http://www.pjbs.org

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences, 1 (1): 29-32, 1998

Determination of Serum Vitamin-A, β-carotene, Total Proteins and Fractions in Women Within 24 Hours of Delivery from Different Age and Socioeconomic Groups

B. Tabassum, M.T. Javed♪, N. Abbas, Alia, S. Pervaiz✣ and K. Almas
Department of Rural Home Economics, ♪Department of Veterinary Pathology,
✣Department of Animal Nutrition, University of Agriculture, Faisalabad-38040, Pakistan

Abstract
Serum studies in 90 randomly selected lactating women of three socioeconomic (low, middle and high) and age (below 25, 26-32 and above 33 years) groups of Faisalabad, Pakistan, revealed an overall concentration of β-carotene and vitamin-A to be 170.12±88.64 and 54.72±22.69 mg/100 mL, respectively. The β-carotene and vitamin-A showed non-significant difference between socioeconomic and age groups, however, β-carotene was relatively higher in young women and those belonging to higher socioeconomic group, whereas vitamin-A was relatively higher in old women and those belonging to meddle socioeconomic group. The serum total proteins, albumin, globulins and A:G ratio during present study was 5.48±1.24 g/100 mL, 2.82±1.27 g mL^{-1}, 2.68±1.44 g mL^{-1} and 1.66±1.78 g/100 mL, respectively, The total proteins and albumin showed non-significant difference between socioeconomic and age groups while globulins and A:G ratio revealed higher ($p<0.05$) values in high and middle socioeconomic groups, respectively.

Key words: Lactating women, serum, β-carotene, vitamin-A, Pakistan

Introduction

Vitamin-A in women under 40 years of age is less in plasma than in men of similar age or in women over 40 years (Alouane *et al*., 1988). However its level during pregnancy is significantly higher in vitamin supplemented group (Villard and Bates, 1987) and decreases during pregnancy and reaches to those of non-pregnant women at postpartum period (Bates, 1983; Willingford and Underwood, 1986; Panth *et al*., 1990). The immunoglobulin studies have shown low concentrations in children with low intake of vitamin-A (Vobecky *et al*., 1986). The concentration of total proteins, albumin and retinol binding protein is also reported to the significantly lower in protein energy malnutrition (Burri *et al*., 1990). The studies in infants have shown significant correlation of retinol with total proteins and albumin (Mejia and Arroyave, 1983). The information on different parameters viz values of β-carotene, vitamin-A, total proteins, albumin, globulins and A:G ratio in serum of lactating women of Faisalabad, Pakistan is scarce. Therefore, the present study was planned with the following objectives:

1) To find out the levels of above-mentioned parameters in blood within 24 h of delivery in women of different age and socioeconomic groups
2) To find out any relation of vitamin-A, β-carotene, albumin and globulins
3) To have basic data on serum vitamin-A level in women within 24 h of delivery which could be useful for further studies

Materials and Methods

Blood samples were collected from 90 women admitted in various hospitals of Faisalabad, Pakistan, within 24 h post deliver. In each case 5 mL blood was collected and serum was separated and stored in coloured glass bottles at 4°C for overnight. The sampling was done during the months of June and July. These women were divided into three socioeconomic groups (low, middle and high), each comprising 30 women on the basis of monthly income. Each socioeconomic group was further divided into three age groups, (women below 25, 26-32 and above 33 years of age).

Different parameters included for this study were, determination of vitamin-A, β-carotene, total proteins, albumin, globulins and A:G ratio. The estimation of vitamin-A and β-carotene in serum was made by trifluoroacetic acid (TFA) method as described by Neeld and Pearson (1963). The serum total proteins were determined following the method of Oser (1976) and albumin was determined following the method of Varley *et al*. (1980). The globulins were measured by subtracting albumin from total proteins. The data thus obtained on these parameters was analyzed by one way to two way analysis of variance and means were compared by using Tukey's confidence interval test. correlation coefficients were also obtained by using Minitab (10.2) computer software package on personal computer (Anonymous, 1994).

Result and Discussion

β-carotene and vitamin-A

The overall mean serum β-carotene during present study (Table 1) showed slightly higher concentration (170.12±88.64 µg/100 mL) as compared with values reported for lactating (137.1 µg/100 mL, Newman, 1994) and pregnant women (120.4-140.2 µg/100 mL;

Table 1: Comparison (means±S.D.) of serum β-carotene and vitamin-A between women of different Age and socioeconomic groups

Socioeconomic Group	Age groups (years) Below 25	26-32	33 & above	Total
β-Carotene (µg/100 mL)				
Low	152.13±57.25	153.46±67.98	122.56±55.00^{B}	142.72±60.01
Middle	200.07±108.41	135.65±64.55	214.22±75.48^{A}	183.31±88.98
High	251.50±132.51^{a}	195.36±77.96^{ab}	106.08±35.11^{Bb}	184.31±106.90
Total	201.23±108.70^{a}	161.49±72.54^{ab}	147.26±73.69^{b}	170.12±88.64
Vitamin-A (µg/100 mL)				
Low	39.48±25.41^{B}	50.19±26.12	59.41±12.93^{AB}	49.70±23.07
Middle	56.85±22.01^{ABab}	48.03±10.69^{b}	75.48±29.85^{Aa}	60.12±24.45
High	65.97±21.01^{Aa}	52.14±15.97^{ab}	44.91±17.81^{Bb}	54.34±19.84
Total	54.11±24.75	50.12±18.14	59.93±24.25	54.72±22.69

Values in each column with different capital letters are statistically significant at $p<0.05$
Values in each row with different small letters are statistically significant at $p<0.05$

Table 2: Comparison (means±S.D.) of serum total proteins and fractions (g/100 mL) between women of different age and socioeconomic groups

Socioeconomic Group	Age groups (years) Below 25	26-32	33 & above	Total
TOTAL PROTEINS (g/100 mL)				
Low	5.36±1.28	5.22±0.98	6.16±1.50^{A}	5.58±1.30
Middle	5.15±1.26	5.64±1.04	4.76±1.04^{B}	5.18±1.14
High	5.96±1.68	55.65±1.21	5.40±0.79^{AB}	5.67±1.25
Total	5.49±1.41	5.50±1.06	5.44±1.25	5.48±1.24
SERUM ALBUMIN (g/100 mL)				
Low	2.64±0.51	2.52±1.24	3.31±1.20^{A}	2.82±1.06
Middle	3.28±1.14	2.64±1.45	3.35±0.72^{A}	3.09±1.04
High	3.36±1.93	2.32±1.24	1.97±1.35^{B}	2.55±1.60
Total	3.09±1.32	2.50±1.18	2.88±1.26	2.82±1.27
SERUM GLOBULINS (g/100 mL)				
Low	2.73±1.27	2.70±1.64	2.85±1.01^{A}	2.76±1.29^{AB}
Middle	1.87±0.75^{b}	3.00±1.51^{a}	1.41±0.80^{Bb}	2.09±1.24^{B}
High	2.60±0.96	3.33±1.77	3.43±1.86^{A}	3.21±1.57^{A}
Total	2.40±1.05	3.01±1.61	2.56±1.53	2.66±1.42
ALBUMIN:GLOBULIN RATIO				
Low	1.29±0.94	1.48±1.06	1.37±0.87^{B}	1.38±0.93^{B}
Middle	1.98±1.00^{ab}	1.31±1.02^{b}	3.89±3.74^{Aa}	2.39±2.49^{A}
High	1.74±1.97	1.06±0.80	1.03±1.13^{B}	1.28±1.38^{B}
Total	1.67±1.37	1.28±0.95	2.10±2.58	1.68±1.78

Values for albumin and globulins in each column with different capital letters and in each row with different small letters are statistically significant at $p<0.01$
Values for total proteins and albumin:globulin ratio in each column with different capital letters and in each row and different small letters are statistically significant at $p<0.05$

Sharma *et al*., 1986). This indicates that serum β-carotene increases at the time of parturition, which may be due to the fact that pregnant women, especially during last trimester take carotenoids as supplement (Khan, 1977). Panth *et al*. (1990) reported increase in β-carotene concentration during pregnancy but fall during first 3-6 week of parturition. The socioeconomic and age groups did not reveal significant difference in β-carotene (Table 1), however, it showed decrease with age (r = -0.248) but increase with family income (r = 0.193). Olson (1990) also reported that carotenoids concentration is dependent on ingested diet and later is related with family income. The β-carotene showed positive correlation with albumin (r = 0.305) and total proteins (r = 0.031) but negative with globulins (r = −0.245). The vitamin-A concentration was almost same (54.72±22.69 µg/100 mL) as reported for lactating women of developing countries (58 µg/100 mL; Newman, 1994) and was above than the lower cut off point, i.e., 20 µg/100 mL and also from marginal range, i.e., 20-30 µg/100 mL (Panth *et al*., 1990). It was, however, slightly lower than reported for lactating women which compared well with the findings of Panth *et al*. (1990). The present findings showed no deficiency of vitamin-A within 24 h post parturition, as reported in association with child death in Pakistan (Franken, 1974). This could be attributed to the ample availability of mangoes during June and July. Bates *et al*. (1984) reported that mangoes contribute significantly to the serum retinol level in pregnant and lactating women. It may also be due to oral use of vitamin-A tablets which may have increased from previous observation by Khan (1977) who reported that 78% of the pregnant females in Pakistan consume less than 70% of recommended daily allowance of vitamin-A. The age and socioeconomic groups revealed non-significant difference in vitamin-A concentration (Table 1), however, it showed increase with age (r = 0.105) and family income (r = 0.084). The β-carotene, however, decreased with age. Panth *et al*. (1990) also reported that effect of parturition on serum carotene appeared to be opposite to that of retinol. The increase with age in vitamin-A has also been reported by Tanumihardjo *et al*. (1994). The vitamin-A showed a low positive correlation with β-carotene (r = 0.135) and albumin (r = 0.065) but negative with total proteins (r = −0.187) and globulins (r = −0.220). Tarwotjo *et al*. (1982) reported that plasma carotene not necessarily provide a good index of vitamin-A status.

Serum Proteins

The total serum proteins during present study (Table 2) revealed lower values (5.48±1.24 g/100 mL) within 24 hours post parturition than reported for normal healthy women (6.0-8.0 g/100 mL, Bennington *et al*., 1970; 5.8-7.8 g/100 mL, Davidson, 1979). Total proteins is lower in pregnancy, lactation (Kaneko and Cornelius, 1970) as compared to those of non-pregnant levels. This could be due to failure to meet the increased demand during pregnancy and lactation. Serum proteins showed a relative decrease (r = −0.017) with age at postpartum, but these generally increases with age in healthy non-pregnant women (Dimopoullos, 1970). This decrease may be due to lower potential to synthesize new proteins during old age to meet the increased demand. The socioeconomic groups also revealed non-significant difference in total proteins (Table 2), however, these showed relative increase with family income (r = 0.029). It appears that dietary proteins has direct effect on serum proteins level. Burri *et al*. (1990) and Chang (1990) reported low serum proteins in protein energy malnutrition.

The albumin showed low values (2.82±1.27 g/100 mL) compared with normal values in healthy human (4.0-5.0 g/100 mL, Bennington *et al*., 1970; 3.5-5.6 g/100 mL, Davidson, 1979). The albumin significantly contributes in the increase or decrease in total proteins level (Benjamin, 1978), and was also indicative from a higher correlation coefficient (r = 0.354) during the present study. The albumin decreases at the time of pregnancy (Dimopoullos, 1970) and may be at parturition (present study). The negative correlation of total proteins (r = −0.070) and albumin (r = −0.017) with age indicates that decrease in proteins is due to decrease in albumin.

The globulins (Table 2) were (2.66±1.42 g/100 mL) within normal range as reported for humans (1.6-3.1 g/100 mL, Davidson, 1979; 2-3.6 g/100 mL, Murray *et al*., 1996). These reported to decrease rarely, because decrease in an individual fraction of globulins leads to simultaneous increase in other globulins (Coles, 1980). The age revealed non-significant difference in globulins but these relatively increased with advanced age (r = 0.047) as has also been reported by Dimopoullos (1970). However, globulin was higher ($p<0.01$) is high socioeconomic group and also contributed significantly to increase in the levels of total proteins (r = 0.555) similar to albumin (r = 0.354).

The albumin:globulin (A:G) ratio was (1.68±1.78) higher than 1.5 as reported for human (Cornelius, 1970) and highly correlated with albumin (r = 0.529) which is responsible for higher A:G ratio. The later showed significantly ($p<0.05$) higher levels in women of middle compared with other socioeconomic groups. The A:G ratio revealed non-significant difference between age groups (Table 2), however, it was relatively higher in women above 33 years of age, but was less than 1.5 in women of 26-32 years of age. The increasing age has a positive correlation with A:G ratio (r = 0.098) and globulins (r = 0.047) but negative with albumin (r = −0.070). This indicates that although albumin in old age declines to some extent while the globulins otherwise, but the decline in albumin is not marked and still contribute to higher A:G ratio in old women.

References

Alouane, L.T., C. Alguernin and B. Ghrib, 1988. Estimation of vitamin-A and E in plasma of Tunisians: A preliminary study. Med.-et-Nutr., 24: 365-368.

Anonymous, 1994. Minitab 10.2 release (Minitab for windows). Minitab Inc 3081, Enterprise Drive State College, PA.

Bates, C.J., 1983. Vitamin A in pregnancy and lactation. Proc. Nutr. Soc., 42: 65-79.

Bates, C.J., L. Villard, A.M. Prentice, A.A. Paul and R.G. Whitehead, 1984. Seasonal variations in plasma retinol and carotenoid levels in rural Gambian women. Trans. Royal Soc. Trop. Med. Hygiene, 78: 814-817.

Benjamin, M.M., 1978. Outline of Veterinary Clinical Pathology. 3rd Edn., Iowa State University Press, Ames, IA., USA., ISBN-13: 9780813812304, Pages: 351.

Bennington, J., L. Fouty, A. Robert and C. Hougie, 1970. Laboratory Diagnosis. Macmillan, Toronto.

Burri, B.J., T.R. Neidlinger, M. Van Loan and N.L. Keim, 1990. Effect of low-calorie diets on plasma retinol-binding protein concentrations in overweight women. J. Nutr. Biochem., 1: 484-486.

Chang, S.J., 1990. Antimicrobial proteins of maternal and cord sera and human milk in relation to maternal nutritional status. Am. J. Clin. Nutr., 51: 183-187.

Coles, E.H., 1980. Veterinary Clinical Pathology. 3rd Edn., W.B. Saunders Co., London, ISBN: 9780721626444, Pages: 562.

Cornelius, C.E., 1970. Liver Funcrtion. In: Clinical Biochemistry of Domestic Animals, Kaneko, J.J. and C.E. Cornelius (Eds.). Academic Press, USA.

Davidson, S .S., 1979. Human Nutrition and Dietetics. 7th Edn., Churchill Livingstone, USA., ISBN: 9780443017643, Pages: 641.

Dimopoullos, G.T., 1970. Plasma Protems. In: Clinical Biochemistry of Domestic Animals, Kaneko, J.J. and C.E. Cornelius (Eds.). Academic Press, USA.

Franken, S., 1974. Measles and xerophthalmia in East Africa. Trop. Geogr. Med., 26: 39-44.

Kaneko, J.J. and C.E. Cornelius, 1970. Clinical Biochemistry of Dxerophthalmia omestic Animals. 2nd Edn., Academic Press, USA., Pages: 791.

Khan, A., 1977. Micronutrient survey of Pakistan. Nutrition Cell, Planning and Development Division. Islamabad, Pakistan.

Mejia, L.A. and G. Arroyave, 1983. Lack of direct association between serum transferrin and serum biochemical indicators of vitamin A nutriture. Acta Vitaminol. Enzymol., 5: 179-184.

Murray, R.K., D.K. Granner, P.A. Mayes and V.W. Rodwell, 1996. Harper's Biochemistry. 24th Edn., Appleton and Lange, Stanford, CT.

Neeld, Jr. J.B. and W.N. Pearson, 1963. Macro- and micromethods for the determination of serum vitamin A using trifluoroacetic acid. J. Nutr., 79: 454-462.

Newman, V., 1994. Vitamin A and breast-feeding: A comparison of data from developed and developing countries. Food Nutr. Bull., 15: 161-176.

Olson, J.A., 1990. Vitamin A. In: Present Knowledge in Nutrition, Brown, M.L. (Ed.)., (Chapter 11). International Life Sciences Institute, Washington, DC., pp: 96-107.

Oser, B.L., 1976. Hawk's Physiological Chemistry. MacGraw Hill Publ. Co., New Delhi, India.

Panth, M., V. Shatrugna, P. Yasodhara and B. Sivakumar, 1990. Effect of vitamin A supplementation on haemoglobin and vitamin A levels during pregnancy. Br. J. Nutr., 64: 351-358.

Sharma, S.C., J. Bonnar and L. Dostalova, 1986. Comparison of blood levels of vitamin A, beta-carotene and vitamin E in abruptio placentae with normal pregnancy. Int. J. Vitamin Nutr. Res., 56: 3-9.

Tanumihardjo, S.A., D. Permaesih, A.M. Dahro, D. Karyadi and J.A. Olson, 1994. Assessment of the vitamin A status in lactating and nonlactating, nonpregnant Indonesian women by use of the Modified-Relative-Dose-Response (MRDR) test. Am. J. Clin. Nutr., 60: 142-147.

Tarwotjo, I., A. Sommer, T. Soegiharto and D. Susanto, 1982. Dietary practices and xerophthalmia among Indonesian children. Am. J. Clin. Nutr., 35: 574-581.

Varley, H., A.H. Gowenlock and M. Bell, 1980. Practical Clinical Biochemistry. Vol. 1, Heinemann Medical, USA., ISBN: 9780433338055, Pages: 1277.

Villard, L. and C.J. Bates, 1987. Effect of vitamin A supplementation on plasma and breast milk vitamin A levels in poorly nourished Gambian women. Hum. Nutr. Clin. Nutr., 41: 47-58.

Vobecky, J.S., J. Vobecky, D. Shapcott and M. Rola-Pleszczynski, 1986. Humoral and cell-mediated immunity in relation to the serum level of selected nutrients in preschoolers. Recent. Adv. Clin. Nutr., 2: 369-372.

Willingford, J.C. and B.A. Underwood, 1986. Vitamin A Deficiency in Pregnancy Lactation and the Nursing Child. In: Vitamin A Deficiency and its Control, Bauernfeind, J.C. (Ed.). Academic Press, Orlando, FL., pp: 101-152.