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Correlation Between Blood Pressure, Hemoglobin Content and Intellectual Status of the School Going Children (10-12 Years) in Agartala, India and Effect of the Extracts of the Leaves of *Asteracantha longifolia* Nees

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The intellectual status of the school going children (10-12 years) were correlated with the hemoglobin content and blood pressure. A positive correlation was established for both the male and female students irrespective to tribal and non-tribal (Bengali). Further the extract of the leaves of *Asteracantha longifolia* Nees was subjected to see the impact of supplementation on hemoglobin contents of the blood in mice and found that the extract was the enhancer of hemoglobin content, which may have the efficacy to increase the intellectual status of the children as knowledged from the villagers residing at Tripura, India.

Key Words: Intelligent quotient, Blood pressure, Hemoglobin, School going children, *Asteracantha longifolia* Nees.

INTRODUCTION

School going children is one of the important segments of the society and accounts for about 27 % of the total population[1]. It is a dynamic period of the school going children (10-12 years) for their growth and development as they undergo physical, social, mental and emotional changes[2]. Obviously nutrition is one of the major contributors for that growth and development. Better nutritional status improves the intellectual status of the children[3].

An intelligent person is always in an advantageous position in the society[4]. Iron plays a significant role in human nutrition. Iron deficiency has adverse effects on neurological functions such as attention, intelligence, school achievement[5]. Hypertension is also related to intellectual changes among the aged[6]. As the iron content depends on the amount of hemoglobin present in the body and the hypertension is related with blood pressure, so an attempt has been made to establish the correlation between intellectual status, blood pressure and hemoglobin contents individually.

In this compilation, the Intelligent Quotient (IQ : a parameter to know the intellectual status of individual) of the school going children (10-12 years) of tribal and non-tribal (Bengali) in Agartala, Tripura, India are reported and correlated with their blood pressure and hemoglobin content.

Further a subsequent study was carried out to see the impact of supplementation of *Asteracantha longifolia* Nees leaves on hemoglobin contents of the blood in mice, as knowledged from the villagers of Tripura, India that the leaves may have the enhancing capacity of hemoglobin content in blood.

EXPERIMENTAL

Present investigation was carried out by conducting survey randomly among the male and female school going children (10-12 years) of tribal and non-tribal (Bengali) in different schools at Agartala irrespective of castes. Their IQ were measured by following Stanford-Binet test[7] along with blood pressure (in mmHg) and hemoglobin content (in g %). The IQ then tried to correlate with blood pressure and hemoglobin contents by the help of MS-Excel program of Microsoft-1998 and the respective curve with R^2 (correlation co-efficient square) and equation are reported here.

To calculate an IQ score, the following formula is used, in which MA stands for mental age and CA for chronological age: IQ score = (MA / CA) × 100. Anyone who has a mental age equal to his/her chronological age will have an IQ equal to 100. Moreover people with a mental age that is greater than their chronological age will have IQs that exceed 100 and those with a mental age lower than their chronological age will have IQs lower[7] than 100. Terman's categories in this aspect can be presented as-IQ range: 80-89 indicates dullness, 90-109 indicates average intelligence, 110-119 indicates superior intelligence and 120-140 indicates very superior intelligence[8]. Stanford-Binet Test consists of a series of items that vary in nature according to the age of the person being tested. For example, young children are asked to copy figures or answer questions about everyday activities. Older people are asked to solve analogies, explain proverbs and describe similarities that underline set of words. The test is conducted orally. An examiner begins by finding a mental age level is at which the person is able to answer all questions correctly and then moves on to successively difficult problems. When a mental age level is reached at which no items can be answered, the test is over. By examining the pattern of correct and incorrect responses, the examiner is able to compute an IQ score for the being tested[7].

Blood pressure was measured in the sitting position using a mercury sphygmomanometer with the appropriate compression cuff. The pulse pressure was calculated as difference of systolic and diastolic pressure[9].

The hemoglobin content was measured by Sahli's method using Sahli's hemoglobinometer[10]. The colour is matched against standard brown tinted glass rods, which gives the reading in g/100 mL of blood and also in percentage.

Extract of the leaves of *Asteracantha longifolia*: The leaves of *Asteracantha longifolia* were collected from the village areas of Agartala, Tripura, India and was authenticated by the expert of Botany, Department of Botany, M.B.B. College, Agartala, India. Leaves were cleared from extraneous matters and were shed dried with occasional shifting of material to avoid any growth of fungi. Completely dried parts were powered and passed through sieve 40. Extraction was done by using Soxhlet apparatus in methanol. Liquid extract was collected, filtered, air dried followed by keeping at desicator, for further works. The extract was applied to mice to see the impact of supplementation on hemoglobin content by following standard procedure[11]. Further the phytochemical studies[12] were also carried out to know the probable chemical entities present in extracts. The chemical used for all purposes were of analytical grade.

Hemoglobin content determination in mice to see the effect of leaves extract of *Asteracantha longifolia*: Two groups of mice (containing six mice weighing 20-25 g in each group) were taken for study purpose. One group received propylene glycol only (control). Another group received extract in propylene glycol in 100 mg/kg body weight once a week for 6 weeks. One day after the final injection the mice (two groups) were sacrificed by decapitation and blood of each mouse was collected to estimate the hemoglobin content.

RESULTS AND DISCUSSION

The measured IQ of the school going children was in range of average intelligence. Grossly it was found that tribal students were of less intelligent than the non-tribal (Bengali). The hemoglobin content was in the range of 10.3-12.1, where one cannot distinguish the individual group of the students in tribal/non-tribal by hemoglobin content and moreover the blood pressure for both systolic and diastolic and also the pulse pressure could not help to distinguish (Tables 1-4). The correlation between IQ and hemoglobin content/blood pressure/pulse pressure were showing positive correlation as $R^2 = 1$ in all the cases *i.e.*, indicated in Figs. 1-16, which was found in 3rd order polynomial curves. From the above discussion it could be concluded that the IQ was influenced by the hemoglobin content and blood pressure. Observing this and knowledged from the villagers of Tripura, India, the methanolic extract of the leaves of *Asteracantha longifolia* Nees was subjected for the study to see the impact of supplementation on hemoglobin content of blood in mice. It was found that the extract was containing alkaloid, tannin, reducing sugar and steroid. From Table-5, it has been observed that the extract was able to enhance the hemoglobin content by 5 g % of blood in mice after 6 week treatment. Therefore it may be suggested that the leaves of *Asteracantha longifolia* Nees can be used to enhance the hemoglobin content in diseased condition or in regular interval, which may accelerate the IQ of the school going children, as IQ has positive correlation with hemoglobin content.

TABLE-1
INTELLIGENCE QUOTIENT, BLOOD PRESSURE AND HEMOGLOBIN CONTENT OF BENGALI (MALE) STUDENTS

Parameters		Mean ± SEM for the age groups (in years)		
		10+	11+	12+
Hemoglobin		12.00 ± 0.40	12.10 ± 0.30	11.20 ± 0.30
Blood pressure	Systolic blood pressure	117.75 ± 0.81	116.27 ± 0.99	118.11 ± 1.00
	Diastolic blood pressure	77.88 ± 0.90	77.87 ± 0.88	78.21 ± 1.01
	Pulse pressure	39.90 ± 0.80	38.50 ± 1.30	39.90 ± 1.30
Intelligence quotient		103.94 ± 1.14	104.33 ± 1.49	106.42 ± 1.14

TABLE-2
INTELLIGENCE QUOTIENT, BLOOD PRESSURE AND HEMOGLOBIN CONTENT OF BENGALI (FEMALE) STUDENTS

Parameters		Mean ± SEM for the age groups (in years)		
		10+	11+	12+
Hemoglobin		11.30 ± 0.40	10.50 ± 0.3	11.10 ± 0.40
Blood pressure	Systolic blood pressure	116.38 ± 1.94	116.00 ± 2.21	118.00 ± 2.44
	Diastolic blood pressure	76.00 ± 2.15	77.89 ± 1.42	80.00 ± 1.22
	Pulse pressure	40.40 ± 2.20	38.10 ± 2.20	38.00 ± 2.10
Intelligence quotient		105.44 ± 1.16	105.63 ± 1.08	105.93 ± 1.31

TABLE-3
INTELLIGENCE QUOTIENT, BLOOD PRESSURE AND HEMOGLOBIN CONTENT OF TRIBAL (MALE) STUDENTS

Parameters		Mean ± SEM for the age groups (in years)		
		10+	11+	12+
Hemoglobin		11.70 ± 0.30	11.70 ± 0.30	12.00 ± 0.30
Blood pressure	Systolic blood pressure	117.40 ± 1.60	121.01 ± 1.50	123.40 ± 1.50
	Diastolic blood pressure	80.40 ± 1.40	81.00 ± 1.60	81.00 ± 0.90
	Pulse pressure	37.00 ± 2.10	40.10 ± 2.10	42.40 ± 2.00
Intelligence quotient		103.63 ± 1.70	102.63 ± 0.95	102.56 ± 1.48

TABLE - 4
INTELLIGENCE QUOTIENT, BLOOD PRESSURE AND HEMOGLOBIN CONTENT OF TRIBAL (FEMALE) STUDENTS

Parameters		Mean ± SEM for the age groups (in years)		
		10+	11+	12+
Hemoglobin		11.50 ± 0.50	11.20 ± 0.60	10.30 ± 0.40
Blood pressure	Systolic blood pressure	113.50 ± 1.80	116.70 ± 2.10	116.20 ± 2.20
	Diastolic blood pressure	78.00 ± 1.10	80.30 ± 0.60	80.40 ± 1.30
	Pulse pressure	35.50 ± 1.50	36.40 ± 2.10	35.80 ± 2.00
Intelligence quotient		99.47 ± 0.85	102.00 ± 1.02	102.06 ± 1.24

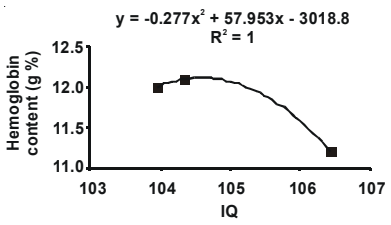

Fig. 1. Correlation between IQ and hemoglobin content of Bengali male students

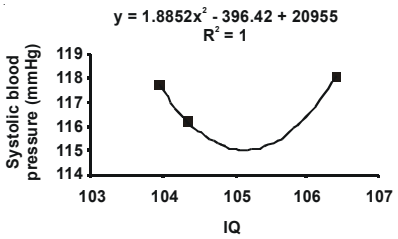

Fig. 2. Correlation between IQ and systolic blood pressure of Bengali male students

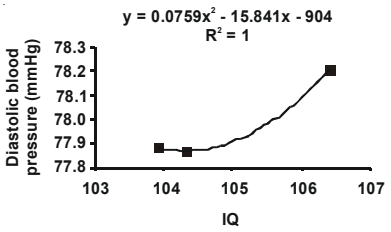

Fig. 3. Correlation between IQ and diastolic blood pressure of Bengali male students

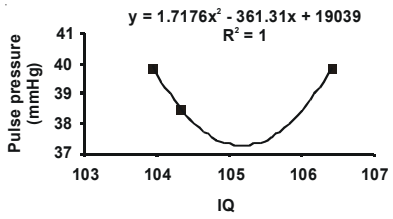

Fig. 4. Correlation between IQ and pulse pressure of Bengali male students

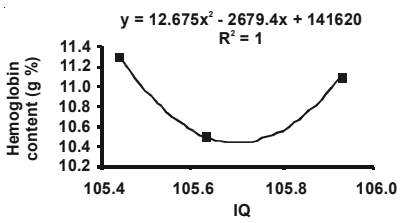

Fig. 5. Correlation between IQ and hemoglobin content of Bengali female students

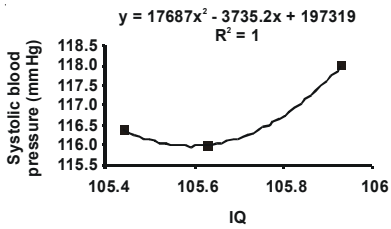

Fig. 6. Correlation between IQ and systolic blood pressure of Bengali female students

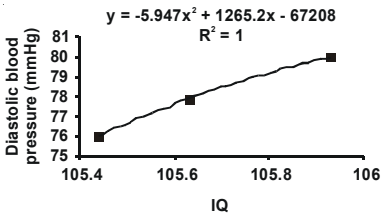

Fig. 7. Correlation between IQ and diastolic blood pressure of Bengali female students

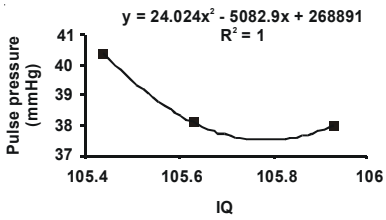

Fig. 8. Correlation between IQ and pulse pressure of Bengali female students

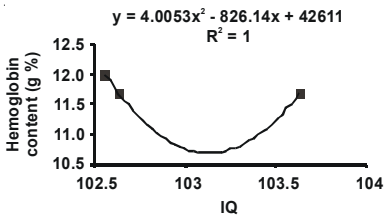

Fig. 9. Correlation between IQ and hemoglobin content of Tribal male students

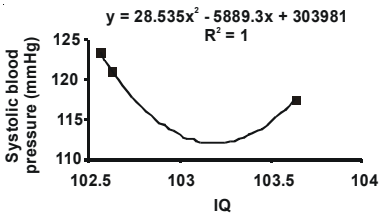

Fig. 10. Correlation between IQ and systolic blood pressure of Tribal male students

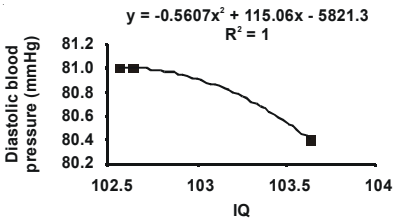

Fig. 11. Correlation between IQ and diastolic blood pressure of Tribal male students

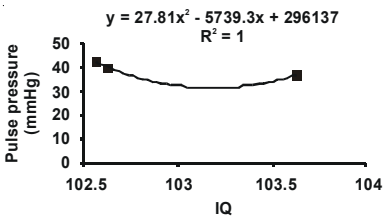

Fig. 12. Correlation between IQ and pulse pressure of Tribal male students

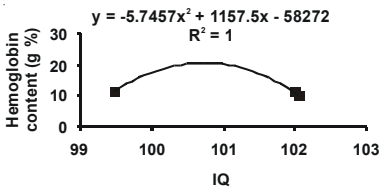

Fig. 13. Correlation between IQ and hemoglobin content of Tribal female students

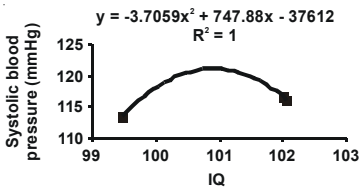

Fig. 14. Correlation between IQ and systolic blood pressure of Tribal female students

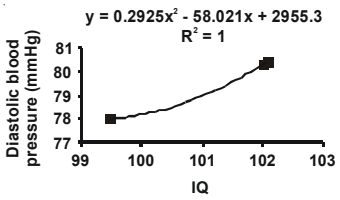

Fig. 15. Correlation between IQ and diastolic blood pressure of Tribal female students

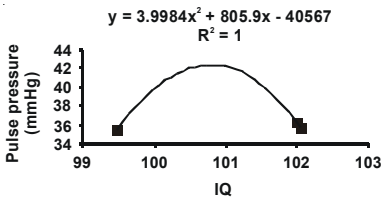

Fig. 16. Correlation between IQ and pulse pressure of Tribal female students

TABLE-5
EFFECT OF THE EXTRACT OF THE LEAVES OF *Asteracantha longifolia* Nees IN MICE

Group	Mice No.	Hemoglobin content (g %)	Average hemoglobin content (g %) ± SEM
I (Control)	1	11.4	11.30 ± 0.24
	2	12.1	
	3	11.2	
	4	10.8	
	5	10.9	
	6	10.4	
II (Extract treated)	1	16.2	16.33 ± 0.31
	2	17.5	
	3	16.3	
	4	15.7	
	5	16.9	
	6	15.4	

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