Summary
SUMMARY

The present study entitled “Study of cardiovascular involvement in protein energy malnutrition by clinical, electrocardiographic and echocardiographic methods in children” was conducted in Department of Pediatrics with active collaboration of the Department of Radiology, MLB Medical College, Jhansi.

- A total of fifty cases were selected for the present study, age varying from 6 months –5 years. Out of fifty cases, thirty five cases belonged to the study group and fifteen cases served as control.

- The study group cases, included those having severe malnutrition i.e. Grade III or Grade IV PEM by IAP classification 1972, while the control cases had weight for age >80% of Harvard standard. All these cases were further classified on the basis of grades of PEM, sex distribution, body surface area.

- Cases having preexisting heart disease, CHD, RHD, children with secondary malnutrition such as malabsorption syndromes, children with severe anaemia, severe electrolyte imbalance were not included in the study.

- Complete detailed history including presenting complaints, past illness, family history, dietary history, immunization history, developmental history, anthropometric measurements were recorded and a thorough general examination was done in each and every case with special emphasis on cardiovascular system.
• Blood investigations viz Hb, S. albumin, S. sodium, S. potassium was done in each and every case.

• X-ray chest was performed in all cases to calculate the cardiothoracic ratio.

• Electrocardiography and echocardiography was performed in each and every case to calculate the heart rate, P wave amplitude, QRS wave amplitude, ST and T wave changes, while ECHO was done to calculate the IVS thickness, left ventricular internal dimension, left ventricular posterior wall thickness and ejection fraction.

• All the observations were tabulated and data was analyzed statistically. The mean±SD value was calculated and statistical significance of each parameter was determined by applying Student’s ‘t’ test, thus comparing the values between study group and control group cases.

• Amongst the cases, the most common presenting complaints was fever (82%), poor weight gain/weight loss (82%) and loss of appetite (80%). The other common complaints were of cough (54%), diarrhoea (48%), irritability/apathy (34%), vomiting and edema (20%). The occurrence of other uncommon complaints like skin infections, adenitis, convulsions, pain in abdomen, worm passage varied from 17% to 3% (Table - 4).

• Past history showed recurrent diarrhoea which was commonly present in malnourished children (48%) cases. Previous history of measles and recurrent ARI was observed in 37% and 34% cases respectively (Table-5).
There was a positive history of contact with tuberculosis in 28% cases (Table – 6).

Vaccination status of children was incomplete except for OPV which was received by all cases (100%). BCG, DPT and measles immunization coverage was 16% and 2% respectively (Table – 7).

Developmental history showed delayed milestones in 54% cases, out of these 30% cases belonged to PEM grade IV and 14% cases belonged to PEM grade III (Table – 8).

Among clinical signs, pallor was the most common finding present in all cases (100%). The other common clinical signs were subcutaneous fat loss (91%), muscle wasting (91%), hair changes (85%), signs of vitamin A and B complex deficiency (82%), while adenitis and edema varied from 28-20% (Table – 10).

Mid arm circumference was <12.5cm in all cases (100%) i.e. severe malnutrition. Head circumference measurement showed microcephaly in 15% cases, (Table 11,12) rest 85% had normal HC.

In CNS examination most common finding was hypotonia (69%), while irritability, apathy, convulsion, tremors varied from 7% to 1%. In respiratory examination signs of RTI were present in 54% cases. In GI examination hepatomegaly (28%) and splenomegaly (23%) were frequent finding (Table-13).

In cardiovascular system examination mean heart rate was significantly increased in malnourished children (1.22±16/min) as compared to controls (106±12/min). The other clinical findings
were low pulse volume, poor perfusion, cold extremities. These clinical changes suggests the low cardiac output state of severely malnourished children, decreased blood volume and metabolic adaptation of their body (Table – 14).

- Mean haemoglobin levels were lower in malnourished children (9.9±0.8gm/dl) as compared to controls (8.6±1.2gm/dl). There was also significant lower levels of serum albumin values in malnourished children (3.0±0.30gm/dl) as compared to controls (4.10±0.20gm/dl) (p<0.02) (Table – 15,16).

- Electrolyte study showed comparatively lower levels of serum potassium levels in severely malnourished children (3.6±0.21meq/lit) in respect to controls (4.2±0.46meq/lit) (p<0.01). Most of the values fall in normal range i.e. between 3.5-5.5meq/lit, however 9 cases (26%) had serum potassium level in range of 3-3.5meq/l. There was no significant difference observed in the mean values of serum sodium level in malnourished children as compared to controls (139.2±3.5meq/l; 140.3±2.4meq/l, p>0.05). Thus we observed lower haemoglobin level, decreased serum albumin level and a comparatively lower levels of serum potassium in severely malnourished children (Table – 17,18).

- Radiologic changes were suggestive of decreased heart size in malnourished children. A significant decrease in CT ratio was observed in cases as compared to controls (p<0.001). Over 90% of cases had CT ratio of less than 50% (Table – 20).
Electrocardiographic changes were suggestive of increased heart rate among malnourished children as compared to controls (p<0.05). There was also significant decrease in amplitude of P wave and QRS complex (p<0.001). This decrease in amplitude can be attributed to cardiac atrophy (Table-21, 22, 23).

M mode echocardiography findings showed significantly decreased values of IVS thickness (systole) (0.54±0.03cm; 0.62±0.02 cm, p<0.001), IVS thickness (diastole) (0.40±0.02cm; 0.44±0.03cm, p<0.001), LVID (systole) (1.5±0.21cm; 1.9±0.19cm, p<0.001), LVPWT (systole) (0.58±0.04cm; 0.64±0.03cm, p<0.001), LVPWT (diastole) (0.40±0.03cm; 0.45±0.01cm, p<0.001). The left ventricular function values viz. ejection fraction was also found to be significantly decreased as compared to controls (63.7±5.2%, 70±3.4%, p<0.05). Hence, all these findings give us the impression of cardiac atrophy and impaired left ventricular function in severe protein energy malnutrition (Table-24).