

## Original Article

# Correlation between Body Weight and Serum Albumin Concentration in Premature Infants

Shabih Manzar, Arun Kumar Nair, Mangalore Govind Pai, Saleh M Al-Khusaiby  
Neonatal Intensive Care Unit, Royal Hospital, Muscat, Sultanate of Oman

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## ABSTRACT

**Objective:** Albumin is the most abundant protein in human plasma, exerting 75 to 80% of the normal colloid osmotic pressure. Its normal concentration is required for many of the physiological effects in the body. Premature babies are reported to have low serum albumin. However, it is not clear that this is weight related. To look into the relationship between the body weight and albumin in premature infants we selected a group of extremely low birth weight (ELBW) infants, defined as birth weight of less than 1000 grams, having the available data.

**Methods:** The study was carried out at the Neonatal Intensive Care Unit (NICU) of Royal Hospital, Muscat. All ELBW infants admitted during the period from January 2000 to October 2003 were reviewed for the level

of serum albumin concentration in the first 48 hours. The required data were extracted from the computer database in the NICU. A total of 90 ELBW infants, out of 114 ELBW admissions during the specified study period had complete information.

**Results:** The birth weight of ELBW infants ranged from 490 to 990 grams with a mean of  $845 \pm 107$  grams. The mean serum albumin concentration among the cohort was noted to be  $22 \pm 4$  g/L with a range varying from 12 to 33 g/L. No significant correlation ( $r = 0.13$ ,  $p = 0.21$ ) was noted between the birth weight and albumin concentration.

**Conclusion:** There is no correlation between the body weight of premature infants and the serum albumin concentration.

**KEYWORDS:** albumin, birth weight, extremely low birth weight (ELBW) infants, hypoalbuminemia, premature infants

## INTRODUCTION

Albumin is a 66-kDa protein and is the most abundant protein in the human plasma, exerting 75 to 80% of the normal colloid osmotic pressure<sup>[1,2]</sup>. One unique aspect of albumin's biological function is its antioxidant and anti-inflammatory property<sup>[3]</sup>. Albumin is important in regulating the fluid distribution, binding and transporting an array of ligands including steroids, fatty acids, bile pigments, metal ions, nitric oxide and drugs<sup>[4]</sup>. Serum albumin has been used, in addition to pre-albumin and total protein, as a marker of nutritional status in patients recovering from illnesses<sup>[5,6]</sup>. As compared to adults and children, a relatively lower serum value is reported in premature infants<sup>[7-9]</sup>. However, it is not clear that this is weight related. Theoretically, a positive relationship is expected between the weight and serum albumin based on the fact that smaller body mass reflects less stores of protein and vice versa. Also, it has been documented that in newborn infants, low albumin reflects poor nutritional status<sup>[10]</sup>. Thus, low albumin is expected with lower weight. Similarly, premature babies are stressed, which is known to effect the serum albumin by

activating catabolism through the surge of cortisol<sup>[11]</sup>. This study was carried out to look into the relationship between body weight and albumin in the premature extremely low birth weight (ELBW) infants.

## METHODS

The study was conducted in the Neonatal Intensive Care Unit (NICU) at Royal Hospital in Muscat during the period from January 2000 to October 2003. The NICU comprises of 30 beds. It provides level III-IV care for all high-risk neonates including general and cardiac surgery. It is the main tertiary center of the region with birth rate of 5,000 annually. In the NICU, details of all the admissions and discharges / deaths are kept both as case files in the Medical Records Department and on the computer database using Visual D base Program. For this study, the data was extracted from the computer database. All extremely low birth weight infants (defined as those with the birth weight of less than 1000 grams) were reviewed for the serum albumin concentration. Limited search was performed using the database. The selected fields

Address correspondence to:

Dr. Shabih Manzar, Division of Neonatology, John H. Stroger Jr. Hospital, 1969 West Ogden Chicago, Illinois 60612, USA. Tele/ Fax : 312-864-4043, E-mail: shabihman@hotmail.com

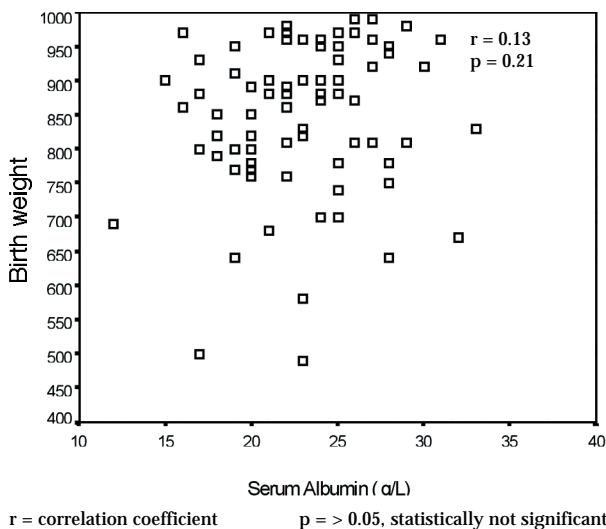


Fig. 1: Scatter diagram graph suggesting no correlation between serum albumin and birth weight

were the birth weight (set for < 1000 grams) and the identification number. After retrieving the list, the corresponding serum albumin concentration for each infant was obtained by putting the identification number in the investigation module of the online hospital data storage system (Medicom). Our unit follows a restrictive blood draw policy for ELBW infants. Full blood count is done routinely at birth while Urea and Electrolytes (UE1) and Liver Function Test (LFT) are done after 24 but within 48 hours.

Only 90 ELBW infants, out of a total of 114 ELBW admissions during the specified study period had complete information needed for the study. The serum albumin concentration were reported in International System of Units (SI) as g/L by our laboratory using auto-analyser technique, ALEX 20, USA. As the study did not require any intervention on the infants and no extra sampling, informed parental consent and formal approval from the Institution Review Committee was not considered necessary. No external or internal funding was used for the study. The mean, frequencies and correlation were calculated using the statistical package for social sciences (SPSS version 7.5 for windows).

## RESULTS

The birth weight of ELBW infants ranged from 490 to 990 grams with the mean of  $845 \pm 107$ . The mean serum albumin concentration among the cohort was noted to be  $22 \pm 4$  g/L with a range varying from 12 to 33 g/L. No significant correlation ( $r = 0.13$ ,  $p = 0.21$ ) was noted between the birth weight and albumin concentration (Fig. 1).

## DISCUSSION

The mean serum albumin concentration of 22 g/L among the ELBW infants, as observed in the study, is lower than the cut-off value of 30 g/L used in previous research reports for defining hypoalbuminaemia<sup>[7,8]</sup>. However, our finding of lower ranges of serum albumin is in agreement to the figures reported by Siner and Newman<sup>[9]</sup>. Thus, in the light of our findings, the definition of hypoalbuminaemia as values less than 30 g/L in ELBW infants seems unjustified and requires critical evaluation. We suggest a level of 20 g/L as the lower limit basing on the fact that mean value was noted to be 22 g/L and only 18 infants (20%) had values lower than 20.

We observed no significant relationship between the birth weight and serum albumin concentration. This suggests that body weight alone cannot be taken as surrogate for serum albumin concentration and should not be used to predict the serum albumin concentration. The possible mechanism for this sparing effect on albumin could be explained by the findings of Yudkoff *et al*<sup>[12]</sup>. They described an adequate synthetic capacity for albumin among premature infants and attributed the relative lower serum albumin to rapid turn over rather than low synthesis.

It is worth mentioning that further studies should be carried out to look into the serum albumin in infants weighing more than 1000 grams at birth and performing a comparison between the groups. Also important is to compare serum albumin based on gestational age and gender, including both male and female infants.

In conclusion, although there is a tendency among neonatologists to assume low albumin based on weight of the neonate, in view of the present study, this assumption seems to be invalid. We suggest a larger study with inclusion of neonates with gestational age ranging from 24- 42 weeks to further confirm our findings.

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