DISCUSSION

Congenital heart disease is the most common congenital disorder in newborns. They account for about thirty percent of all major birth defects. [1] CHD is one of the leading causes of perinatal and infant death from congenital malformations. [2] There are approximately 1.5 million new cases of CHD per year worldwide. [3] The reported incidence of congenital heart disease at birth ranges from six to thirteen per thousand live births. [4]

Etiology of CHD is multifactorial and a large collection of environmental and genetic causes have a role in its pathogenesis. [13]

Between 25% and 30% of children with CHD will have some form of additional congenital lesion, a comorbidity or structural extracardiac anomaly that may be immediately appeares. [18] However, comorbidity may have an important, even crucial, bearing on the course and outcome of the management of a child with a congenital heart lesion. [19]

The renal functions of patients with acyanotic congenital heart disease has been less studied, and relatively few studies have focused on renal function in infants and young children with congenital heart diseases. [36] Those studies have documented proteinuria, decreased renal blood flow, and decreased glomerular filtration rate. It has been documented that chronic cyanosis affects renal glomerular structure and function. The structural hallmark of glomerular injury in patients with congenital cyanotic heart disease has been described as glomerulomegaly, capillary dilatation, thickening of the capillary walls, focal or diffuse proliferation of mesangial cells, and segmental or global glomerulosclerosis. [37]

Serum and urinary biomarkers, both glomerular and tubular, play an important role in the early detection of renal damage. Urine as a diagnostic medium allows for noninvasive detection of biomarkers. Detection of renal tubular proteins and enzymes in the urine demonstrates a tubular involvement that leads to renal complications. [43]

In the present study, it was found that there was no significant difference between the studied groups regarding sex and age (Table 1, 2). Agras et al [55], studied 20 children with ACHD and 23 children with CCHD and 13 healthy children as control. Jianyong et al [36], studied 24 children with ACHD and 20 children with mild CCHD and 14 children with severe CCHD and 20 healthy children as control. Majid et al [56], studied 34 children with ACHD and 20 children with CCHD and 20 healthy children as control. In the three studies, there were no differences in demographic characteristics between the three studied groups.

In the present study the eGFR was proved that in acyanotic children below age of one year, there were no patients with GFR below normal range while in cyanotic corresponding age group, there were 2 of 13 patients (15.4%) showed abnormal values with significant difference to corresponding control group (Table 4). In subgroups above one year, there was 1 of 12 acyanotic patients (8.3%) showed abnormal value while 3 of 12 cyanotic patients (25%) showed GFR out of normal range with significant difference to both acyanotic and control groups (Table 5). Although, Agras et al [55], they found that GFR was found to be lower in the cyanotic group, the difference in the mean GFR values

among groups was not statistically significant. Also, Jianyong et al [36], they found that acyanotic patients group and severe cyanotic patients group did not have a significantly higher eGFR than mild cyanotic patients group. Majid et al [56], they found that there was no any relationship between the presence of cyanosis and GFR level. Though the three studies came as no significant difference between the two acyanotic and cyanotic groups, but they acknowledged that eGFR in cyanotic groups (severe cyanotic group in Jianyong et al [36]) was the lowest.

Regarding urinary albumin / creatinine ratio in the present study, it was found that in acyanotic children below age of one year, there was 1 of 13 patients (7.7%) with U Alb/Cr out of normal range while in cyanotic corresponding age group, there were 3 patients of 13 (23.1%) showed abnormal values (Table 6). In subgroups above one year, there were 2 of 12 acyanotic patients (16.7%) showed abnormal value while 4 of 12 cyanotic patients (33.3%) showed U Alb/Cr out of normal range. Both acyanotic and cyanotic subgroups with no significant difference to corresponding control subgroups (Table 7). Similarly, Agras et al [55], they found that both acyanotic and cyanotic groups had no significant difference to control group or to each other. Jianyong et al [36], they proved that there was no significant difference between acyanotic and cyanotic patients groups. But in contrast to our study, U Alb/Cr levels in the three patient groups were comparable and significantly higher than that in the control group. Hesham et al [57], in their study, 72 patients with CCHD were divided into 4 equal groups according to age: G2 (Below 1 year), G3 (above 1 year and Below 5 years), G4 (above 5 years and Below 10 years) and G5 (above 10 years). In addition to, G1 as control and G6 as cases underwent palliative surgery. In this study, they found that there was a significant difference between both two groups G2 and G3 to each other and to control group. In our study, absence of significant difference between studied groups may be due to the fact that microalbuminuria mainly has glomerular origin and in turn, glomerular injury may be manifested much later than tubular injury which may be detected even before glomerular injury develops. On other hand, in Hesham et al [57], they compare between groups differ from each other according to mean of age and then comparing them to single control group which in turn differs from each of them according to mean of age that may lead to apparently significant difference between the studied groups.

Concerning urinary NAG / creatinine ratio, in our work it was found that in acyanotic children below age of one year, there was 1 of 13 patients (7.7%) with U NAG/Cr above normal range while in cyanotic corresponding age group there were 3 of 13 patients (23.1%) showed abnormal values (Table 8). In subgroups above one year, there were 3 of 12 acyanotic patients (25%) showed abnormal value while 6 of 12 cyanotic patients(50%) with U NAG/Cr out of normal range (Table 9). Both acyanotic and cyanotic subgroups below age of one year with no significant difference to corresponding control subgroup. While In subgroups above one year, only cyanotic subgroup had a significant difference to corresponding control subgroup. Agras et al [55], found that Cyanotic patients had significantly higher urinary NAG/creatinine levels than controls. The patients in the acyanotic group also had a higher median urinary NAG/creatinine ratio than the controls, but the difference was not significant. On the other hand the differences between median NAG/ creatinine ratios of cyanotic and acyanotic groups were not significant. On the same way, Jianyong et al [36], found that Urinary NAG/UCr levels were higher in acyanotic groups (G I) and severe cyanotic patients groups (G III) than in mild cyanotic group (G II) and control group (G IV). There was a significant difference between both G I and G III to

G II and G IV. But conversely, there was no significant difference between G I and G III. Also, Hesham et al [57], found that there was a significant difference between G 2 and G 3 to each other and to control group. This significant difference between acyanotic and cyanotic groups in our study may be explained as urinary NAG/UCr is known biomarker to assess tubular functions and as we mentioned before that tubular injury may take place much earlier and effect of chronic hypoxia and other conditions such as polycythemia, malnutrion and anemia may accelerate renal local hypoxia and tubular injury in cyanotic congenital heart patients.

Regarding serum ß2M, in our study we found that in acyanotic children below age of one year, there was 1 of 13 patients (7.7%) with ß2M above normal range while in cyanotic corresponding age group there were 2 of 13 patients (15.4%) showed abnormal values (Table 10). In subgroups above one year, there was 1 of 12 acyanotic patients (8.4%) showed abnormal value while 4 of 12 cyanotic patients (33.3%) with ß2M out of normal range (Table 11). Both acyanotic and cyanotic subgroups below age of one year showed no significant difference to corresponding control subgroup. While In subgroups above one year, only cyanotic subgroup had a significant difference to corresponding control subgroup.

Regarding serum ß2M as biomarker for renal function in CHD, searching in the literature for similar researches to compare them with our results, we found all of researches about urinary B2M/U Cr. Noting that both of serum ß2M and urinary B2M/U Cr have the same scientific value in evaluation of different levels of renal dysfunctions. [58]

SUMMARY

Worldwide, congenital heart defects are the leading cause of infant deaths owing to congenital anomalies. Comorbidity may have an important, even crucial, bearing on the course and outcome of the management of a child with a congenital heart lesion. Congenital heart disease can be associated with renal injury and dysfunction. Findings of abnormal renal functions included normal or decreased glomerular filtration rate and decreased renal plasma flow as well as both glomerular and tubular proteinuria were reported.

The aim of the present work was to assess renal functions in infants and children with congenital heart diseases.

Fifty children with CHD from those attending the cardiology outpatient clinic at Alexandria University Children's Hospital were enrolled in this study, they were divided to two groups; cyanotic and acyanotic in addition to third control group. Each group was divided to nearly two equal subgroups according to age either below the age of one year or above the age of one year and up to five years.

All children were subjected to:

1. Full history taking
2. Full general and cardiac examination
3. Detailed echocardiographic study
4. Abdominal ultrasound.
5. Blood and early morning urine samples collection to assess eGFR, U Alb/ Cr, U NAG/Cr and serum ß2M.

The present study showed that,

- There was no significant difference between the studied groups regarding age, sex.

- Regarding the eGFR, there was no case of 13 acyanotic patients below one year had abnormal value, while 2/13 of corresponding cyanotic patients had abnormal values. There was a significant difference between the cyanotic and control groups.

- It was found that only 1of 12 of acyanotic patients above one year had abnormal eGFR value. While 3 of 12 of cyanotic patients above one year had eGFR values out of range. There was a significant difference between cyanotic group and both of acyanotic and control groups.

- Regarding U Alb/Cr, there was 1 of 13 of acyanotic patients below one year with abnormal value, while 3 of 13 of corresponding cyanotic patients had abnormal values. There was no significant difference between the studied groups.

- It was found that 2 of 12 of acyanotic patients above one year had abnormal U Alb/Cr values. While 4 of 12 of cyanotic patients above one year had values out of range. There was no significant difference between the studied groups.

- Regarding U NAG/Cr, there was 1 of 13 of acyanotic patients below one year had abnormal value, while 3 of 13 of cyanotic patients with the same age group had abnormal values. There was no significant difference between the studied groups
- It was found that 3 of 12 of acyanotic patients above one year had abnormal U NAG/Cr values. While 6 of 12 of cyanotic patients above one year had values out of range. There was a significant difference between cyanotic and control groups.
- Regarding serum ß2M, there was 1/13 of acyanotic patients below one year has abnormal value, while 2/13 of corresponding cyanotic patients have abnormal values. There was no significant difference between the studied groups.
- It was found that 1/12 of acyanotic patients above one year have abnormal serum B2M values. While 4/12 of cyanotic patients above one year have values out of range. There was a significant difference between cyanotic and control groups.