www.jmscr.igmpublication.org
Impact Factor 5.84
Index Copernicus Value: 83.27
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v5i5.175

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Original Article

Relationship Between Urinary Microalbumin and Allied Renal Function Tests in Children with Bronchopneumonia

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Abstract
Aims and objective: *To determine urinary microalbumin and allied renal function tests in children with bronchopneumonia.*
Material and Methods: *Bronchopneumonia patients selected from pediatric ward, Padmbhushan Vasantdada Patil General Hospital, Sangli as well as General Hospital, Miraj. The study group comprised of 30 children with bronchopneumonia and control group of 30 children matching in age and sex. Patient's blood and urine samples were subjected to estimation of serum urea, creatinine, uric acid, sodium, potassium, and urinary total protein, and microalbumin by using commercial kits.*
Results: *Serum urea, creatinine, uric acid, sodium and potassium levels were significantly altered in children with bronchopneumonia and excretion of total protein and microalbumin were increased.*
Conclusion: *These findings suggest that urinary microalbumin and renal functions were altered due to may be renal insufficient antidiuretic hormone (ADH) secretion and hypoxia.*
Keywords: *Bronchopneumonia, microalbuminuria, renal function tests.*

Introduction

The state of the world's children is the best measure of the human well-being, and the health of the children is the best measure of the health of our planet. Clearly, neither planet earth nor children are in a healthy state. The largest single cause of childhood illness and death is disease caused by unsafe water and poor or non-existent sanitation[1].

Pneumonia refers to acute inflammation of the lungs. It is one of the most serious infectious diseases. The condition becomes complicated if both the lungs are affected. It is called double pneumonia in common parlance. The World Health Organization has categorized this disease as a leading killer of infants and children, particularly in developing countries like India [2].

Renal function assessment is important for clinical management of patients and for intervention studies. It has specific issue in children because most parameters are influenced by age, body size and the level of renal function itself [3]. More importantly, microalbuminuria has been found to be predictive of mortality in a heterogeneous group of critically ill patients [4]. In our present study, we have made an attempt to throw light on alteration of renal function in patients with bronchopneumonia, and correlate the biochemical parameters.

Material and Methods

Thirty children with bronchopneumonia (seventeen boys, thirteen girls) were admitted in pediatric ward, Padmbhushan Vasantdada Patil General Hospital, Sangli / General Hospital, Miraj and composed the study group. The control group consisted of 30 children matching in age and sex without a history of acute illness or renal disease.

Patients with cardiac disease, hepatic disease, diabetes mellitus, septicemia, and human immunodeficiency virus (HIV) infection were excluded from the study. A radiological evidence of pneumonia was present in all patients. The details such as history, treatment, reports of routine investigations like complete blood count, blood pressure, blood sugar and urine report were recorded. The study was conducted as per approval of Institutional Ethical Committee, Govt. Medical College, Miraj.

Blood Sample Collection

Venous blood samples were collected in test tube with aseptic precautions. After 2 hours of collections sample was centrifuged at 3000 rpm for 5 minutes. Serum was separated and collected in polythene tube with cork. The serum sample with no sign of hemolysis was used for the analysis of urea, creatinine, uric acid and electrolytes.

Urine Collection

After collection of blood sample, early morning urine sample were collected on the next day. To avoid contamination, morning urine sample were collected in sterile 10ml polythene wide mouth container. The fresh urine sample was collected and part of which diluted for urea and creatinine estimation. Remaining urine was taken into plain polythene tube with cork as well as sodium azide as a preservative, for estimation of total protein and microalbumin. Also urine centrifuged and clear supernant used for estimation of microalbumin.

Serum urea was estimated by diacetylmonoxime method [5]. The concentration of creatinine was measured by Jaffe's colorimetric method [6]. Serum uric acid was estimated by the method of Uricase–PAP (peroxidase, 4-aminophenazone, dichlorophenol) method [7]. Serum electrolytes concentrations were measured by flame photometer [8]. Urinary total proteins and microalbumin were estimated by pyrogallol red method [9] and immunoturbidimetric method [10] respectively by using commercial kits. The concentration of total proteins and microalbumin in urine were expressed as µg/mg urinary creatinine.

Statistical Analysis

Numerical variables were reported in terms of mean and standard deviation. Statistical analysis of results was done by normal distribution 'z' test. In this analysis, variables showing 'p' value less than 0.05 and 0.001 were considered to be statistically significant and highly significant respectively. Pearson correlation test was used to test correlation.

Results

The present study show that thirty children with bronchopneumonia of which 56% males and 44% females. The age and sex wise distribution of normal control and study cases are shown in Table 1.

Table 1 – Age and sex wise distribution of normal control group and children with bronchopneumonia

Subjects	Sex	n	Age in years	Percentage of participation
Normal control (n = 30)	Male	19	2.58 ± 0.82	63%
	Female	11	1.92 ± 1.47	37%
Bronchopneumonia Patients (n = 30)	Male	17	1.73 ± 0.65	56%
	Female	13	2.91 ± 1.09	44%

On comparison, concentrations of urea ($P < 0.001$), creatinine ($P < 0.001$), uric acid ($P < 0.001$), potassium ($P < 0.05$) in sera sample were found to be significantly higher whereas, serum sodium levels showed statistically significant ($P < 0.05$) decrease in patients with bronchopneumonia as compared to control group shown in Table 2.

Table 2 - Serum profile: renal function tests in controls and children with bronchopneumonia

Parameters	Control (n = 30)	Bronchopneumonia patients (n = 30)
Urea (mg/dL)	20.5 ± 2.22	28.5 ± 6.56**
Creatinine (mg/dL)	0.67 ± 0.07	0.94 ± 0.31**
Uric Acid (mg/dL)	4.42 ± 0.28	6.33 ± 0.31**
Na^+ (mmol/L)	141 ± 2.02	129 ± 4.13*
K^+ (mmol/L)	4.15 ± 0.25	4.77 ± 0.48*

** $P < 0.001$ * $P < 0.05$

Table 3 depicted urinary total proteins and microalbumin levels were found to be significantly higher ($P < 0.001$) in bronchopneumonia study group as compared to control group.

Table 3 - Urine profile: renal function tests in controls and children with bronchopneumonia.

Parameters	Control (n = 30)	Bronchopneumonia patients (n = 30)
Total Protein (µg/mg creatinine)	85.48 ± 26.28	458.6 ± 144.2**
Microalbumin (µg/mg creatinine)	26.37 ± 4.16	95.88 ± 21.68**

** $P < 0.001$

Table 4 shows that, urinary microalbumin was found to be positively correlated with serum urea, creatinine, uric acid, potassium, and correlation between them was statistically significant. On other hand, negative and highly significant correlation was found between urinary microalbumin and serum sodium levels in our study group.

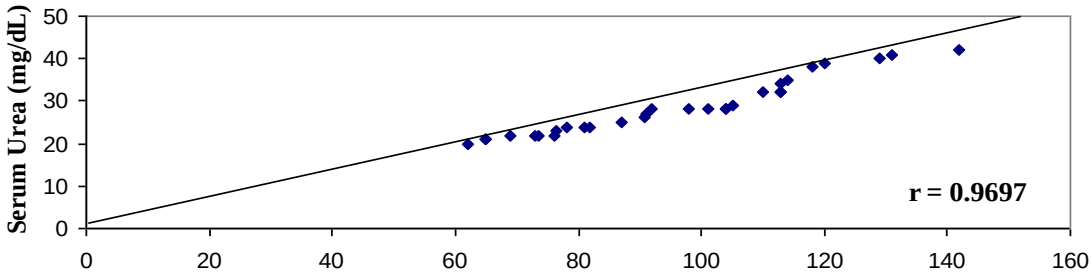
Table 4 - Correlation of urinary microalbumin with serum urea, creatinine, uric acid, electrolytes in subjects with bronchopneumonia.

Parameters	r	p
Serum urea (mg/dL)	+ 0.9697	< 0.001
Serum creatinine (mg/dL)	+ 0.7072	< 0.001
Serum uric acid (mg/dL)	+0.3173	< 0.05
Serum Na^+ (mmol/L)	- 0.9772	< 0.001
Serum K^+ (mmol/L)	+ 0.9658	< 0.001

Discussion

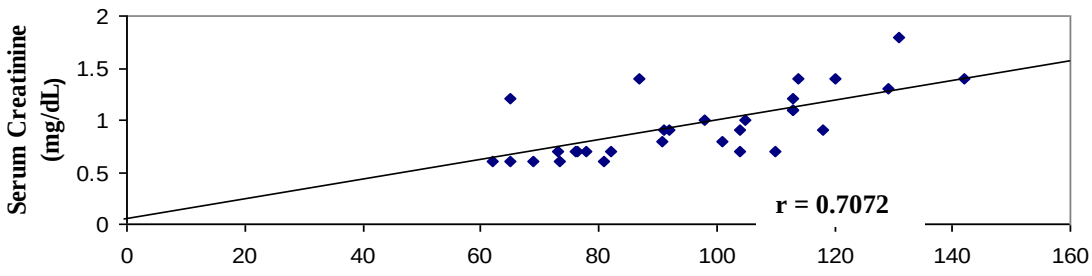
Our results show that there was significant change in renal function tests in patients with bronchopneumonia. Hyperuricemia and microalbuminuria, found in such patients in our study.

Fig 1-Correlation between urinary microalbumin and serum urea in patients with bronchopneumonia.



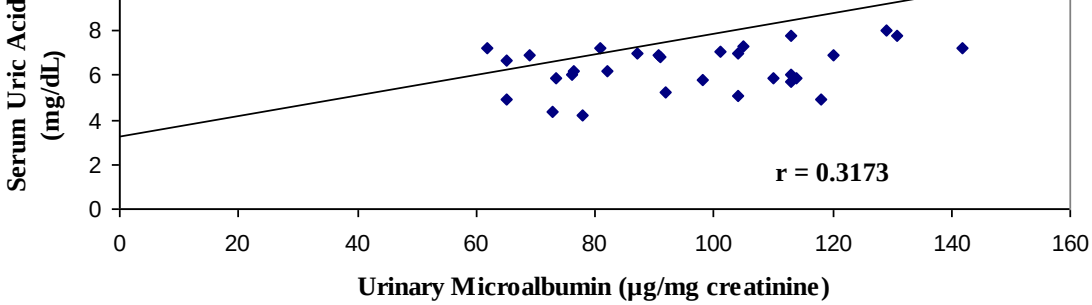
Urinary microalbumin level was significantly increased (p<0.001) in children suffering from bronchopneumonia, which positively correlated with urea, creatinine, uric acid, potassium in serum, alteration of concentration of these parameters suggest that the risk of overt renal complications. In pneumonia with transient albumin excretion was reported. Direct infection of the kidneys or an immunologic mechanism may have been the underlying cause. [11, 12]

Fig 2-Correlation between urinary microalbumin and serum creatinine in patients with bronchopneumonia.

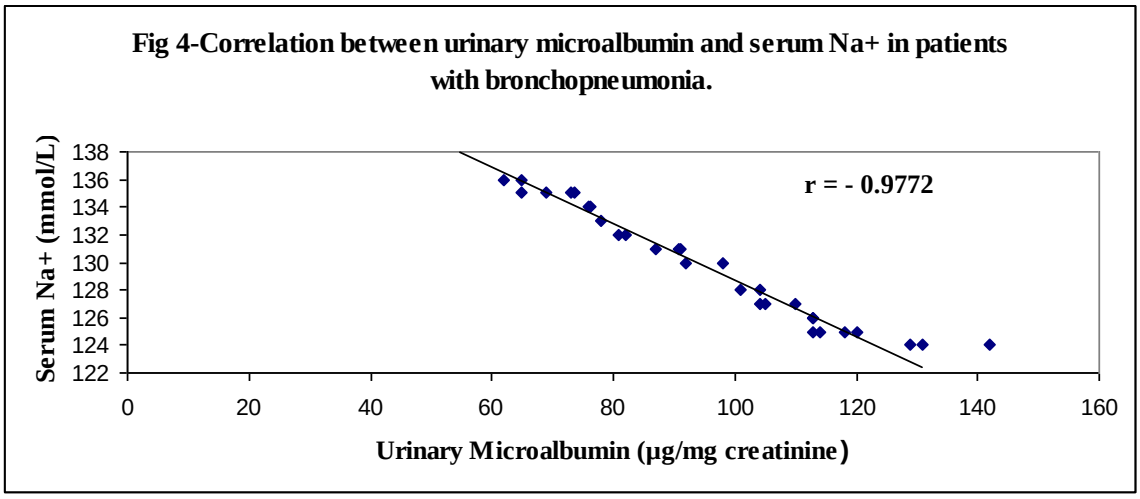


There was increase serum creatinine (p<0.001) and uric acid (p<0.001) levels in the patients with bronchopneumonia in our study. Hypoxemia was reported in 90% patients with acute phase pneumonia in the study of Singhi S, et al. (2005) [13].

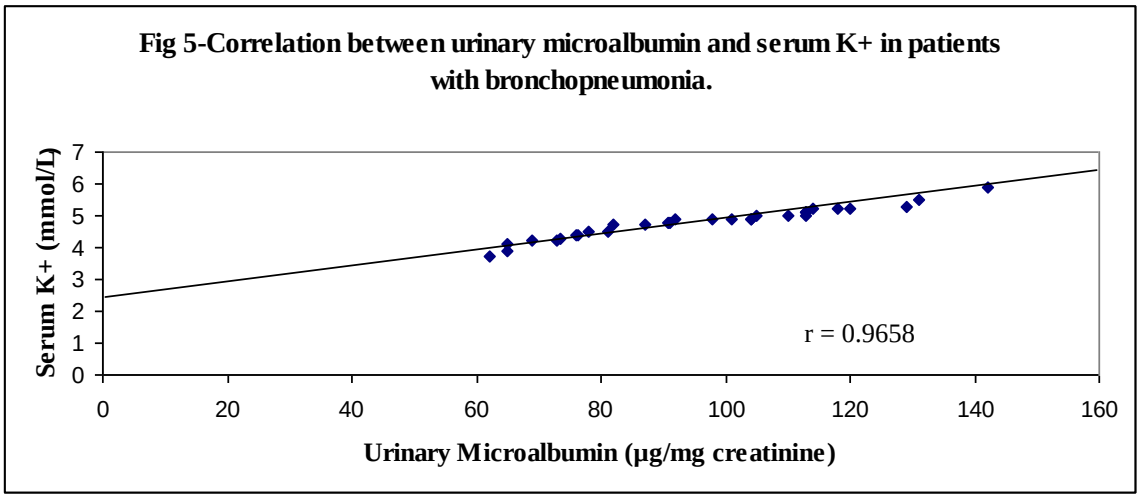
Fig 3-Correlation between urinary microalbumin and serum uric acid in patients with bronchopneumonia.



Thus hypoxemia is an important causative factor which can increase serum uric acid level. Organic acidemia due to lactic acidosis may interfere with tubular secretion of urate and can cause elevation of serum uric acid concentration [14]. This showed that there was mild impairment in renal functions.



Our findings suggest that all patients with bronchopneumonia were hyponatremic (serum $Na^+ \leq 136$) and 14 patients were hypokalemic ($K^+ \leq 3.5$ mmol/L). Electrolyte disturbances especially hyponatremia was reported in pneumonia. Water retention, increase in plasma volume and hyponatremia were seen in association with pneumonia [15] Our results are similar to Singhi S et al. (1992) and Nair V, et al. (2007) where they observed disturbances in electrolyte levels in children with lower respiratory tract infection [16, 17].



We observed, positive and significant correlation between urinary microalbumin and serum urea, creatinine, uric acid, and potassium levels in patients with bronchopneumonia shown in figure 1, 2, 3, and 5 respectively. Negative and significant correlation found between urinary microalbumin and serum sodium (figure 4). These correlations suggest that urinary microalbumin and renal functions were altered may be due to renal insufficient antidiuretic hormone (ADH) secretion and hypoxia. This may be explaining correlations in between them.

Conclusion

From this study we conclude that these biochemical tests are of paramount importance in the treatment of bronchopneumonia. Further study in more number of patients and follow up

experiments will is essential. Hence, it is necessary to perform these tests routinely to avoid progression of disease like end stage renal disease in children with bronchopneumonia.

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