

CORRELATION BETWEEN DIETARY PROTEIN INTAKE, SERUM PROTEIN, BLOOD UREA NITROGEN AND SERUM CREATININE LEVEL IN APPARENTLY HEALTHY MALES AND FEMALES

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Abstract

The purpose of the study was to correlate dietary protein intake with serum protein, blood urea nitrogen and serum creatinine level in apparently healthy males and females of various age groups.

Two hundred samples from subjects representing various ages and socioeconomic status were assessed for the fore mentioned parameters.

Protein intake was found maximum in the age group of 30-39 years and the level of serum protein, blood urea nitrogen and serum creatinine were also found highest in this age group. It was observed that a direct relationship exists between the dietary protein intake and serum total protein, serum albumin, blood urea nitrogen and serum creatinine level (JPMA 29: 112, 1979).

Introduction

The term nitrogen balance is often used to reflect the anabolic and catabolic phases of the dynamic state of protein metabolism. Dietary protein represents most of the nitrogen intake and most of the nitrogen excretory products are derived from protein catabolism.

Plasma protein occupy a central position in protein metabolism, not only do they interact with virtually all the body tissues but they are intimately related to protein metabolism in the liver (Putnam 1960).

Urea and creatinine represents end-product of protein catabolism (Cantarrow and Schepartz, 1967). Blood urea nitrogen depends upon the relationship between urea production, protein ingestion and catabolism and urea excretion. Variation in protein in-

take contributes to the spread of normal range (Davidson and Henry, 1969). The serum creatinine level is remarkably constant and is considered to be an index of endogenous metabolism (Lynch et al., 1969). Unlike urea it does not reflect dietary protein intake and is related to protein content of body and muscle mass (Davidson and Henry, 1969).

Blood urea gives information about protein metabolism and glomerular filtration rate while plasma creatinine mainly gives information about glomerular filtration rate (Wardener 1974). Kasamer and Harri (1959) showed elevated levels of blood urea nitrogen and creatinine in patients with renal impairment.

Material and Method

Two hundred blood samples of apparently healthy individuals of both sexes were collected. The age and sex distribution was as follows :-

Age Range (yrs)	Males	Females
0-9	33	31
10-19	23	23
20-29	16	18
30-39	10	11
40-49	8	8
50-59	5	5
60-60+	5	4

These samples represent various age groups and socioeconomic status as the nutritional needs of the human body differ with age, sex, height, body weight, growth and physical activity.

Biochemical tests were estimated by following methods :-

1. Blood Urea Nitrogen. It was determined by urease Nesslerization method of Varley (1958).
2. Creatinine was estimated by the method of Brod and Sirota (1948).
3. Total protein was measured by the method of Reinhold (1953).

In the absence of food composition table for Pakistan, the nutrient intake was calculated by reference to food composition tables

used by Pellet and Schadarevien et al. (1970), at the American University of Beirut.

Result

Dietary Analysis:

Information on dietary intake was gathered from the volunteers by recording one week dietary intake. Table I represents protein intake (gm/person/day) of apparently healthy males and females of various age groups. Protein intake was found maximum in both males and females of the age group 30-39 years.

Tables II, III, IV and V represent the level of blood urea nitrogen, serum creatinine and serum total protein and serum albumin

Table I: Protein Intake (gm/person/day) in Apparently Healthy Males and Females of Various Age Groups

Age Range	Male (gm)	Female (gm)
0-9	43	42
10-19	51	47
20-29	61	54
30-39	63	59
40-49	56	54
50-59	55	50
60-60+	53	49

Biochemical Investigation

in apparently healthy males and females of various age groups.

Table II: Blood Urea Nitrogen (mg%) Level in Apparently Healthy Males and Females of Various Age Groups

Age Range (yrs)	MALE					FEMALE				
	Number (n)	Mean	+ S.D.	+ S.E.	Range	Number (n)	Mean	+ S.D.	+ S.E.	Range
0-9	33	11.0	+ 3.2	+ 0.56	5.0 - 16.0	31	10.40	+ 3.3	+ 0.6	5.0 - 17.0
10-19	23	12.40	+ 3.00	+ 0.62	6.0 - 15.5	23	10.80	+ 2.8	+ 0.6	5.0 - 15.0
20-29	16	12.5	+ 2.00	+ 0.52	6.0 - 15.5	18	11.0	+ 2.5	+ 0.6	6.0 - 13.4
30-39	10	13.0	+ 3.2	+ 1.00	5.0 - 14.5	11	12.00	+ 2.4	+ 0.7	6.0 - 14.5
40-49	8	12.8	+ 2.20	+ 0.77	7.0 - 14.0	8	11.50	+ 3.5	+ 1.2	5.0 - 15.0
50-59	5	11.8	+ 2.50	+ 1.1	5.0 - 14.8	5	11.20	+ 2.5	+ 1.1	9.0 - 15.0
60-60	5	11.2	+ 2.4	+ 1.1	7.6 - 15.0	4	11.0	+ 1.3	+ 0.7	10.0 - 12.8

Table III: Serum Creatinine (mg%) in Apparently Healthy Males and Females of Various Age Groups

Age Range (yrs)	MALE					FEMALE				
	Number (n)	Mean	+ S.D.	+ S.E.	Range	Number (n)	Mean	+ S.D.	+ S.E.	Range
0-9	33	0.60	+ 0.2	+ 0.03	0.3 - 1.0	31	0.60	+ 0.18	+ 0.03	0.4 - 1.0
10-19	23	0.66	+ 0.2	+ 0.04	0.3 - 1.0	23	0.65	+ 0.1	+ 0.03	0.3 - 0.8
20-29	16	0.80	+ 0.22	+ 0.06	0.4 - 1.2	18	0.71	+ 0.1	+ 0.04	0.4 - 1.0
30-39	10	0.81	+ 0.18	+ 0.06	0.5 - 1.1	11	0.77	+ 0.2	+ 0.08	0.5 - 1.4
40-49	8	0.75	+ 0.18	+ 0.06	0.6 - 1.0	8	0.70	+ 0.26	+ 0.09	0.3 - 1.3
50-59	5	0.72	+ 0.09	+ 0.04	0.8 - 1.0	5	0.68	+ 0.2	+ 0.08	0.6 - 1.2
60-60+	5	0.70	+ 0.34	+ 0.15	0.4 - 1.2	4	0.65	+ 0.10	+ 0.05	0.6 - 0.8

Table IV: Serum Total Protein (gm%) in Apparently Healthy Males and Females of Various Age Groups

Age Range	MALE					FEMALE				
Age (yrs)	Number (n)	Mean	+ S.D.	+ S.E.	Range	Number (n)	Mean	+ S.D.	+ S.E.	Range
0-9	33	7.08	+ 0.76	+ 0.13	5.6-8.0	31	6.90	+ 0.75	+ 0.13	5.7-8.0
10-19	23	7.28	+ 0.74	+ 0.15	5.7-8.2	23	6.99	+ 0.72	+ 0.15	6.0-8.2
20-29	16	7.43	+ 0.66	+ 0.17	5.9-8.0	18	7.04	+ 0.77	+ 0.18	5.7-8.3
30-39	10	7.53	+ 0.64	+ 0.20	6.0-8.0	11	7.20	+ 0.88	+ 0.26	5.5-8.2
40-49	8	7.28	+ 0.70	+ 0.25	6.0-8.2	8	7.03	+ 0.51	+ 0.18	6.4-8.2
50-59	5	7.18	+ 0.25	+ 0.11	6.8-7.5	5	6.90	+ 0.70	+ 0.31	5.9-8.0
60-60 ⁺	5	7.08	+ 0.92	+ 0.41	5.8-8.2	4	6.8	+ 0.43	+ 0.25	6.2-7.2

Table V: Serum Albumin (gm%) in Apparently Healthy Males and Females of Various Age Groups

Age Range	MALE					FEMALE				
Age (yrs)	Number (n)	Mean	+ S.D.	+ S.E.	Range	Number (n)	Mean	+ S.D.	+ S.E.	Range
0-9	33	4.4	+ 0.6	+ 0.10	3.5-5.8	31	4.13	+ 0.57	+ 0.10	3.0-5.5
10-19	23	4.5	+ 0.56	+ 0.12	3.2-5.7	23	4.14	+ 0.54	+ 0.11	3.5-5.6
20-29	16	4.6	+ 0.56	+ 0.14	3.6-5.6	18	4.37	+ 0.64	+ 0.15	3.2-5.2
30-39	10	4.7	+ 0.65	+ 0.21	4.0-5.8	11	4.56	+ 0.53	+ 0.16	3.0-5.0
40-49	8	4.6	+ 0.56	+ 0.2	3.5-5.0	8	4.50	+ 0.54	+ 0.18	4.1-5.6
50-59	5	4.5	+ 0.30	+ 0.13	4.2-5.0	5	4.48	+ 0.70	+ 0.31	3.5-5.5
60-60 ⁺	5	4.4	+ 0.53	+ 0.24	3.7-5.1	4	4.47	+ 0.19	+ 0.11	4.2-4.6

Table VI: Correlation Between Dietary Protein Intake and Serum Protein and Serum Albumin Level

Protein Intake	Number	Protein Intake (gm)			Serum Protein (gm%)			Serum Albumin (gm%)		
Range (gm)		Mean	+ S.D.	+ S.E.	Mean	+ S.D.	+ S.E.	Mean	+ S.D.	+ S.E.
30-39	12	37.8	+ 0.99	+ 0.29	5.87	+ 0.14	+ 0.04	3.65	+ 2.24	+ 0.07
40-49	88	44.8	+ 2.92	+ 0.31	6.93	+ 0.67	+ 0.07	4.18	+ 0.53	+ 0.06
50-59	68	54.0	+ 2.73	+ 0.33	7.24	+ 0.66	+ 0.08	4.56	+ 0.50	+ 0.06
60-69	31	63.25	+ 2.30	+ 0.14	7.87	+ 0.25	+ 0.04	4.88	+ 0.42	+ 0.07

Discussion

Nutrition is the process of supplying to the body with the necessary food nutrients. Dietary survey provides information on food intake. Biochemical assessment indicates nutrient supply to the body depending on the dietary intake and the storage of nutrients. It is less affected by temporary shortage and has an advantage that it indicates the actual supply of nutrients to the tissue.

Protein metabolism is reflected in the balance between nitrogen intake and output (Chiaraviglio et al., 1963). Urea and creatinine are the major end products of protein catabolism and like other non-protein constituents are present in the blood and excreted in the urine. As such knowledge of their concentration in the blood and body fluids and quantities excreted serve as criteria of the state of protein metabolism. The concentration of blood urea nitrogen varies directly with the nitrogen intake (Davidson and Henry, 1969). Similar findings have been observed in the present study (Table II). Table II shows that there is a gradual increase in the blood urea nitrogen concentration from children of 0-9 years to adult of 30-39 years in both males and females. After that a decrease in the concentration has been observed. Hence an increase in protein intake is associated with an increase in blood urea nitrogen level.

Table III shows an increase in the serum creatinine levels with the increasing protein intake. The concentration was maximum in the age group 30-39 years in both the sexes.

Serum protein serve as a source of nutrition for the tissue of the body, this is most attributable to the albumin fraction. This study shows that a direct correlation exists between the protein intake and the serum total protein and serum albumin level (Table IV). It is observed that with the increase in protein intake there has been an increase in the serum protein and albumin level and vice versa.

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