VITAMIN A LEVELS IN PREGNANT NIGERIAN WOMEN AND NEWBORN

by

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Introduction

Although pregnancy increases the demand for vitamins, there is no general agreement from reports in the literature on maternal serum vitamin levels. Bodansky *et al* (1943) found the mean value of plasma vitamin A concentration during the first 6 months of pregnancy to be significantly higher than in the third trimester of pregnancy. Similar results of a decrease during pregnancy were obtained by Lund and Kimble (1943).

However, Hoch *et al* (1948) found no evidence of a fall in vitamin A levels after the early stages of pregnancy. In fact, Pulliam *et al* (962) and Gal and Parkinson (1974) reported that maternal serum vitamin A concentrations increased during pregnancy. All the reports, however, agree that maternal serum vitamin A levels fall during labour but rise after delivery. It has also been suggested that maternal serum vitamin A levels are influenced by the sex of the fetus.

Many of the reported studies on vitamin A levels during pregnancy are from the industrialised countries and are separated by gaps of many years with obvious differences in nutritional status and socio-economic conditions. Information is needed from the developing world where the level of nutrition is different.

The objective of this study is to provide some data from a developing country concerning vitamin A levels during pregnancy and at delivery and to examine the correlations between vitamin A levels, infant sex and birth weight.

Material and Methods

The subjects in this study were pregnant women attending the University College Hospital, Ibadan, Nigeria for antenatal care and delivery. All the patients gave informed consent to participate in this study. No dietery restrictions were imposed but patients were instructed not to take tablets obtained outside the Clinic. Only patients who were sure of their menstrual dates and were seen before the twelvth week of pregnancy and had no complications were considered eligible for the study. Recruitment was done consecutively but patients who developed complications requiring admission into the Hospital were excluded from the analysis. Venous blood samples were taken at first visit and subsequently at monthly intervals until

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delivery. No vitamin supplements were prescribed to the patients. At the time of delivery, cord and maternal samples were obtained. Information was also obtained regarding self-medication with vitamin tablets during pregnancy. Sera were separated from all the samples and stored until analysis.

Chemical Method

The serum concentrations of vitamin A were determined by the method of Gal and Parkinson (1974).

Results

One hundred and fifty patients were initially recruited into the study. Fifty of these were excluded from the analysis for reasons given in Table I. The results presented here were from 100 eligible women and their newborn.

TABLE I

Vitamin A Levels in Pregnant Nigerian Women and Newborn

Recruited Patients Excluded from the Analysis

Reasons	No. of patients
Severe Pre-eclampsia	6
Premature delivery	5
Ante-partum haemorrhage	5
Self-Medication during pregnancy	3
Delivered elsewhere	9
Emergency Caesarean Section	8
Incomplete set of Samples	14
Total	50

Table II shows the mean vitamin A levels at various stages of gestation. From this, it is seen that the mean vitamin A levels fall with increasing gestation. Although the mean vitamin A level in the first trimester was lower than in the second trimester, the differences were not statistically significant ($p > 0.05$). However, at the time of delivery, the vitamin A level was significantly lower than the level in the first and second trimesters ($p < 0.01$ in each cases).

TABLE II

Vitamin A Levels at Various Stages of Gestation

(in ug per 100 ml)

		Mean	S.D.
1st Trimester (n = 100)	=	95.5	41.55
2nd Trimester (n = 100)	=	85.68	32.34
3rd Trimester/ delivery (n = 100)	=	69.41	27.89

Table III shows the mean cord vitamin A levels and the corresponding paired maternal vitamin A levels at delivery: Using the Paired t-test, the vitamin A level in the newborn was significantly lower than the maternal level at parturition ($p < 0.001$). There is very low correlation between the cord vitamin A level and the maternal level ($r = 0.20$, $p > 0.05$).

TABLE III

Mean Vitamin A Levels in Cord and Maternal Plasma at Delivery

(in ug per 100 ml)

	Maternal	Cord
	N = 100	N = 100
Mean	= 69.41	Mean = 33.16
S.D.	= 27.89	S.D. = 10.12
Coefficient of variation	= 40.18%	= 30.53%

The distribution of vitamin A levels based on the sex of the infant are shown in Table IV. There are higher mean levels of vitamin A in mothers with male babies than in those with female babies, but the differences are not statistically significant ($p > 0.10$). Also, male infants have

higher mean levels of vitamin A than female infants but the differences are not statistically significant ($p > 0.05$). There is no correlation between vitamin A levels and birth weight ($r = 0.05$; $p > 0.10$). No significant seasonal variations were found in the concentrations of serum vitamin A.

TABLE IV

Showing Relationship Between Sex of Newborn and Vitamin A Levels in Cord and Maternal Blood at Birth

(in ug per 100 ml)

	Males	Females
	n = 43	n = 57
Mean material	= 72.6	= 67
S.D.	= 33.2	= 23.1
Mean cord	= 34.64	= 32.05
S.D.	= 10.76	= 9.56

Discussion

Our study shows that there is a fall in the serum concentrations of viamin A with increase in gestation. These findings agree with those of some earlier workers (Bodansky *et al*, 1943; Lund and Kimble, 1943, Leonard *et al*, 1972). However, Gal and Parkinson (1974) reported a fall in the mean values of serum vitamin A in early pregnancy followed by an increase in vitamin A levels as pregnancy subsequently progressed. This increase continued until a few weeks before term when there was a tendency to a slight fall. Hoch *et al* (1948), Pulliam *et al* (1962) also reported increase in serum vitamin A concentration with increase in gestation. In spite of these differences, all the studies were consistent in finding that vitamin A concentrations fall during labour but rise in the puerperium.

Serum vitamin A concentration is probably not the most accurate index of vitamin A Status (Caster and Mickelsen, 1955). It is known that the vitamin is stored in the liver and other tissues and there is evidence that serum vitamin A is not directly related to the concentration of the vitamin in the liver (Meyer *et al*, 1943; Popper *et al* 1943, Popper and Steigman, 1943). However, a relatively high serum vitamin A concentration excluded low liver storage (Meyer *et al*, 1942).

The factors which may influence the levels of serum vitamin A during pregnancy include: hormonal changes, increased fetal demands, vitamin intake, haemodilution, and seasonal variations.

Gal and Parkinson (1974) suggested that hormonal changes during pregnancy (especially increase in progesterone levels) significantly affected the levels of serum vitamin A. Thus the fall in serum vitamin A level found by Gal and Parkinson (1974) in very early pregnancy was explained to be related to the changing site of progesterone production from the corpus luteum to the placenta while the fall they observed a few weeks before term was said to be related to the hormonal changes that precede spontaneous labour.

Serum vitamin A levels during pregnancy may be related to increased demand by the fetus. Vitamins are nutrients needed for metabolic processes occurring in the fetus. While the maternal system is already established, the fetus is dynamic and still growing. Consequently, the demands for weight increase may affect them.

To what extent are the values obtained in these studies an index of vitamin intake? Nigerian diet with its abundance of vegetable oils is not deficient in vitamin A. Administration of extra vitamin A during pregnancy is not common in obstetric practice in this country. These results

are therefore likely to be characteristic of the individual to a greater extent rather than a reflection of individual intake of the vitamin (Caster and Mickelsen, 1955). Lund and Kimble (1943) suggested that the fall in serum vitamin A during pregnancy might be due to increased storage of vitamin A in the tissues. However, they also found that there was a correlation between vitamin A intake and plasma vitamin A levels.

The variations in the results of studies reported in the literature may not only be due to environmental and nutritional factors but may also be reflections of normal physiological patterns of vitamin metabolism in pregnancy. Baker *et al* (1975) in a study of vitamin profile of 174 mothers and newborn concluded that maternal vitamin titres were not greatly altered despite the haemodilution common in pregnancy. From our data, the serum vitamin A concentrations were not significantly affected by seasonal variations. This agrees with the findings of Lund and Kimble (1943).

In our study we obtained lower mean vitamin A concentrations in cord blood as compared to the corresponding maternal levels at parturition. Most vitamins cross the placenta but the ratio of the vitamin concentration in maternal as compared to fetal blood is different for different vitamins. However, Baker *et al* (1975) suggested that for a particular vitamin, the alteration in the normal maternal—to—neonate vitamin ratio may be an important indicator for identifying abnormalities in vitamin transport across the placenta.

Gal and Parkinson (1974) suggested that the sex of the fetus affected maternal circulating vitamin A. They found significantly higher levels in males than in females. In our study, we found that mothers with male babies had higher vitamin A concentration than mothers with female babies; also we found that the mean cord vitamin A concentrations were higher in males that females, but these differences were not statistically significant. We did not find any significant correlation between vitamin A concentrations and fetal birth weight.

In conclusion, we have provided data on vitamin A profile in normal pregnant Nigerian women and newborn. Further studies are in progress to help determine the vitamin levels in certain complications of pregnancy and the newborn.

Summary

Vitamin A levels were estimated in a group of healthy Nigerian women at various stages of pregnancy and at delivery. The results show that the levels of vitamin A fall with increasing gestation and at delivery the level of vitamin A was significantly lower than the levels at the second and first trimesters of pregnancy. Very low correlation was found between maternal and neonatal vitamin A levels. The vitamin A level in the newborn was significantly lower than in the maternal blood. There were no significant correlations between vitamin A levels, infant sex and birth weight.

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