Vitamin A Status in Healthy Kuwaiti Newborn and Their Mother Pairs Selected from a Local Hospital Population

Abdul Majid Molla^a Majeda Sabri Hamoud^b Wasfi Abdul Jalil^b
Ayesha Molla^c P.N. Sharma^a Brahm Swaroop Srivastava^a

Departments of Paediatrics, ^aFaculty of Medicine, Kuwait University and ^bAl-Adan Hospital, and ^cDepartment of Medical Laboratory Science, Faculty of Allied Health and Nursing, Kuwait University, Kuwait

Key Words

Retinol · Chromatography · Infection

Abstract

Objectives: Both clinical and subclinical vitamin A deficiency has substantial impact on the mortality and morbidity of infectious diseases among children. We prospectively studied the serum retinol level in 200 neonates and their mothers at the Al-Adan Hospital in Kuwait. **Methods:** Five millilitres each of cord blood and maternal venous blood were collected at the time of delivery. Serum was separated and transported under specified conditions to the laboratory. Serum retinol was estimated using high performance liquid chromatography. **Results:** Mean serum retinol levels of both babies and mothers were found to be adequate, being 48 and

57 µg/dl, respectively. Significant correlation ($p < 0.01$) was obtained between serum retinol levels for the babies and their mothers.

Conclusion: The results of this study demonstrate that vitamin A deficiency is not present among the neonates and their mothers studied. A larger population survey is recommended in some high risk areas of Kuwait.

Introduction

Vitamin A deficiency is one of the major nutritional problems in the world. According to a recent estimate, 25–30 million children suffer annually from vitamin A deficiency. Five million of them develop xerophthalmia and 250,000–500,000 become blind [1]. Vitamin A deficiency occurs largely in underde-

KARGER

Fax + 41 61 306 12 34
E-Mail karger@karger.ch
www.karger.com

© 1999 S. Karger AG, Basel
1011–7571/99/0081–0040\$17.50/0

Accessible online at:
<http://BioMedNet.com/karger>

Abdul Majid Molla
Department of Paediatrics
Faculty of Medicine, Kuwait University
PO Box 24923
13110 Safat (Kuwait)

veloped countries among poorer children whose diets are deficient in carotene-containing vegetables, animal products and fat. Repeated episodes of diarrhoea and other infectious diseases, especially measles, may precipitate keratomalacia [2]. Administration of large doses of vitamin A to children with measles reduces mortality [3, 4]. Children with signs of vitamin A deficiency are at higher risk of death than normal children [5, 6]. Recently, the role of vitamin A in the reduction of child mortality has been increasingly recognized. A controlled field trial in Indonesia reported a 34% reduction in mortality among pre-school children, when their diet was supplemented with large doses of vitamin A [7]. In India, mortality among pre-school children was lowered by 40% upon distribution of small weekly doses of vitamin A [8]. More recently, the anti-infective property of vitamin A has received attention. Vitamin A appears to enhance survival during acute phases of severe infection as evidenced by studies on measles. Case fatality among children with moderate to severe measles has been reduced by 50%, through the use of oral vitamin A therapy on admission to hospital [8, 9]. In survivors, the severity of acute illness is modulated and is associated with rapid recovery [10]. Vitamin A-deficient animals survive longer in germ-free environment than in a conventional environment [11]. Recently, the association between subclinical vitamin A deficiency and respiratory infection among children has been reported. In Kuwait, children with respiratory tract infection occupy almost 20% of the beds in all hospitals, during every winter. There are no data available on vitamin A status of the Kuwaiti population. Therefore, a pilot study was conducted among Kuwaiti newborns and their mothers to estimate the vitamin A status among this population, before embarking upon an intervention study.

Subjects and Methods

The study was carried out in Al-Adan Hospital, located 40 km south of Kuwait City, during January 1995 to December 1995. A random paired sample of 200 full-term neonates born by vaginal delivery and their mothers were included in the study. Adan is one of the underprivileged areas in Kuwait and was considered appropriate for this study, as the risk of subclinical vitamin A deficiency is more likely in this population. The study was approved by the Research Review Committee of Kuwait University, which also approved the ethics involved in the study. Informed consent was obtained from the mothers of the newborns.

Laboratory Analysis

About 5 ml each of cord blood and maternal venous blood were collected at the time of delivery. The samples were divided into a tube containing EDTA for estimation of haemoglobin and haematocrit, and into a neutral tube for estimation of serum retinol. The EDTA sample was sent to the haematology Department at the Al-Adan Hospital and the neutral tube sample was transferred to the Paediatric Departmental Laboratory at the Faculty of Medicine, Jabriya, in a thermos containing ice. Serum samples were separated, flushed with nitrogen gas, and stored at -70°C until retinol estimation was done within 8 weeks of collection. Transportation and serum separation were done within 4 h of collection. Storage and analysis were done avoiding direct exposure to light. Serum retinol was estimated in duplicates using high performance liquid chromatography according to the method described by Bieri et al. [12]. Quality control serum was analysed for each set of test sera evaluated. The coefficient of variation of the retinol results obtained on different days ranged from 7 to 9%. Haemoglobin and haematocrits were analysed using standard methods at the Al-Adan Hospital laboratories. Serum retinol levels of <10 , $10\text{--}19$ and ≥ 20 $\mu\text{g/dl}$ were considered as deficient, low, and adequate, respectively.

Statistical Analysis

SPSS 6.1 on PC WINDOWS program was used for statistical analysis and graphical presentation. Pearson's correlation coefficients were calculated to find out if there was an association between serum retinol level and other variables.

Fig. 1. Distribution of serum retinol among newborn babies.

Table 1. General information of 200 newborns and their mothers included in the study

Variables	Mean	SD	Range
Maternal age, years	27.19	6.17	17–44
Pregnancy, n	2.98	2.54	1–13
Maternal Hb, g/dl	11.64	1.38	6.30–16.80
Maternal Hct, %	34.87	6.9	11.20–49.90
Baby's Hb, g/dl	14.89	1.53	10.2–19.10
Baby's Hct, %	44.59	8.9	32.50–58.40
Gestation, weeks	38.95	4.77	31–42
Baby's weight, kg	3.29	0.43	2.27–4.48
Maternal serum retinol, µg/dl	57.00	23.72	10.17–183.50
Baby's serum retinol, µg/dl	47.59	21.02	5.0–132.0

Results

The clinical and physical characteristics of the babies and their mothers are presented in table 1. Mean serum retinol levels for both babies and mothers were adequate being 48 and 57 µg/dl, respectively. Only 2 of the neonates (1%) had serum retinol level of less than

10 µg/dl, which, however was improved to a normal level (>20 µg/dl) as demonstrated by a repeated estimation after 1 month. A histogram with a normal curve for the neonate's serum retinol level is shown in figure 1. Besides a few outliers the distribution of retinol values is normal. A significant ($p < 0.01$) correlation with a correlation coefficient $r =$

Fig. 2. Correlation between the serum retinol of the newborns and their mothers.

0.614 was obtained between serum retinol levels for the babies and their mothers (fig. 2). There was no correlation between the baby's serum retinol level to their birth weights, or to their mother's age, or haemoglobin levels and number of pregnancies, respectively.

Discussion

Vitamin A deficiency occurs largely among the children of the poorer countries, where diets are deficient of carotene-containing vegetables, animal products and fat. Repeated episodes of diarrhoea and other infectious diseases deplete the vitamin A stores and increase the vitamin A requirements [10]. This has been proved by reduction of mortality in children due to pneumonia and measles after supplementation with large doses of vitamin A [3]. Vitamin A supplement has provided substantial positive results only in those countries and among children with gross vitamin A

deficiency, malnutrition and enormous disease burden [11, 12]. More important is the impact of subclinical vitamin A deficiency which is clinically not apparent, but can influence the course and outcome of infectious diseases [13]. It is therefore important to remember that in a country like Kuwait, gross vitamin A deficiency is unlikely to exist. But other nutritional deficiency disease, e.g. nutritional rickets, are not uncommon in Kuwait and some other gulf countries [14, 15]. Patients with nutritional rickets demonstrate deterioration of total nutritional status [16]. The quality of weaning diets of these children is poor. Therefore, it is possible that a specific target group, if studied carefully, may reveal deficiency of vitamin A. The peak incidence of illness among the children due to infections of the respiratory tract in Kuwait, though common throughout the year, occurs during the winter months, e.g. November to February, and most of the paediatric beds are occupied by children suffering from respiratory

tract illness. Some of these children very often are very sick. The social and dietary habits of the local population are showing a changing pattern with increasing affluency. All sectors of the population do not follow uniform child rearing practices in Kuwait. The weaning diet of young children and its quality has not received adequate attention. Therefore, it is important to carry out a comprehensive study to clearly define that vitamin A deficiency does not exist in this country. The present study, a relatively small one, is unlikely to find vitamin A deficiency in neonates or their

mothers. The objective of this study was to assess the status in this specific group of population. A larger study involving children of the vulnerable group is recommended within Kuwait.

Acknowledgements

The authors gratefully acknowledge the generous co-operation of Dr. Khidr Al-Najdi, Chairman, Department of Paediatrics, Al-Adan Hospital, during this study.

References

- 1 Sommer A: Large dose vitamin A to control vitamin A deficiency. *Int J Vitamin Nutr Res* 1989(suppl 30): 37-41.
- 2 Bloem MW, Wedel M, Egger RJ, Speck AJ, Schrijver JAAP, Kontha SS, Schreurs WHP: Mild vitamin A deficiency and risk of respiratory tract diseases and diarrhea in pre-school and school children in Northern Thailand. *Am J Epidemiol* 1990;131:332-339.
- 3 Sommer A, Katz J, Tarwotjo I: Increased risk of respiratory disease and diarrhea in children with pre-existing vitamin A deficiency. *Am J Clin Nutr* 1984;40:1090-1095.
- 4 Hussau GD, Klein MA: A randomized controlled trial of vitamin A in children with severe measles. *N Engl J Med* 1990;323:160-164.
- 5 Sommer A, Djunaedi E, Loeden AA, et al: Impact of vitamin A supplementation on childhood mortality. *Lancet* 1986;i:169-173.
- 6 Cohen M, Rahman H, Sprague J: Prevalence and determinants of nutritional blindness in Bangladeshi children. *World Health Stat Q* 1985; 38:317-330.
- 7 Green HN, Mellanby E: Vitamin A as an anti-infective agent. *BMJ* 1928;20:691-696.
- 8 Rahmatullah L, Underwood BA, Thulasiraj RD, Milton RC, Swamy KR, Rahmatullah R, Babu G: Reduced mortality among children in southern India receiving a small weekly dose of vitamin A. *New Engl J Med* 1990;323:929-935.
- 9 Herrera MG, Nestle P, El Amin A, Fawzi WW, Mohammed KA, Weld L: Vitamin A supplementation and child survival. *Lancet* 1992;340: 267-271.
- 10 Humphrey JH, West KD Jr, Sommer A: Vitamin A deficiency and attributable mortality under 5 year old. *Bull World Health Organ* 1992; 70:225-232.
- 11 Rogers WE, Bieri JG, Mc Daniel EG: Vitamin A deficiency in germ free state; in Deluca HP, Suttie JW (eds): *The Fat Soluble Vitamins*. Madison, University of Wisconsin Press, 1969, pp 241-255.
- 12 Bieri JG, Tolliver TJ, Catignani GL: Simultaneous determination of alpha-tocopherol and retinol in plasma and red cells by high pressure liquid chromatography. *Am J Clin Nutr* 1979;32:2143-2149.
- 13 Barclays AJG, Foster A, Sommer A: Vitamin A supplements and mortality related to measles: A randomised clinical trial. *BMJ* 1987;294:294-296.
- 14 Fawzi WW, Herrera MG, Willet WC, Nestle P, Elamin A, Mohammed KA: Dietary vitamin A intake and the incidence of diarrhoea and respiratory infection among Sudanese children. *J Nutr* 1995;125: 1211-1221.
- 15 Lubani MM, Shab TS, Al-Saleh QA, Sharda DE, Quattawi SA, Heavy PC: Vitamin D deficiency rickets in Kuwait: The prevalence of a preventable disease. *Ann Trop Paediatr* 1987;3:134-139.
- 16 Sidrani SH, Elidrissy AWTH, El-Arabi AM: Sunlight and vitamin D status in normal Saudi subjects. *Am J Clin Nutr* 1983;38:129-132.
- 17 Elidrissy AWTH: Vitamin D deficiency rickets in Saudi Arabia; in Gloriens FH (ed): *Rickets*. Nestlé Nutrition Workshop Series. New York, Raven Press, 1991, vol 21, pp 223-233.
- 18 Molla AM, Badawi M, Yaish S, et al: Nutritional rickets in the children of Kuwait. *Abstr Annu Conf Kuwait Med Assoc*, 1997.