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$\beta_2$ Microglobulin is a low molecular weight protein whose only site of excretion and catabolism is kidney. It is readily filtered across the glomeruli. In mature kidney approximately 99.9% of the filtered $\beta_2$ Microglobulin is reabsorbed by the tubules so that normal urine contain very low concentration of the protein. The kidney of full term neonates has a well developed capacity to reabsorb $\beta_2$ Microglobulin. Reabsorption of $\beta_2$ Microglobulin is limited to proximal tubule which has high reabsorptive capacity for the protein. In consequence elevated plasma level of $\beta_2$ Microglobulin even though they result in increased filtered load of the protein are not translated into increased urinary level of $\beta_2$ Microglobulin. With these characteristic, it has been proposed that $\beta_2$ Microglobulin can serve as a sensitive marker for detecting the proximal tubular damage. We carried out a study to see the validity of this hypothesis.

In our study, there were two groups, control group consisted of 15 full term healthy neonates and study group which consisted of 45 sick neonates, which included neonates with birth anoxia,
meconium aspiration and septicemia. Premature infants were excluded due to immaturity of renal function.

Gestational age of neonates was calculated by counting the number of weeks from the first day of last menstrual period till the birth of baby, and by physical and neurological examination (Ballard scoring). In the present study mean gestational age to study group was $38.13 \pm 6$ weeks in comparison to control whose mean gestational age was $38.04 \pm 1.04$ week. Mean weight of study group was $2760 \pm 346$ gm in comparison of control group where mean weight was $2768 \pm 330$ gm. On calculating p-value no statistical significant difference was observed in two groups in term of weight and gestational age.

On analyzing the result of our study we observed that $\beta_2$ Microglobulin value were significantly elevated in study group on day 1, 3 and 7 in comparison to control group. The value of $\beta_2$ Microglobulin in study group. were $8.8. \pm 5.8$mg/L, $7.01 \pm 3.16$mg/L and $5.8 \pm 2.5$mg/L on day 1,3 and 7 respectively in comparison to study group where the respective values were $1.43 \pm 1.03$mg/L, $1.49 \pm 1.08$mg/L and $1.55 \pm 1.02$mg/L.

Similar finding were observed by K.P. Mehta, U.S. Ali, L. Shankar in there study 'Renal dysfunction detected by $\beta_2$ Microglobulin in sick neonates' carried out in 1996 at Wadia
Hospital, Bombay. In their study, they studied 46 sick neonates and 40 healthy term neonates served as control. Urinary $\beta_2$ Microglobulin was estimated in both the groups on day 1 and 3 by radioimmunoassy. On comparing these values statistical significant elevation of $\beta_2$ Microglobulin were, noted in study group in comparison to control group irrespective of the primary diseases, which is similar to our observation. In their study, the mean values of $\beta_2$ Microglobulin were $12.1 \pm 9.7 \text{mg/L}$ and $10.2 \pm 11.0 \text{mg/L}$ respectively in study group on day 1 and 3 in comparison to control group where corresponding values were $1.58 \pm 0.30 \text{mg/L}$ and $1.27 \pm 0.28 \text{mg/L}$.

Similar result were observed by Tack et al in 1987 in his study 'Renal injury in sick newborn: A prospective evaluation using urinary $\beta_2$-microglobulin concentration', in this study he study 140 sick neonates out of which 109 were asphyxiated and 35 were healthy neonates. $\beta_2$ microglobulin were measured in both groups on day 1 and 3. In study group average $\beta_2$ Microglobulin concentration, comes out to be $10 \pm 10.4 \text{mg/L}$ and $8.32 \pm 7.27 \text{mg/L}$ on day 1 and 3 respectively in comparison to control group where corresponding values were $1.34 \pm 1.34 \text{mg/L}$ and $1.32 \pm 0.98 \text{mg/L}$. On calculating p value statistical significant difference was observed in two groups.
Now we consider several possible cause for an elevated urinary $\beta_2$ Microglobulin in these sick neonates including immaturity of renal function, increase production of $\beta_2$ Microglobulin or proximal tubular damage.

Aperia A, Broherger U conducted a study 'beta microglobulin as an indicator of renal tubular maturation and dysfunction in the newborns' and concluded that tubular reabsorptive capacity for $\beta_2$ Microglobulin are fully developed in neonates by 35 weeks of gestation age. Another similar study was carried out by Takieddine F 'Fetal renal maturation studies using urinary $\beta_2$ microglobulin' and showed that renal handling of $\beta_2$ microglobulin are fully mature by 36 weeks of gestation. Since our study included full term neonates with mean gestational age of 38 weeks the likelihood of renal immaturity as a cause of increase urinary $\beta_2$ Microglobulin is unlikely.

Other cause of increased urinary $\beta_2$ Microglobulin could be high serum $\beta_2$ Microglobulin value in sick neonates. Bric D in his study of $\beta_2$ Microglobulin in sick neonates compared the serum $\beta_2$ Microglobulin values with urinary $\beta_2$ Microglobulin and observed that there is no direct co-relation in these two variables i.e. infants with the highest urinary $\beta_2$ microglobulin concentration were not those with most elevated blood levels of $\beta_2$
Microglobulin. This observation can be explained by the fact that tubular maximum for \( \beta_2 \) Microglobulin is very high, to take over this \( T_{\text{max}} \) serum \( \beta_2 \) Microglobulin value need to be elevated by 100 times. Because of this reason increased serum \( \beta_2 \) Microglobulin as a cause of increased urinary \( \beta_2 \) Microglobulin is unlikely.

The most likely explanation for the observed increased urinary \( \beta_2 \) Microglobulin concentration in sick infants is that these infant has a pathological lesion in proximal convoluted tubule which decrease renal tubular reabsorption of \( \beta_2 \) Microglobulin. The proximal convoluted tubule which is the site for reabsorption of \( \beta_2 \) Microglobulin is especially susceptible to hypoxic injury.

We further divided our study group into two subgroups Group A. included neonates with impaired renal function and Group B consisted of neonates with normal renal function test. Group A consisted of 11 (31%) neonates and Group B consist of 24 (69%) neonates. The value of \( \beta_2 \) microglobulin for group A and B were 9.26 ± 2.36mg/L and 5.63 ± 2.4mg/L respectively on day 3. When these values were compared with control group whose mean value was 1.27 ± 0.28mg/L, significant statistical difference was observed. This means that \( \beta_2 \) microglobulin values
were elevated significantly not only in those neonates who show abnormal renal function test but also in other sick neonates in which, standard renal function tests were normal. This indicates that $\beta_2$ microglobulin can detect subclinical renal injury that are missed by standard renal function tests. Similar result were observed by K.P. Mehta et al in his study 'Renal dysfunction detected by $\beta_2$ Microglobulin in sick neonates' where 90% of sick neonates had elevated $\beta_2$ Microglobulin but only 17% of these had abnormal standard renal function tests.