODUCTION:

Market Research is a process of collecting information, analysing the data, and interpreting the possible outcomes known as forecasting. Market researcher helps in the identification of problems, which leads to the creation of problem of statement. It helps us to understand the latest market trends, opportunities for new companies and products. Through market research we do estimation and forecasting related to the sales and demand of customers. It also includes the competitor analysis which helps new companies or startups to know about the ground for the success of their business. Market researcher also helps the companies in product launch in right market at right time. We also estimate whether the specific business can expand in the new market with a new geographical environment or not.

Market research mainly divided into two categories:
1. Primary Research
2. Secondary Research

Primary research involves the data collection from population in specific cohort, which represents the sample size for the study. The data is collected through personal interviews, group discussions, and through electronic means like e-mail or telephonic interview.
The data collected in primary research is representative for the forecasting regarding how the product will be able to survive in a new market or not. Secondary research involves the data mining from online databases, archives, and previous studies. Market Research also utilizes the Ansoff matrix to predict what kind of market and product they are going to explore with the risk assessment.

Market penetration
This growth strategy includes entering the already existing market with already existing products. This type of market will pose less risk to the company because there is already a customer base is already present to accept the product.

Market development
This growth strategy includes selling the existing products in a new market, creating a new customer base. This strategy is quite risky because we are entering a new market where we are not certain whether the customers will purchase our product or not and this can result in capital loss to the companies.

Product development
This strategy involves the development of new product launch in the existing market, which can either be less accepted but not fully rejected because there is already a customer base is there which might be interested in buying new product due to their curiosity, price, or other reasons. So, there is quite a little risk of failure.

Diversification
This growth strategy comes in the category of innovation, where the market and the product are new. So, it's a highly risky strategy to enter the market because we must create our own customer base and we are not very sure whether it will be accepted or not by our targeted customers. Along with market analysis we have also researched in another domain where we have conducted the experiment to learn about bioactivity and antioxidant activity. Herbal formulations, a new era have emerged after COVID-19 pandemic where the people have acknowledged its importance for treating ailments and prevention from the disease. Earlier this practice was only considered in the ayurveda, homeopathy, Yunani medicine etc. But now it is expanding its arm in allopathic medicine as well, where the doctors prescribe these formulations to cope up with the side-effects caused by the allopathic medicines.
There are multiple animal studies that have been conducted using herbal formulations where they have shown promising results with lesser side-effects and preventing further damage.

Rationale of the Study
The changing market perception of accepting herbal formulation as a safe alternative to chemical counterpart is revolutionizing the world due to ease of availability and minimum side effect along with associated therapeutic properties.

Objective

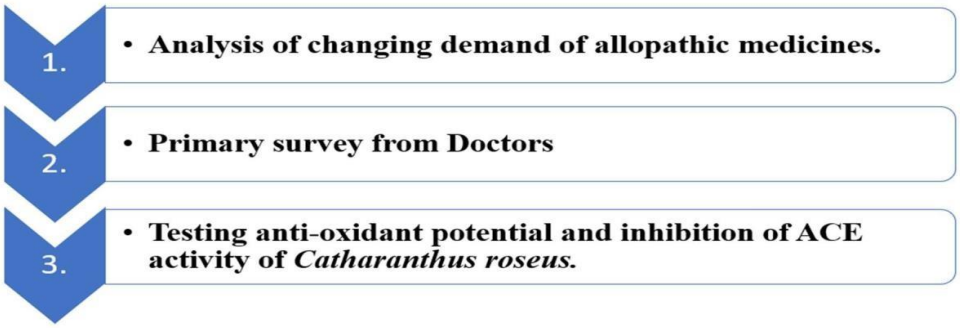


Fig. 1.2: Objectives of the study

REVIEW OF LITERATURE:

Neurological diseases are the diseases which affect the nervous system of our body which can be peripheral or central nervous system which is composed of brain and spinal cord. The disease which affects the neuron, their activity at neuromuscular junction and at muscle level are also included.

Some Neurological diseases with etiology:
a) Huntington's disease and muscular dystrophy, caused by defective genes.
b) Spina bifida, neural development issue.
c) Stroke, blockage or narrowing down of the blood vessels supplying the brain.
d) Injuries to the spinal cord or brain.
e) Epilepsy
f) Brain tumor
g) Meningitis, viral or bacterial infections.
h) Degenerative diseases like Parkinson's disease and Alzheimer's disease

Alzheimer's disease (AD)
Formation of extracellular plaques of beta-amyloid protein in cerebral region and hippocampus of brain and intra-axonal tangles of phosphorylated tau-proteins. They interfere with the signal transmission. Due to involvement of cerebral region the symptom of disease includes cognitive decline as it progresses. Epidemiology of Alzheimer's Disease includes familial type where genetics plays the important role in developing the disease, the gene mutation commonly associated are amyloid precursor protein and presenilin-1. The AD is also differentiated into early-onset (<65 years) and late-onset (>65 years) type where the disease can develop early due to risk factors which includes the habit of smoking, diabetes, obesity, and stress whereas the late-onset can occur due to preventive measures where the person has the healthy lifestyle so it can reduce the risk of contracting disease in early stages. The sporadic type includes where the etiology of progression of disease is not clear.

Parkinson's Disease (PD)
Formation of clumps of the alpha-synuclein protein in the region of brain known as substantia nigra. Clumps are associated with the reason for the degeneration of the nerve cells that produce dopamine. Clinical Characterization: Parkinsonism e.g. Bradykinesia (slow movement), Changes in gait (baby stepping). PD is a geriatric disorder that starts in the early 50s to late 70s. The epidemiology of PD is involvement of the mutation in α-synuclein gene which is the causative factor of familial type. Other can be due sporadic or developed due to environmental factors such as carbon disulfide and carbon monoxide poisoning etc.
When we look at the drugs available for the treatment of these diseases, we understand that these drugs are not capable for curing the disease or prevention from the progression of these diseases. These drugs are just giving symptomatic relief along with side-effects. Benefit/risk ratio is quite complicated in these types of drugs.
Commonly prescribed drugs for the treatment of AD and PD are levodopa therapy which is the synthetic form of dopamine molecule. Dopamine is a type of neurotransmitter which is responsible for the signalling between

nerve cells. Dopamine controls the motor and non-motor activity in the brain. Deficiency of dopamine is responsible for the symptoms of AD and PD. Levodopa is an alternative for the natural dopamine synthesized in our brain. It fulfills all the duties of dopamine, but it has its limitations, because it is synthetic. The long exposure with this drug, the patient's body starts developing resistance as a result the doses must increase after some time. Increase in dose is associated with increase in side effects like nausea, dizziness, hallucinations, delusions, hypotension, constipation etc.

Herbal formulations/ Drugs

Ayurveda, Yunani, homeopathy specializations are dealing with Herbal formulations/ Drugs from centuries. Herbal drugs are known for their slow and progressive healing with less to no side-effects on the contrary of allopathic medicines. There are multiple research projects going on the benefits of plant derived products and whether they can serve as the alternative and safer options to the allopathic medicines. One of them is Catharanthus roseus which has already been proven for its anti-cancerous properties and activity having compound known as vincristine and vinblastine. Its root possesses the acetylcholine-esterase enzyme inhibition activity which is the main line of treatment option for Alzheimer's.

MATERIALS AND METHODS

Secondary data collection

We have collected information regarding neurological disorders, the global and regional burden of these diseases from the report generated by the Ministry of Health and Family Welfare (MoHFW), Ministry of Finance and World Health Organization.

Also, we have gathered the information related to the shift of Indian population from younger individuals to older individuals which can be the result of rise in neurologic diseases in Indian population.

3.1 Data from MoHFW

Table 3.1: Contribution of AD and PD to total neurological disorder disabilityadjusted life-years in India, 2019

	Both	Male	Female
Non communicable neurological disorders	82·8%	81·9%	83·6%
Alzheimer's disease	4·6%	4·0%	5·2%
Parkinson's disease	1·8%	2·0%	1·6%

Table 3.2: Number of prevalent or incident cases of neurological disorders in India, 2019

Prevalent cases	Both sexes	Males	Females
Alzheimer's disease and other dementias	3692600	1 573800	2 118800
Parkinson's disease	770800	421800	349000

Crude DALY rate: A burden rate derived from the number of years of healthy life lost recorded in a population during a specified time period divided by the number of people in the population, without adjustments for other factors such as age.

Table 3.3 Crude DALY rates of Alzheimer's disease and Parkinson's disease in various states of India, 2019.

States of India	Alzheimer's disease	Parkinson's disease
India	153	58
Bihar	114	41
Madhya Pradesh	129	52
Jharkhand	141	43
Rajasthan	134	49
Uttar Pradesh	113	54
Chhattisgarh	133	61
Odisha	189	68
Andhra Pradesh	224	77
Assam	112	48
West Bengal	137	51
Tripura	151	57
Arunachal Pradesh	95	37
Meghalaya	111	42
Telangana	157	60
Karnataka	185	70
Manipur	133	48
Jammu & Kashmir and Ladakh	142	52
Haryana	174	56
Gujarat	149	60
Mizoram	129	48

Tamil Nadu	182	78
Nagaland	125	47
Sikkim	142	55
Uttarakhand	150	73
Punjab	208	69
Maharashtra	193	68
Himachal Pradesh	214	76
Kerala	312	81
Delhi	110	48
Goa	231	85

In 2019, approximately 3·69 million people had Alzheimer's disease and nearly 1,29,000 deaths occurred due to these diseases. There is a variation of 3.3 times between the states, among them the highest were observed in Kerala, Goa, Andhra Pradesh, and Himachal Pradesh.

In 2019, nearly 7,71 ,000 people were affected by Parkinson's disease and an estimation of 45,300 deaths has been observed. The states shows a variation of 2.3 times, with Goa having the highest rate.

Fig.3.1 Distribution of Alzheimer's disease crude DALY rate in various states of India.

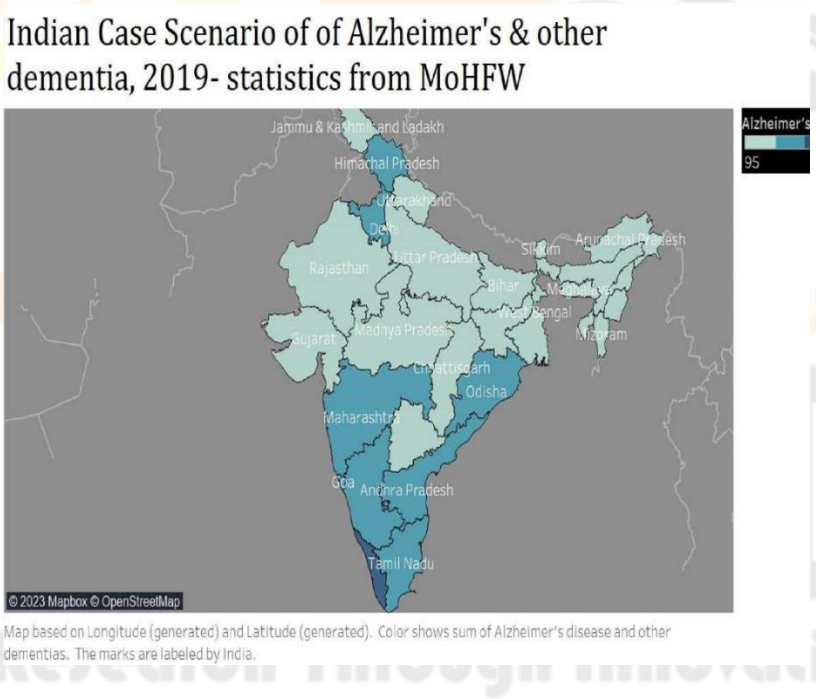


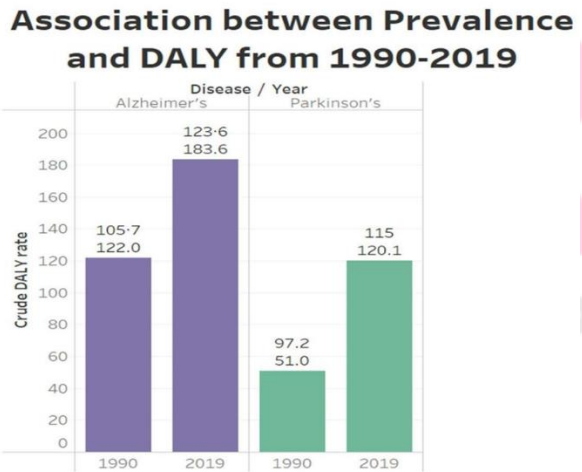
Fig.3.2 Distribution of Parkinson's disease crude DALY rate in various states of India

When we look at the data from the 1990-2019, we will be able to understand that how these diseases are expanding their feet in Indian sub-continent.

Table 3.4 Association between prevalence and DALY rate from 1990-2019.

	1990	2019	1990	2019
Diseases	Crude estimate		Crude DALY	
Alzheimer's disease	105.7	122	123.6	183.6
Parkinson's disease	51	97.2	115	120.1

Fig.3.3 Association between prevalence and DALY rate from 1990-2019.



The risk factors associated with diseases are represented below with the percent involvement in the total no. of cases apart from genetic factors.

Table. 3.5 Risk factor associated with AD & PD disease.

	Risk factor	Both sexes	Males	Females
Alzheimer's Disease	Smoking	11·7%	21·3%	4·4%
	High blood sugar	10·9%	11·3%	10·6%
	Obesity	7·5%	6·4%	8·4%
Parkinson's Disease	Smoking	–6·4%	–10·1%	–1·5%

3.1.2 Data collected from WHO

First, we will look at that why we are focusing on Alzheimer's and Parkinson's Disease.

Years lived with disability (YLD): The number of years which a person spends with the disease. Because it represents the individuals affected with disease, that's why it is also known as a nonfatal burden.

In the graph below we can see that YLDs for Alzheimer's disease, from 165.4% in 2015 to be estimated that it can increase by 203.9% in the year 2030.

But in case of Parkinson's Disease, it's not very clear.

Table.3.6 YLDs per 100000 population projected for 2005, 2015 and 2030 years.

Disease	Year	YLDs (100 000 population)	% of total YLDs
Alzheimer's Disease and other dementias	2005	147.4	1.66
	2015	165.4	1.98
	2030	203.9	2.6
Parkinson's Disease	2005	17.7	0.2
	2015	17.3	0.21
	2030	17.1	0.22

Fig.3.4 YLDs per 100000 population projected for 2005, 2015 and 2030 year.

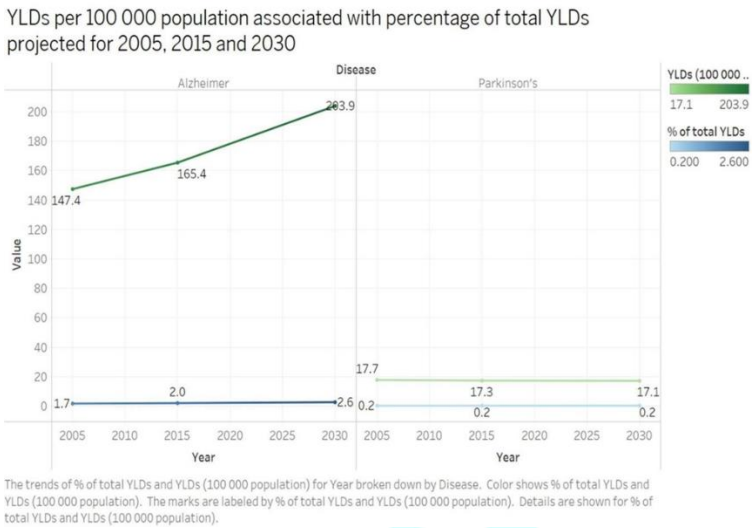


Table 3.7 Deaths due to Alzheimer's and Parkinson's disease, WHO

Cause category	2005 (%)	2015 (%)	2030 (%)
Alzheimer and other dementias	0.73	0.81	0.92
Parkinson's disease	0.18	0.20	0.23

Fig. 3.5 Deaths due to Alzheimer's and Parkinson's disease

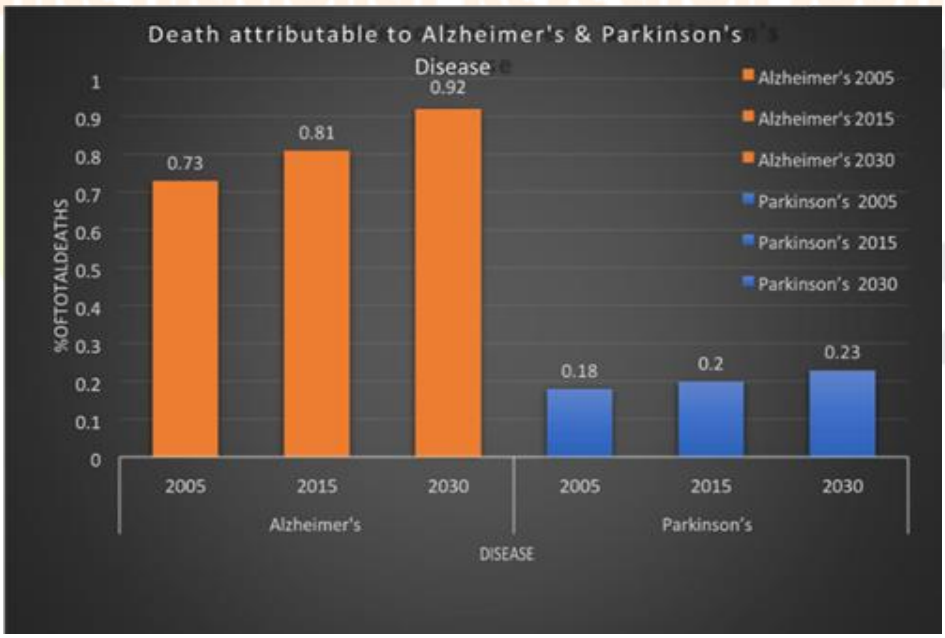
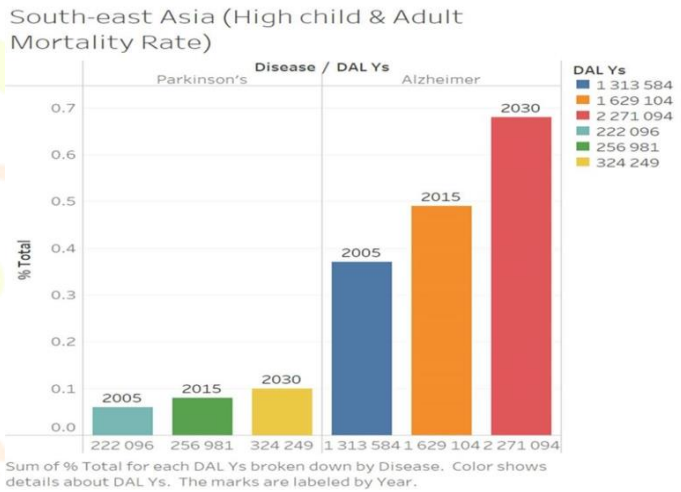


Table 3.8 Percent increase in total DALYs projected for the years 2005, 2015 and 2030.

	Year	DALYs	% total	per 100 000
Alzheimer'sDisease andother dementias	2005	1 313 584	0.37	97.09
	2015	1 629 104	0.49	106.8
	2030	2 271 094	0.68	132.13
Parkinson's	2005	222 096	0.06	16.42
	2015	256 981	0.08	16.85
	2030	324 249	0.1	18.86

Fig.3.6 Percent increase in total DALYs projected for the years 2005, 2015 and 2030.



3.1.3 Data collected from Ministry of finance.

Table 3.9 Population estimation of India for specific age groups in percent, year 2031.

2031			
STATES	(0-19 Years)	(20-59 Years)	(60 or >60 Years)
Andhra Pradesh	24.4	60.2	15.4
Assam	29.1	60.1	10.9
Bihar	35.1	55.9	9.1
Chhattisgarh	30.5	58	11.6

Delhi	23.5	61.9	14.6
Gujarat	28.6	58.2	13.2
Haryana	28.4	59.5	12.1
Himachal Pradesh	24.5	59.3	16.1
Jammu & Kashmir	24.5	62.9	12.6
Jharkhand	31	58.5	10.6
Karnataka	25	60.5	14.5
Kerala	24.9	54.7	20.5
Madhya Pradesh	31.8	57.6	10.6
Maharashtra	24.1	60.9	14.9
Odisha	28.3	58.2	13.4
Punjab	23.8	60.2	16
Rajasthan	31.5	58	10.4
Tamil Nadu	23.2	59.2	17.6
Telangana	26	60.5	13.5
Uttar Pradesh	32.6	57.9	9.5
Uttarakhand	29.4	58.6	12.1
West Bengal	24.2	60.6	15.2

Fig.3.7 Population estimation of India for specific age groups in percent, year 2031.

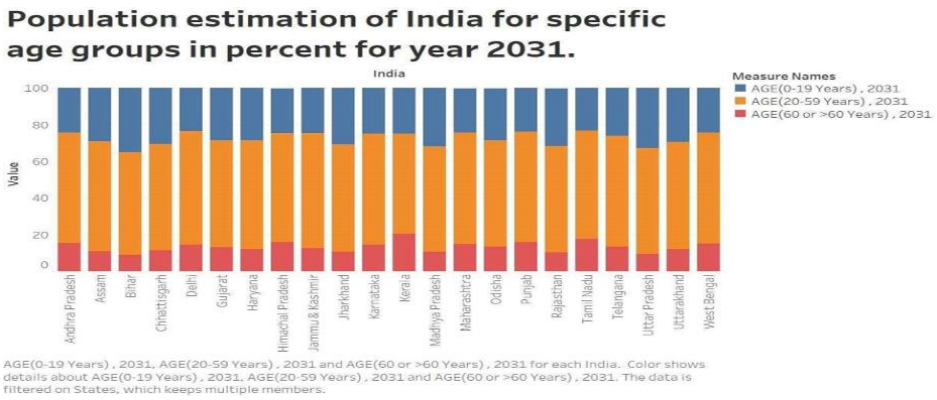
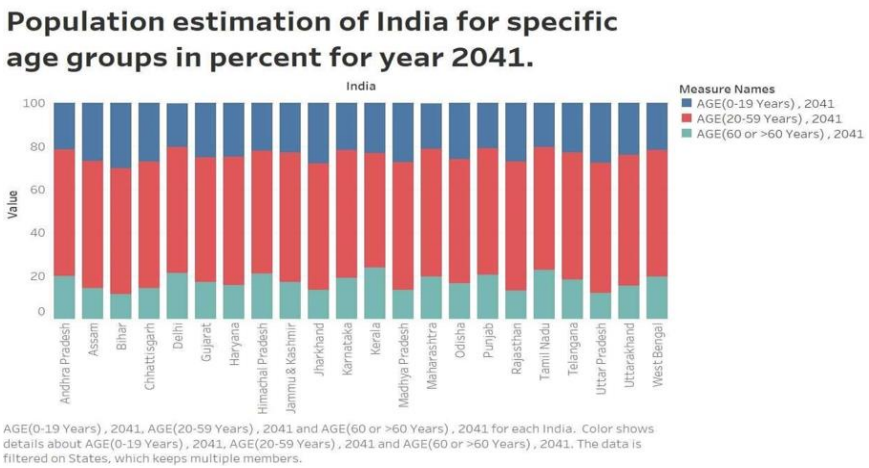


Table 3.10 Population estimation of India for specific age groups in percent, year 2041.

2041			
STATES	Up to 19	20 to 59	>60
Andhra Pradesh	21.4	58.6	20
Assam	26.8	58.8	14.4
Bihar	30.1	58.3	11.6
Chhattisgarh	27.2	58.5	14.4
Delhi	20.2	58.5	21.2
Gujarat	25.1	57.9	17
Haryana	24.9	59.3	15.8
Himachal Pradesh	22	56.9	21.1
Jammu & Kashmir	23	59.8	17.2
Jharkhand	28	58.7	13.4
Karnataka	21.7	59.3	19
Kerala	23.3	52.8	23.9
Madhya Pradesh	27.3	59.3	13.4
Maharashtra	21.2	59	19.7
Odisha	26.1	57.3	16.6
Punjab	21	58.4	20.6
Rajasthan	27.3	59.5	13.3
Tamil Nadu	20.6	56.9	22.6
Telangana	23	58.8	18.2
Uttar Pradesh	27.7	60.3	12
Uttarakhand	24.1	60.6	15.3
West Bengal	21.9	58.4	19.7

Fig. 3.8 Population estimation of India for specific age groups in percent, year 2041.



3.2 Primary data collection

3.2.1 Theory: Questionnaire Designing

1. Required information.
2. Target respondents
3. Method of conducting survey
4. Question content and wording.
5. Order and format of questions.
6. Length of the questionnaire.
7. Pre-testing of the questionnaire.
8. Creation of final survey form.

The questions in questionnaire can be of the following types:

4. Binary, where the answer can be only in Yes/No, these types of questions help us to narrow down to our desired respondent.
5. Multiple choice questions, where the response can be only one correct answer or more than one. It is a short-answered type of question.
6. Closed ended questions, in these types of questions we allow the respondents to give only required information.
7. Open ended questions are the ones where there is liberty for respondents to give their point of view on the related topic. It is a long-answered type of question.

Data collected from the questionnaire can be in the form of numbers, or sentences.

Number related data are utilized for statistical analysis whereas the sentences are useful in inferring the trends.

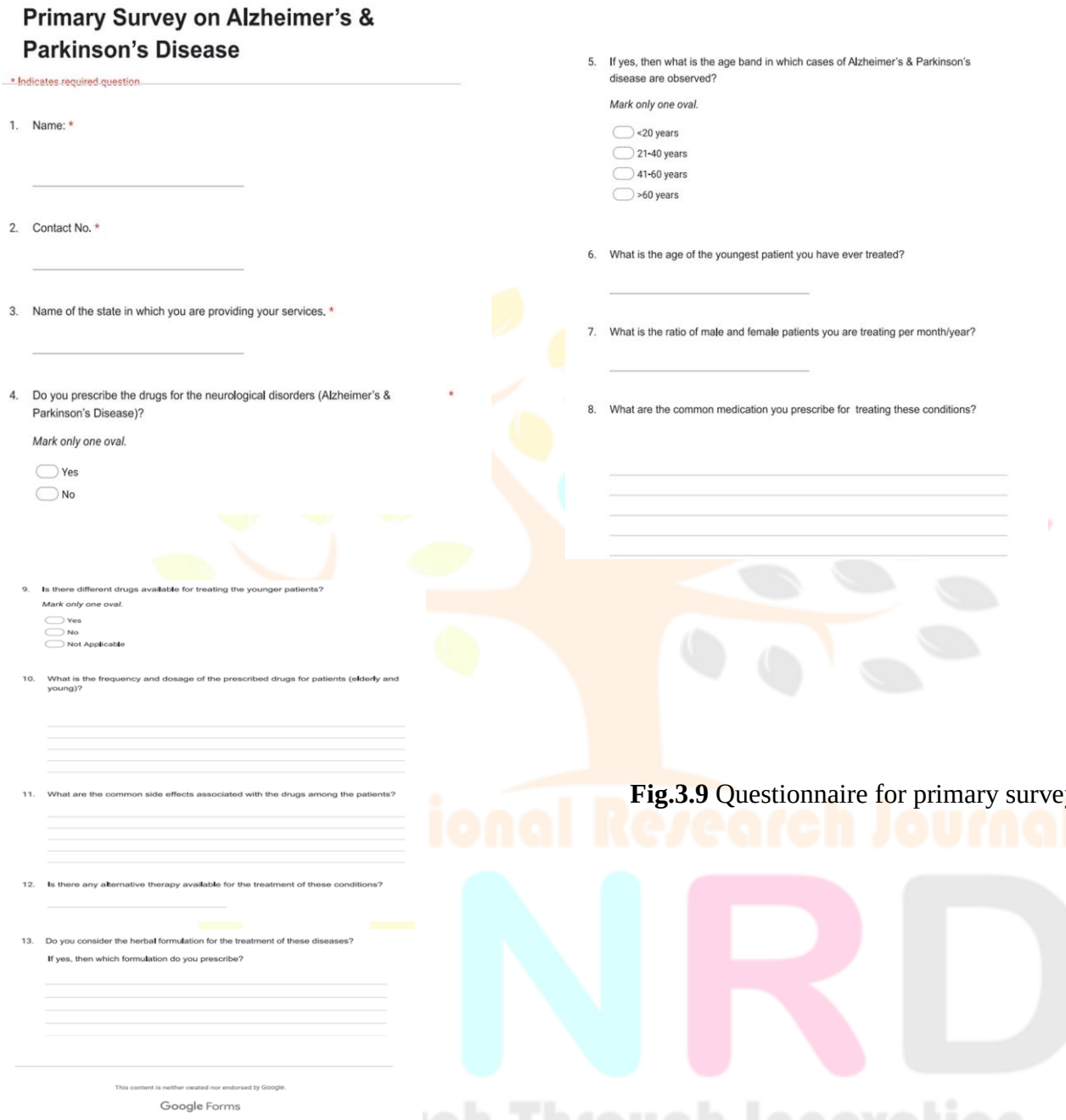
The questions in the questionnaire should make sense or setting a flow to the next question.

Questionnaire must include a variety of questions so that the respondents will not get bored.

The length of the questionnaire should be concise so that the respondents can attempt to survey in less time, and it won't interfere with their busy schedule.

3.2.2 Procedure

Primary survey was conducted with medical professionals dealing with nootropic cases (cognitive and neurological cases), in which a set of Questions were asked. The Questionnaire was designed keeping in mind the thrust of the study to explore the perception of medical practitioners towards herbal formulation and the line of treatment they advise to their patients from the cohort of neurological disease suffering patients.



Primary Survey on Alzheimer's & Parkinson's Disease

* Indicates required question

1. Name: *
2. Contact No. *
3. Name of the state in which you are providing your services. *
4. Do you prescribe the drugs for the neurological disorders (Alzheimer's & Parkinson's Disease)? *

   Mark only one oval.

   Yes
   No
5. If yes, then what is the age band in which cases of Alzheimer's & Parkinson's disease are observed?

   Mark only one oval.

   <20 years
   21-40 years
   41-60 years
   >60 years
6. What is the age of the youngest patient you have ever treated?
7. What is the ratio of male and female patients you are treating per month/year?
8. What are the common medication you prescribe for treating these conditions?
9. Is there different drugs available for treating the younger patients?

   Mark only one oval.

   Yes
   No
   Not Applicable
10. What is the frequency and dosage of the prescribed drugs for patients (elderly and young)?
11. What are the common side effects associated with the drugs among the patients?
12. Is there any alternative therapy available for the treatment of these conditions?
13. Do you consider the herbal formulation for the treatment of these diseases?

    If yes, then which formulation do you prescribe?

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Fig.3.9 Questionnaire for primary survey.

3.4 Testing C. roseus plant extract for antioxidant activity and ACE activity inhibition.

3.3.1. Plant extract preparation method

a) The whole plant of C. roseus is washed to remove dirt.
b) Leaves, stems, flowers, and roots are separated, wet wight taken.
c) Each part is separately kept in the blotted sheet and left at room temperature in the laboratory to dry under the shade.
d) After drying, the weight was again measured.

e) Then 1g of dried leaves, 100 mg of flower, 1 g of stem and 0.5 g of root were mixed and grind together in mortar pestle for aqueous and hexane extract preparation.
f) After grinding, the 2 g of plant powder is mixed with each10 ml of distilled water and10 ml of Hexane in a 50ml falcon tube.
g) Then the tubes kept on shaker for 30 minutes to mix the contents properly.
h) After this the tube centrifuged at 5000 rpm for 30 min. to separate the supernatant.
i) The supernatant then transferred into watch glass to dry the plant extract.
j) After the evaporation of hexane and water from the solution results in the sticky mass left.
k) This sticky mass then reconstituted with 500 µl of distilled water and the extract stored in 1.5 ml MCTs in cold room.

Table 3.11: Weight of the different plant parts.

Plant part	Wet weight (in gram)	Dry Weight (in gram)
Leaves	12.8	2.2
Flowers	1.65	0.5
Stem	8.416	2.3
Root	3.95	1.26

Fig. 3.10: C. roseus plant.

Fig.3.11: Separated parts of C. roseus plant.

Fig.3.13 Dried root and leaves.

Fig.3.14: Powdered form of the dried root, stem, flower and leaves

3.3.2 Dilution of Plant extract

Weight of the empty watch glass-40.430 g

Weight of the watch glass containing hexane extract after drying -40.444 g Therefore, weight of the dried hexane extract- 0.014g or 14 mg

Similarly, Weight of the empty watch glass-47.986 g

Weight of the watch glass containing aqueous extract after drying -48.194 g Therefore, weight of the dried hexane extract- 0.208g or 208 mg

The 14mg and 208mg dried extract was reconstituted in 500µl distilled water.

Then we made the dilutions of sample in 1mg/ml by utilizing the formula $C1V1=C2V2$

The dilutions were made in 5ml of distilled water, where the 178 µl of hexane extract is added and 48 µl of aqueous extract is added.

3.3.3 Antioxidant activity estimation using DDPH

DPPH scavenging activity is measured using spectrophotometer. DPPH acts as the free radical moiety in the solution which can be taken up by the compounds present in the solution which results in the discoloration of solution.

3mg of DPPH is dissolved in 25 ml of methanol, the concentration of the solution will be 0.3mM.

The color of the solution will be purple in color.

We have also prepared the stock solution (1mg/ml) of ascorbic acid to use as standard in the experiment, because it is known for its antioxidant properties.

We take increasing conc. of Ascorbic acid from 50 µg/ml to 250 µg/ml to plot the standard curve.

The absorbance was recorded at wavelength of 517nm.

Fig.3.15 Antioxidant activity estimation.

3.3.4 ACE inhibition activity

ACE or angiotensin converting enzyme is responsible for increasing blood pressure in the body. This enzyme is a part of renin-angiotensin system or RAS, regulates the blood pressure by increasing the vasoconstriction and destroying the bradykinin (a potent vasodilator).
The ACE inhibition activities are conducted to lower the blood pressure in individuals which can reduce the risk of cardiovascular diseases, stroke, heart attack etc.
There is also research based on plant extracts has been performed to get the safer alternative to chemical drugs.
We are also focusing on that aspect, by utilizing plant extract to know whether it can inhibit it or not.
ACE will act on substrate HHL, which results in the release of hippuric acid.
In the presence of inhibitors this activity can't take place.

Material:

a) ACE enzyme
b) Captopril (standard)
c) Hippuryl-histidyl-leucine (HHL) -substrate
d) Buffer
e) Plant extract.

Procedure:

a) 1.5 ml Eppendorf tubes are labelled.
b) 660 µl of buffer is added to each tube.
c) 120 µl of HHL Is added to each tube.
d) Then 30 µl of plant extract is added in sample tube and captopril in standards tube.
e) Then 30 µl of Enzyme is added.
f) Incubate for 6 minutes.
g) Add coloring reagent 120 µl to stop the reaction.
h) Note the absorbance at 405 nm in spectrophotometer.

RESULTS:

4.1 Results of Antioxidant Activity in Plant extract

Table:4.1: Absorbance of Ascorbic Acid in various concentrations.

Sr.No.	Sample	Conc. (□g/ml)	Absorbance of Ascorbic Acid	% reduction
1	Std.1	50	0.366	80.50
2	Std.2	100	0.218	88.39
3	Std.3	150	0.207	88.97
4	Std.4	200	0.195	89.61
5	Std.5	250	0.107	94.30

Fig 4.1 Antioxidant activity of standard

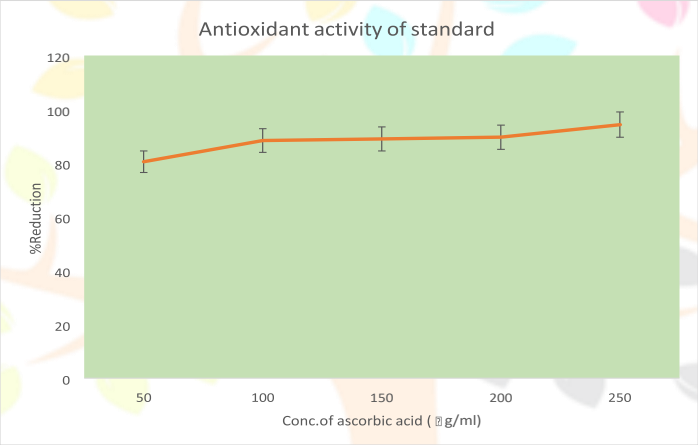
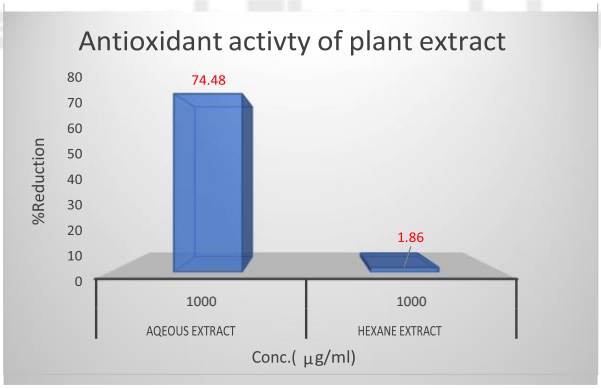


Table.4.2: Antioxidant activity of plant extract

Sr.No.	Sample	Conc. (□g/ml)	Absorbance	% reduction
1	Hexane Extract	1000	1.842	1.86
2	Aqueous Extract	1000	0.479	74.48

Fig.4.2: Antioxidant activity of plant extract.



4.2 Results of Enzyme inhibition Activity in Plant extract

Table.4.3: Enzyme inhibition standard curve

HHL CONC.	AVERAGE
0	0
0.5	0.121
1	0.1375
1.5	0.2885
2	0.44
2.5	0.5
3	0.638

Fig.4.3 Enzyme inhibition studies

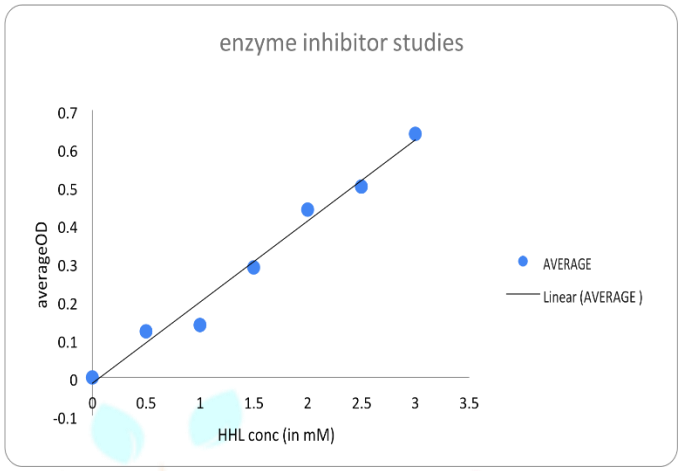


Table.4.4: ACE inhibition activity with plant extracts

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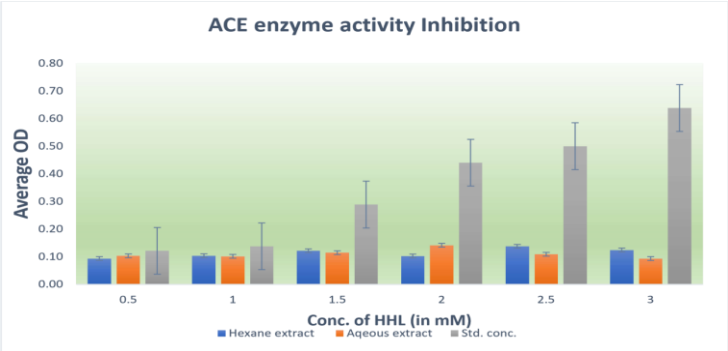
Conc.	Hexane extact	Aqueous extract	Std. conc.
0.5	0.09	0.10	0.12
1	0.10	0.10	0.14
1.5	0.12	0.11	0.29
2	0.10	0.14	0.44
2.5	0.14	0.11	0.50
3	0.12	0.09	0.64

Fig.4.4 ACE inhibition activity with plant extracts



4.3 Results from the primary survey conducted:

The numeric based data is presented here in graphical forms and the sentence type answers will be discussed further.

Fig.4.5: Closed end/short answer question

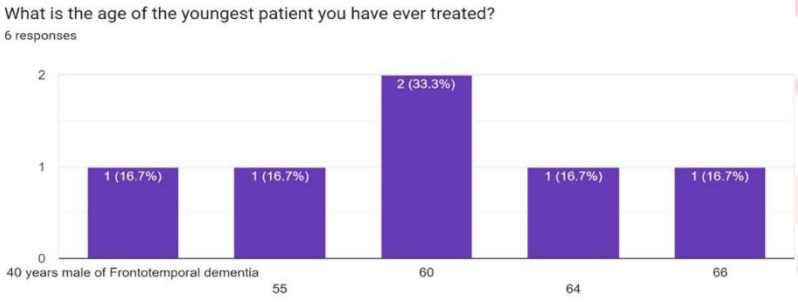
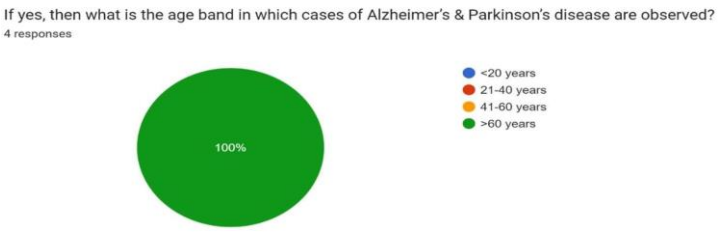
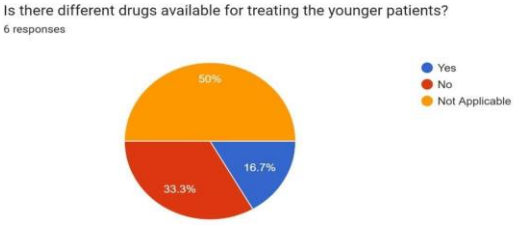
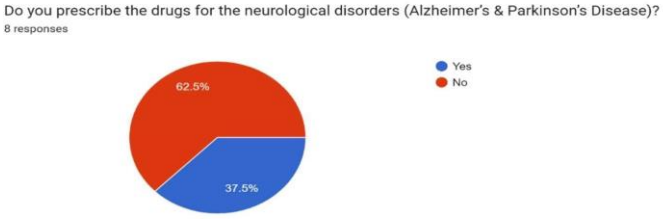


Fig.4.6: Multiple choice questions







- Theresults presented above indicates that C. roseus can be a promising candidate for its antioxidant activity in preventing the damage caused by oxidative stress in the body, it has the potential to scavenge the free radicle generated during various chemical cycles.

- The hexane extract shows nearly no antioxidant activity, maybe because of its polar nature it might not have been able to dissolve the non-polar molecules which can be responsible for antioxidant activity whereas in aqueous extract it shows nearly 78% antioxidant activity which supports the ground for further analysis of which compounds are playing role in antioxidant activity.
- The ACE inhibition activity responsible for lowering blood pressure can be a breakthrough in science.
- The data collected from primary survey, it was difficult to conclude any potential outcome due to non-significant repletion of answers and low population size of respondents (8 in number).
- But we can make some assumptions based on responses that,
- The choice of medicine for treating Alzheimer's and Parkinson's disease is synthetic form of dopamine known as L-dopa which is available in the market under the name Levodopa.
- Second, the ratio of affected in male is more than the female.
- Some of the common side-effects reported are nausea, headache, and dizziness.
- There are other alternative therapies also available other than herbal formulation like nonpharmacological management and other somatic therapies.
- The last question indicates that herbal formulation is still not a choice for the treatment of diseases irrespective of the associated side-effects.

DISCUSSION:

Market analysis conducted on Alzheimer's and Parkinson's disease indicates that there will be slight significant increase in the number of cases due to increasing life expectancy, high risk factors which includes smoking, high-body mass Index and high blood sugar level other than the genetic factors. These diseases can serve as a financial burden on the family as well as on the policy makers because their management and treatment are very expensive and at the same time there is no facility available that we can detect it in an early stage. The stressful lifestyle is becoming a predisposing factor for these diseases, so the chances of younger people to be affected by these diseases is very high. The primary indicates that there are elderly people who are mainly affected by these diseases, among them the male population is more affected than female.

Future prospects:

We will be further looking for the compounds responsible for the antioxidant activity and ACE- inhibition so that we can create a methodology to extract them from plant sources for commercial purposes.
Also, the primary survey will be expanded further to get the real insights of the distribution of these diseases at country level.

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