Effect of *Aswagandha* (*Withania somnifera* Dunal) on the Process of Ageing in Human Volunteers

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A double blind clinical trial to study the effect of Aswagandha (Withania somnifera Dunal) on the prevention of process of ageing in 101 male healthy adults in the age group of 50-59 years has been completed. The results indicate that the increase in haemoglobin, RBC, hair melanin and seated stature in the treated group is statistically significant in comparison to the placebo. The decrease in serum cholesterol is more and in nail calcium it is less in the treated group as compared to the placebo and this difference is statistically significant. The decrease in Erythrocyte Sedimentation Rate is much higher in the treated group than in the placebo and this difference is statistically significant.

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Introduction :

Aswagandha (*Withania somnifera* Dunal has been mentioned in ayurvedic classics as a *Rasasayna*. In Ayurveda, it is stated that *Rasayana* is the best profitable means of obtaining body tissues like *Rasa*, *Raktha Mamsa* etc. of very high quality.[1] (*"Labhopayohi Sastanam Rasadinam Rasayanam"*). *Aswagandha* when taken with milk, ghee, oil or water for 1/2 a month (15 days) imparts strength for the emaciated body, as good rain does to a crop.[2] *Aswagandha* gives lustre, virya and bala (strength).[3] It is *atisukrala*, *rasayanee*, increases *bala*, relieves *svitra*, *sotha*, and *kshaya*.[4] It is effective in the treatment of *kshaya*, anaemia, inflammation and cold. It is an aphrodisiac and appetiser.[3]

A crystalline alkaloid somniferine ($C_{12}H_{16}N_2$), bitter in taste has been isolated from this plant.[5]

On the basis of pharmacological studies, the drug has been shown to possess anti-inflammatory, diuretic[6], sedative[7] activities and anti-bacterial activity[8] against staphylococcus aureus.

In clinical studies[9]: *Aswagandha* root powder has been found to be useful in cases of acute rheumatoid arthritis especially of recent on set and to some extent in the cases of acute exacerbations of chronic rheumatoid arthritis. It is proved to be a good analgesic in cases of vague aches and pains. No side effect of the drug has been observed so far.

In this paper, the results of a well planned, implemented double blind clinical trial to study the effect of *Aswagandha* on prevention of the process of ageing, on normal healthy male adults in the age group of 50-59 years selecting the parameters suggested by Alex Comfort[10] and Hollingsworth[10] are presented.

Methods and materials :

(i) Selection of cases :

Normal healthy male human volunteers in the age group of 50-59 years form the subjects of this study. Detailed clinical examination, laboratory investigations and anthropometric measurements (Annexure-I) were done initially to brand them as normal and healthy. Very strict criteria were adopted while screening the volunteers to include them in the trial, which could be seen from the fact that out of 331 persons screened, 141 were found fit and included in the trial, 190 being rejected on the following grounds.

i) Diabetes-64 ; ii) Asthma and other respiratory illnessess-23 ; iii) Cornnary illnesses, urinary infection with complications-24 ; iv) Hypertension-11 ; v) Peptic ulcer-8 : vi) Obesity-8 ; vii) Cirrhosis and Jaundice 4 ; viii) Anaemia-6 ; ix) T.B.-5 ; x) Venereal diseases-4 ; xi) Miscellaneous-38.

(ii) Preparation of the Drugs :

The root of the plants, shade dried was powdered and tableted in the strength of 0.5 gm. placebo, of same strength (0.5 gm.) made out of starch was also tableted. Placebo and drug tablets were matched for colour, strength and appearance as far as possible.

(iii) Conduct of the Study :

In order to have a double blind trial, the tablets were dispensed every month in separate amber coloured bottles (180 tablets) sealed and labelled with codes A, B, X and Y, so that the contents, may not be identified. The key for the codes was kept confidentially by the manufacturer and the statistician of the Unit.

(iv) Allotment of drugs :

The drug and the placebo were alloted by randomization. The dosage prescribed was two tablets 3 times daily ($6 \times 0.5 = 3$ gms) with milk.

(v) Re-examination and follow-up :

The duration of the treatment period was one year. Volunteers were being periodically followed up for six months duration and one year. On the completion of one year period, volunteers were subjected to all the investigations that had been done at the time of initial screening. Qualified social workers contacted the volunteers at their homes periodically and ascertained the regularity of intake of drugs by "cachet counting" methods.

(vi) Parameters :

A test battery suggested by Alex Comfort for the assessment of the process of ageing was consulted and important parameters which were feasible at this centre were included. Parameters selected from other sources were also taken up for this study. (Annexure II)

(vii) Acceptability:

Out of 141 volunteers found fit and included in the trial, 101 volunteers completed the treatment period of one year, were found to be regular in taking the drug at surprise checks and the remaining 40 persons were the drop-outs due to the following reasons :

a) irregularity of intake of drugs at surprise checks

b) transfer to some other place

c) unwillingness to subject for periodical examination due to the vigorous and regular follow-up by competent social workers; the drop-outs were kept to a minimum (28%).

Results :

The results of clinical, anthropometric and bio-chemical parameters are presented in Table I, II, III respectively.

a) It can be seen from Table I, that there is a significant increase in haemoglobin ($P < 0.001$) and RBC count ($P < 0.02$) in the treated group as compared to the placebo. The decrease in the vital capacity in the treated group is much less as compared to the placebo. However this difference is not statistically significant.

b) It can be seen from Table II that there is significant increase in the seated stature ($P < 0.05$) and in Singh index ($P < 0.1$) in the treated group as compared to placebo.

c) It can be seen from the Table III.

i) that there is an increase in the hair melanin content in the treated group and decrease in the placebo. The difference between the two groups is statistically significant ($P<0.1$).

ii) the decrease in nail calcium in the treated group is much less as compared to the placebo and the difference between the two groups is statistically significant ($P<0.05$).

iii) the decrease in serum cholesterol is much more than that of the placebo and this difference is found to be statistically significant ($P<0.1$).

iv) the decrease in Erythrocyte Sedimentation Rate is much higher in the treated group as compared to the placebo and this difference is found to be statistically significant ($P<0.02$).

Discussion :

Alex Comfort suggests that a study to measure the process of ageing should be set for choice at the age of 50-55 years or 60-65 years, where mortality will be significant and the rate of change in log measurables will be large. Hence in this study the age group selected is 50-59 years. Alex Comfort's statement that homeostasis declines "across the board" with the advancement of age is also truly reflected in this finding that out of 331 volunteers screened, 190 had to be rejected due to various causes. He also suggested that "the sample should be confined to males only to avoid further statistical breakdown and complications associated with the differences in the age of menopause which affects some variables. In keeping with the above statement, only male volunteers of the stipulated age group have been included in this study.

The most promising anthropometric age measures (which give least error in assessment) are seated stature, trunk height and biacromical diameter.[11] It is interesting to note that of the three parameters suggested above, in one parameter namely seated stature the change in the treated group as compared to the control group is in desired direction and the difference is statically significant.

In Hollingsworth's series of seventeen tests, the highest age correlations were for characters like hair greying, skin elasticity which contribute most to the "clinical impression" of age. In this study, hair melanin content has been taken as an index of estimating hair greying and it is worthwhile to recall that the drug increases the hair melanin content.

Serum cholesterol, serum albumin and vital capacity correlate with age in Libow's[12] battery. In consistent with this, it has been shown in this study also that the decrease in serum cholesterol in the treated group is much higher than that in the control. The decline of serum albumin and vital capacity in the treated group is much less than in the control.

Aswagandha has been found to be an excellent haematinic in this study. Analysis for the total iron content by the dry ashing method gives a mean value of 68.94 mgm.[13] per gram dry weight. A comparison of the value with the values of total iron content of a large number of roots[14] reveals that the total iron content of *Aswagandha* is very high. While considering its haematinic activity, it is worth-while to note that *Aswagandha* contains free amino acids like valine, tyrosine, proline alanine and glycine in abundance.[15]

Aswagandha has been shown to reduce significantly Erythrocyte Sedimentation Rate. In this connection, it is interesting to note that the drug possesses anti-bacterial activity.

Aswagandha is more popular as an aphrodisiac agent. Perhaps this is due to its *ati-sukrala* property. In this study 71.4% people have reported improvement in their capacity of sexual performance. Though it is a subjective clinical improvement, still the statement of majority of the volunteers testifying its aphrodisiac effect is worthnoting.

Aswagandha is mentioned under *Brihmaneeya*[16] by Charaka. It has been described under *Rasayana*[2] by Vagbhata. The increase in haemoglobin & RBC indicates its *Brihmana* (growth promoting or anabolic) effect while the same together with increase in hair melanin, seated stature and decrease in serum cholesterol and nail calcium indicates its *rasayana* effect.

Aswagandha is described as *Jwarahara, Vishahara, Vranahara* and *Amavatahara*.[3] The decrease in E. S. R. in our study only confirms these properties.

Ayurveda prescribes drugs and diet, taking the individual's constitution and temperament into consideration. Though *Aswagandha* is described as anti *vata* and anti *kapha* and therefore to be considered in *vata* dominant and *kapha* dominant *prakritis*, the the effecacy of the drug was founde to be more in *kapha prakriti* person than in *pitta* and *vata*, the significant levels being ($P<0.1$ and $P<0.06$ respectively (vide Table IV) It may be used as anti *vata* and anti *kapha* drug in certain illnessess but as a *rasayana* drug for a pro-

TABLE I

Clinical Parameters

S. No.	Parameters	Mean difference between values on admission & at the end of treatment (final-initial) ± S.E.			
		Aswagandha	Placebo	Z	P
1.	Pulse rate	2.69 ± 1.54 (45)	1.02 ± 1.42 (49)	0.82	> .3
2.	Systolic B.P.	0.87 ± 2.69 (45)	-0.33 ± 0.73 (48)	0.36	> .3
3.	Diastolic B.P.	-0.18 ± 1.34 (45)	-0.34 ± 1.34 (47)	0.09	> .3
4.	C/T ratio	0.008 ± 0.006 (40)	0.007 ± 0.005 (42)	0.11	> .3
5.	Haemoglobin	1.71 ± 0.95 (48)	0.00 ± 0.67 (50)	4.62	> .001
6.	R.B.C.	0.08 ± 0.03 (47)	-0.02 ± 0.04 (49)	2.08	< .02
7.	W.B.C.	17.65 ± 556.68 (34)	-110.88 ± 231.07 (34)	0.21	> .3
8.	Vital capacity	-0.07 ± 0.12 (16)	-0.19 ± 0.06	0.30	> .3

Rasayana Drug trial (Clinical) *Aswagandha*

TABLE II

Anthropometric parameters :

S. No.	Parameter	Mean difference between values on admission and at the end of treatment period (final-initial) ± S.E.			
		Aswagandha	Placebo	Z	P
1.	Hand grip	1.75±2.23 (24)	1.08±1.96 (36)	0.21	>0.1
2.	Right hand grip	0.46±1.18 (37)	0.10±1.08 (40)	0.35	>0.1
3.	Bi-acromial diameter	-0.92±0.16 (36)	-0.48±0.26 (40)	1.38	<0.1
4.	Seated stature	0.40±0.14 (34)	-0.18±0.21 (36)	2.23	>0.05
5.	Chest depth	-0.18±0.20 (40)	-0.29±0.20 (42)	0.39	>0.1
6.	Upper arm circumference	0.23±0.14 (37)	0.00±0.14 (40)	1.05	>0.1
7.	Chest circumference	-0.41±0.34 (45)	-0.82±0.32 (49)	0.87	>.01
8.	Height/Weight 1/3	0.10±0.08 (44)	0.07±0.11 (44)	1.31	<0.1

Figures in the parenthesis represent the no. of cases.

TABLE III

Bio-chemical parameters

S. No.	Parameters	Mean difference between values on admission & at the end of treatment period (final-inital) ± S.E.			
		Aswagandha	Placebo	Z	P
1.	Hair melanin content	0.10±0.14 (35)	-0.20±0.09 (41)	1.88	<.1
2.	Nail calcium	-0.27±0.24 (38)	-0.96±0.24 (42)	2.03	<.05
3.	Blood sugar	-0.66±2.31 (50)	-3.18±2.50 (51)	0.66	>.3
4.	Blood urea	-0.47±1.03 (50)	-0.72±0.76 (51)	0.47	>.3
5.	ESR	-2.00±0.90 (34)	0.90±0.77 (39)	2.40	<.02
6.	Serum alk. phos.	-0.02±0.29 (50)	-0.26±0.36 (51)	0.53	>.3
7.	Thymol turbidity	-0.28±0.24 (49)	-0.03±0.24 (51)	0.76	>.3
8.	Serum cholesterol	-28.44±5.29 (48)	-15.22±5.66 (51)	1.70	<.1
9.	Protein	-0.14±0.74 (50)	-0.04±0.11 (50)	0.75	>.3
10.	Albumin	-0.06±0.81 (50)	-0.13±0.72 (50)	0.61	>.3
11.	Acid phosphatase	-0.08±1.07 (50)	-0.06±0.19 (50)	0.10	>.3
12.	Creatinine clearance	-1.26±2.41 (48)	1.93±2.30 (50)	0.95	>.3

Figures in the parenthesis represent the no. of cases.

ANNEXURE-II

Parameters to study the process of ageing selected from the test batteries suggested by Alex Comfort and Hollingsworth.

Parameters	Correlation coefficient) 'r'
1. Hair greying score (Estimation-by hair melanin content)	+0.717
2. Systolic blood-pressure	+0.604
3. Diastolic blood-pressure	+0.519
4. Total Vital capacity	—0.402
5. Hand grip strength	—0.323
6. Visual acuity	—0.423
7. a) Audiometry (200 c. p. s)	+0.455
b) Audiometry (4000 c. p. s)	+0.596
8. Serum scholesterol	+0.234
9. Nail calcium	
10. Serum total albumin	—0.267
11. Seated stature	—0.530
12. Biacromial diameter	—0.400
Parameters to study the process of ageing (other sources)	
13. Acid phosphatase	
14. Blood urea	
15. Creatinine clearance	

TABLE IV

Influence of *Prakriti* (Constitution) on drug effect
Dominant *Prakriti*

Aswagandha	V	P	K	Total
Improved	14%	28%	58%	100%

longed period. It acts better in *Kapha* dominant *prakritis*.

From the above, it may be evident that whenever a rasayana drug is to be prescribed in chronic diseases particularly of *vata* and *kapha* origin or during convalescence period after the treatment of any acute illness *Aswagandha* deserves consideration.

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सारांश

स्वस्थ नरों में जरा की गति को रोकने के रूप में अश्वगंधा के वयस्थापन प्रभाव का अध्ययन।

२०२ स्वस्थ नरों में (५०-५५ उम्र के) जरा की गति को रोकने में अश्वगंधा के रसायनिक प्रभाव का अध्ययन डबल ब्लाँइड ट्रायल के रूप में पूरा किया गया। इसके परिणाम से ज्ञात हुआ है कि प्लासिबो वर्ग से अश्वगंधा के वर्ग के नरों में हेमोग्लोबिन, आर. बी. सी., हेरमेलानिन (Hair melanin) उपवेशन की दशा (seated stature) में अधिकांश वृद्धि दिखाई पड़ती है तथा सीरम कोलस्ट्राल भी अधिकतर घटती है एवं नख में चूने के अंश की कमी अन्य वर्ग से कम है। एरिथ्रो सेडिमेण्ट रेट में भी कमी है। इस अध्ययन के (परिणाम)परिणाम के आधारपर लिखे एक पत्र पर जाम नगर के गुजरात आयुर्वेद विश्वविद्यालय के हरि ओम आश्रम की तरफ से स्वर्ण पदक मिल चुका है।

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