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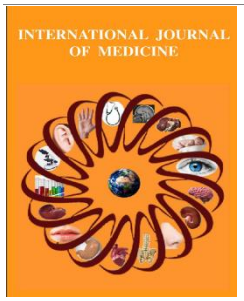

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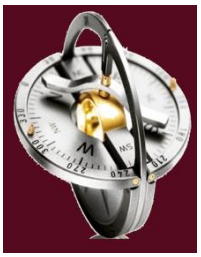

Research Article

Estimation of incidence of iron deficiency anemia and correlation of iron profile, serum cholesterol and serum albumin in children with idiopathic nephrotic syndrome

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Abstract

Objective: Introduction: Nephrotic syndrome is characterized by marked urinary excretion of albumin and other intermediated-size plasma proteins such as transferrin. Excessive urinary loss can produce low serum transferrin level that may lead to decrease serum iron level. Patients with nephrotic syndrome commonly have microcytic hypochromic anemia. ***Aim and objective:*** To estimate the incidence of iron deficiency anemia and correlation of iron profile, serum cholesterol and serum albumin with idiopathic nephrotic syndrome in a tertiary care hospital in south west Bihar. ***Methodology*** This was a prospective observational study to estimate the incidence of iron deficiency anemia and correlation of iron profile, serum cholesterol and serum albumin in children with idiopathic nephrotic syndrome in a tertiary care teaching hospital in south west area of Bihar. Pearson correlation was performed to determine any correlation between the variables. ***Conclusion***: Commonest age group of presentation of idiopathic NS is between 2 to 8 years of age. Microcytic hypochromic anaemia is commonly seen in idiopathic NS and iron deficiency may be a reason. High serum Ferritin may be due to coexisting infections. Prevalence of iron deficiency anaemia is very difficult to conclude as sample size is less.

Keywords: NS- Nephrotic Syndrome, TIBC - Total Iron Binding Capacity, IDA- Iron Deficiency Anaemia, CBC--Complete Blood Count, CKD Chronic Kidney Disease, CVS – cardiovascular disease, IDA-Iron Deficiency anemia.

Introduction:

Nephrotic syndrome is seen more often in children. 9 Glomerular filtration barrier becomes defective which is responsible for loss of protein in urine. 1

Heavy proteinuria (>40 mg/m2/day), hypoalbuminemia (albumin<3 g/dl) and edema are the characteristics of NS in children.

There is significant urinary loss of various molecular weights plasma proteins which leads to mortality in NS. 9

Risk of CVS disease is increased in children with NS due to hyperlipidemia. Hyperlipidemia is not always connected with NS but in some cases like frequent relapsing NS, persistence of hyperlipidemia for longer period is seen. 8

Iron is crucial for erythropoiesis. Normally iron is recycled from aged erythrocytes and it is the major source for erythropoiesis. Enterocytes regulate the absorption of whole-body iron and the major organs for storing iron in the form of ferritin are liver and spleen. Storage cells release iron into the plasma through ferroprotein which is a transmembrane protein located on surface of storage cells. Hepcidin is the regulator for transport of iron in the body. 7

Anemia is seen in patients with NS as a complication. Exaggerated urinary losses of iron, transferrin, erythropoietin and transcobalamin in NS may lead to anemia. 7

Although cause of anemia in patient with CKD are well established, the reason of anemia in NS with normal renal function are complex and not understood completely. 7

Very small number of studies are done in India and none in south west Bihar on iron deficiency and IDA in NS.

Objectives

- To estimate the incidence of iron deficiency anemia in children with NS.
- To study the correlation between iron profile, serum cholesterol and serum albumin in children with NS.

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Materials and Methods

Study design-Hospital based prospective observational study

Place of study:

The study will be conducted in Department of Pediatrics, Narayan Medical College & Hospital, Jamuhar, Sasaram. The duration of study 18 months (November 2022 to April 2024).

Study population:

All Children attending pediatrics OPD/ Emergency with laboratory confirmed diagnosis of Idiopathic Nephrotic Syndrome.

Inclusion criteria:
Children with well-established Idiopathic Nephrotic Syndrome with preserved renal function and under regular follow up.

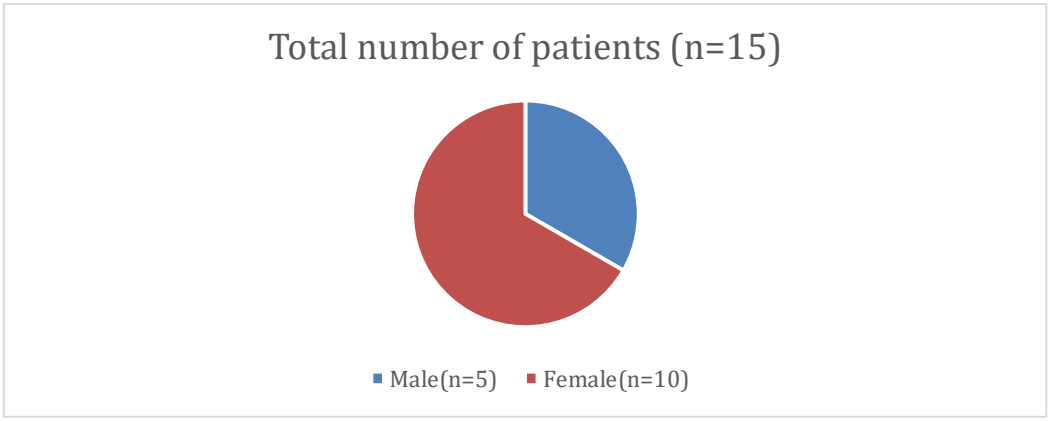
Exclusion criteria:
1. Children with impaired renal function.
2. Children with manifestations of any systemic disease.
3. Patients with secondary nephrotic syndrome.
4. Children who will be already on iron supplements

Follow up: All cases were followed as per the protocol of nephrotic syndrome.

Statistical analysis:
Appropriate statistical method were applied for analysis of data. Statistical significance was taken if p value is < 0.05. Standard statistical methods will be used for calculating statistical

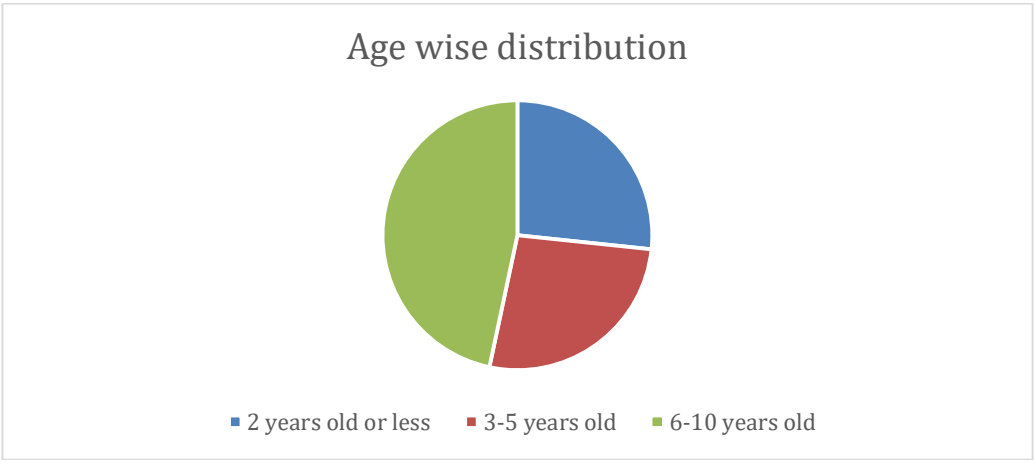
Results
15 patients participated in the study. 66.7% (N=10) were female and 33.3%(N=5) male. Mean age of presentation of the patients who were diagnosed case of idiopathic NS is 5 years.

Chart 1

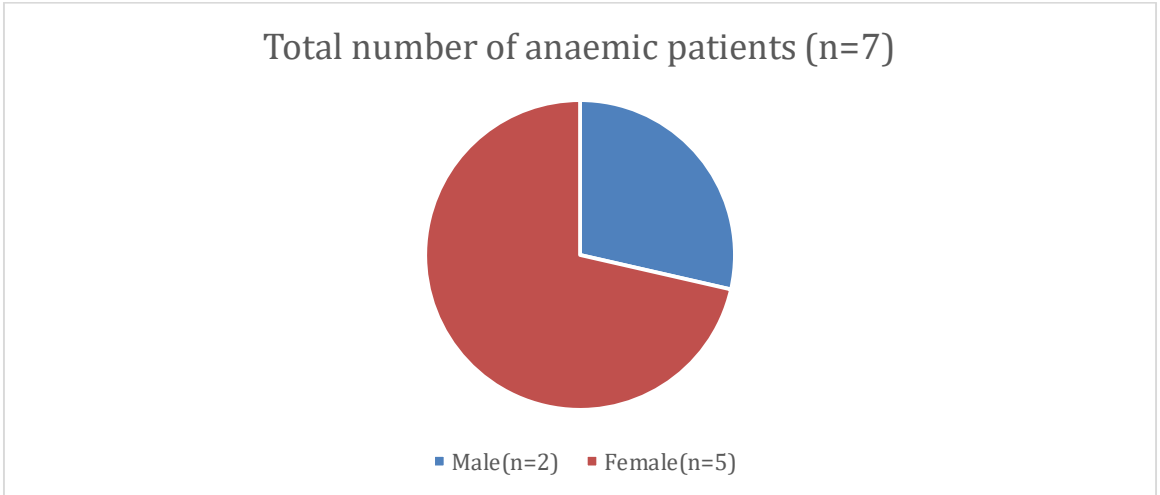


Age wise distribution
26.7%(N=4) of the patients enrolled, were of 2 years of age. 26.7%(N=4) were between 2 years and 5 years of age. 46.6%(N=7) of the patients in this study are between 6 years and 10 years of age.

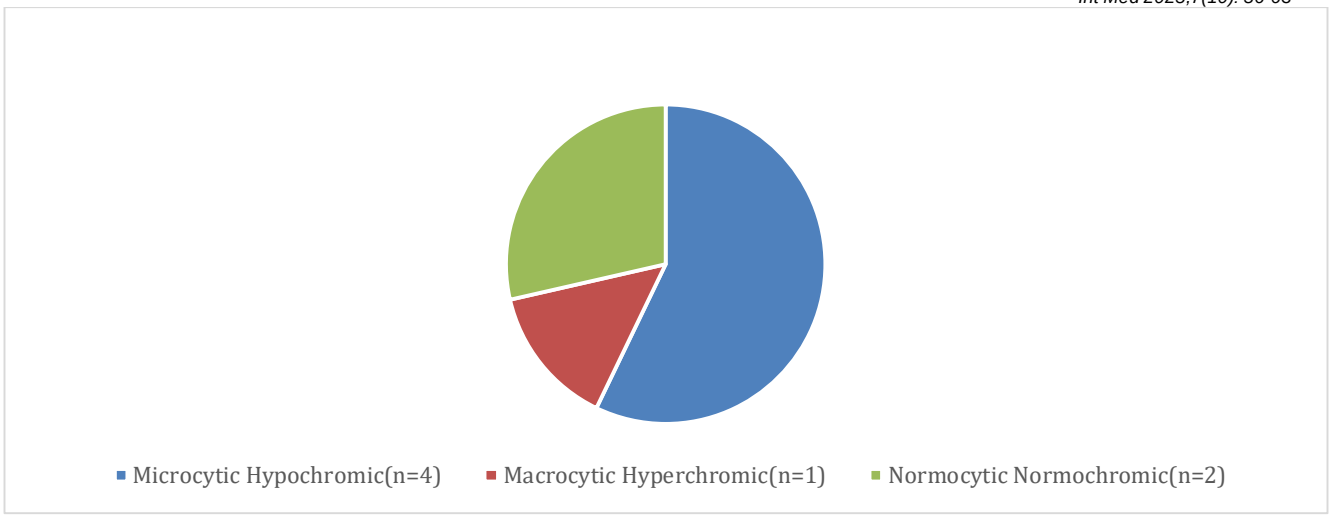
Chart 2



46.7%(N=7) patients were anaemic of which 28.6%(N=2) were male and 71.4%(N=5) of them are female.
Chart 3



Of all anaemic patients, as per RBC indices 57.1%(N=4) patients were microcytic hypochromic, 14.3% (N=1) patients were macrocytic hyperchromic and remaining 28.6%(N=2) patients were normocytic normochromic.
Chart 4



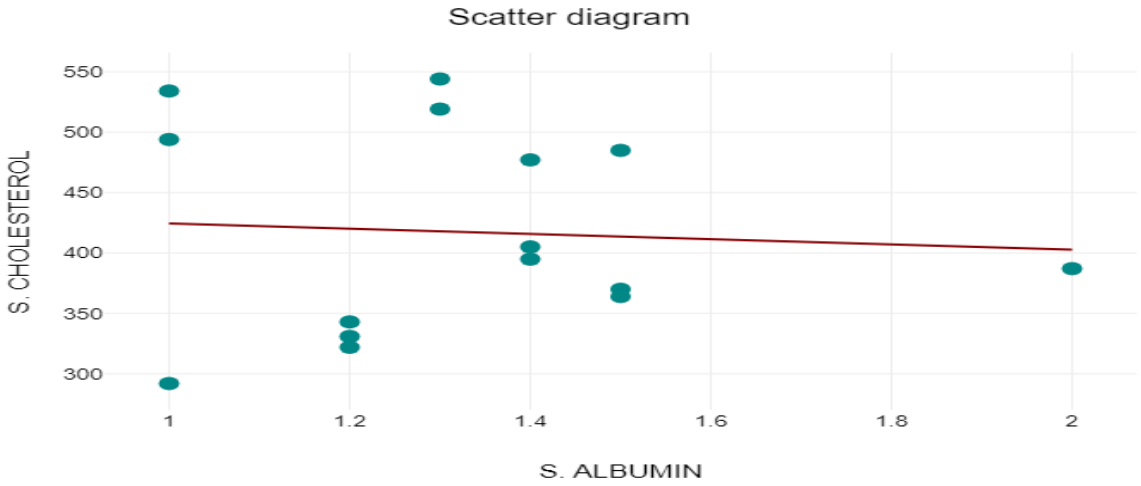
Among those, who were having microcytic hypochromic anaemia (N=4), all were having low s. iron, while s. ferritin was reduced in 50%(N=2) of them. Transferrin saturation was low in 50%(N=2) of them. TIBC was not raised in any of them.

Correlation between serum albumin and serum cholesterol.

The result of Pearson correlation revealed a negligible, not significant inverse correlation between serum albumin and serum cholesterol.

	R	p
S. albumin and S. Cholesterol	-0.07	.813

Graph 1

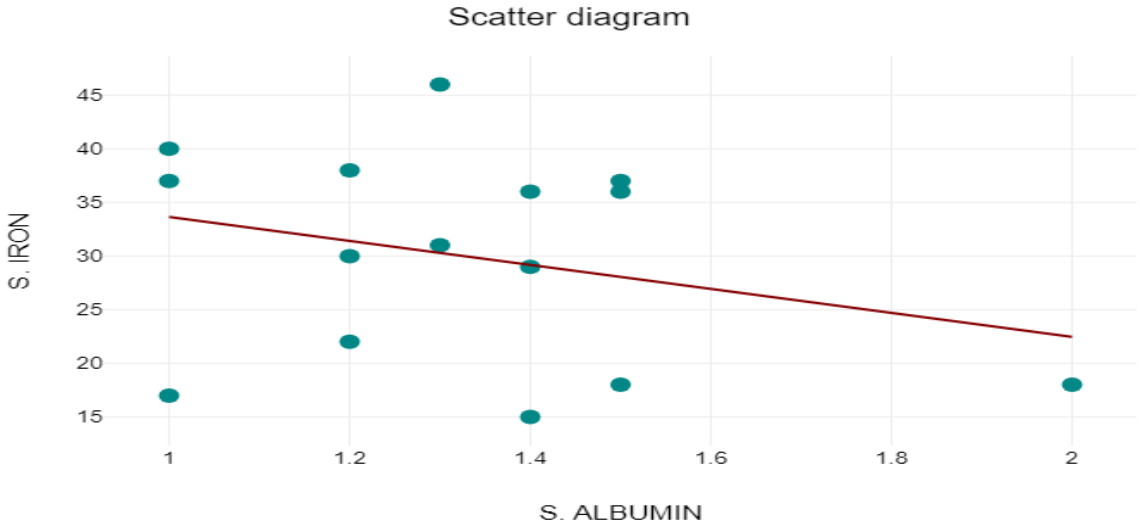


Correlation between serum albumin and serum iron

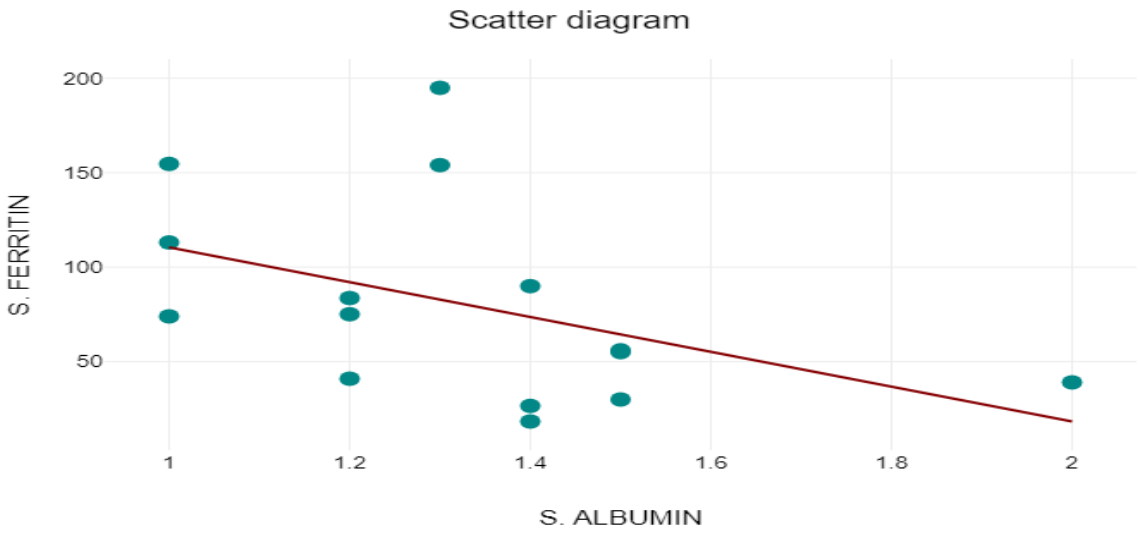
The result of Pearson correlation revealed a low, not significant inverse correlation between serum albumin and serum iron.

	r	p
S. albumin and S. iron	-0.29	.286

Graph 2



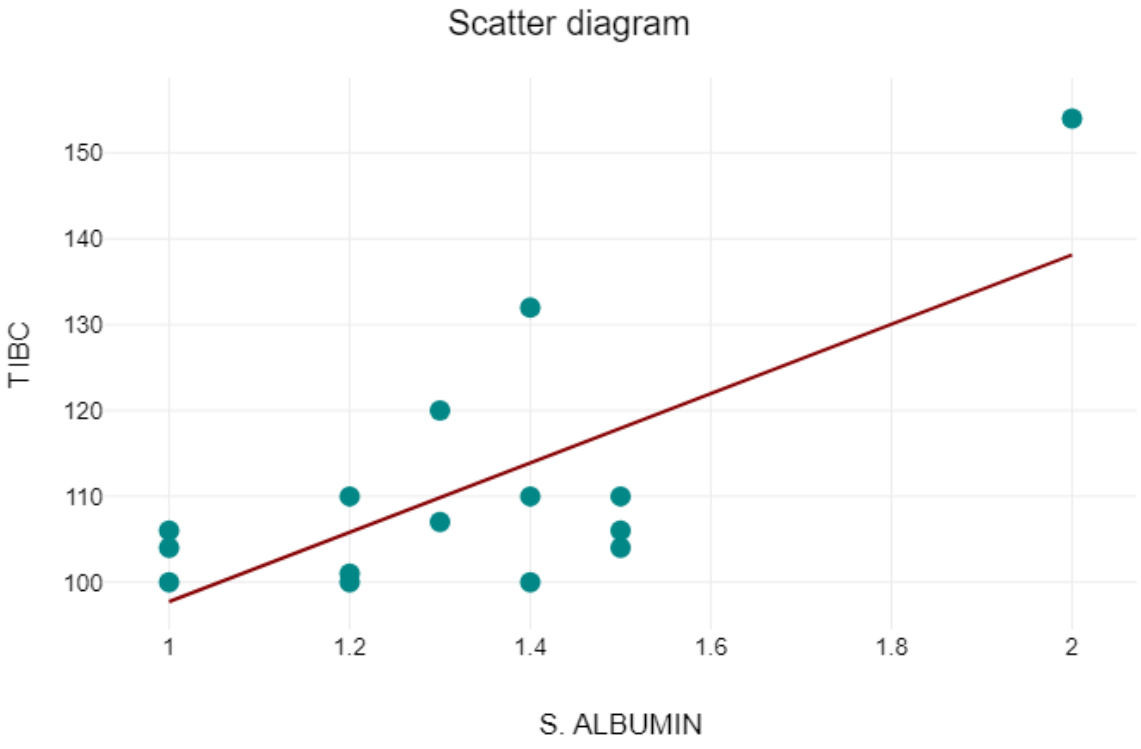
Graph 3



Correlation between serum albumin and TIBC
The result of Pearson correlation revealed a high, significant positive relationship between serum albumin and TIBC.

	r	p
S. albumin and TIBC	0.71	.003

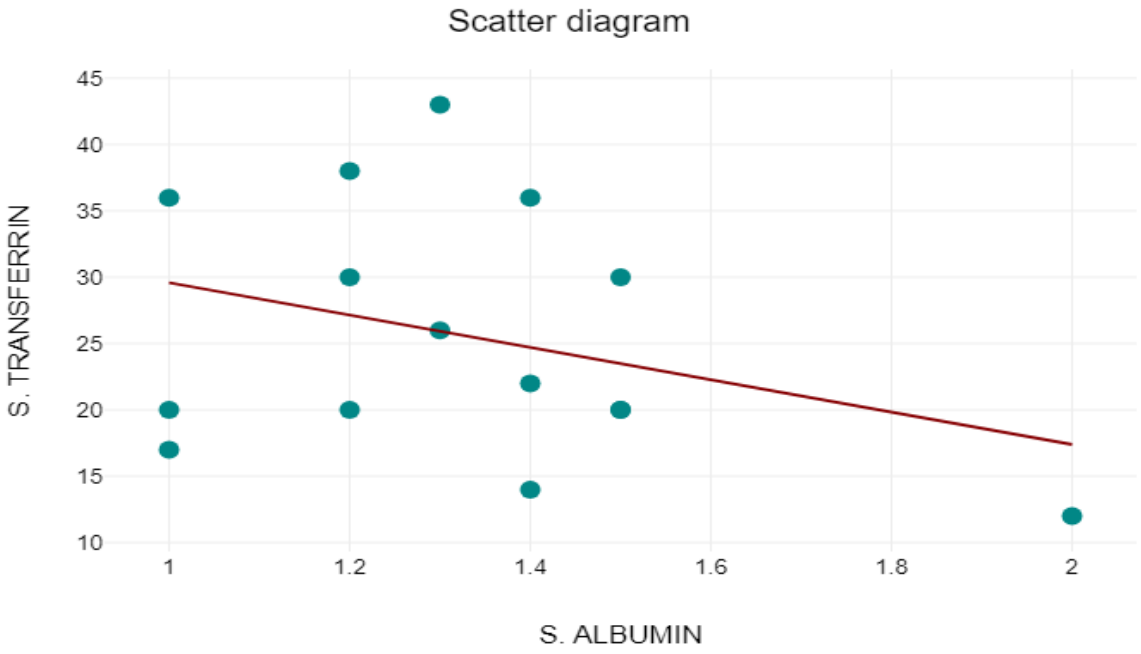
Graph 4



Correlation between serum albumin and transferrin saturation
The result of the Pearson correlation revealed moderate, not significant inverse correlation between serum albumin and transferri n saturation.

	R	p
S. albumin and transferrin saturation	-0.33	.224

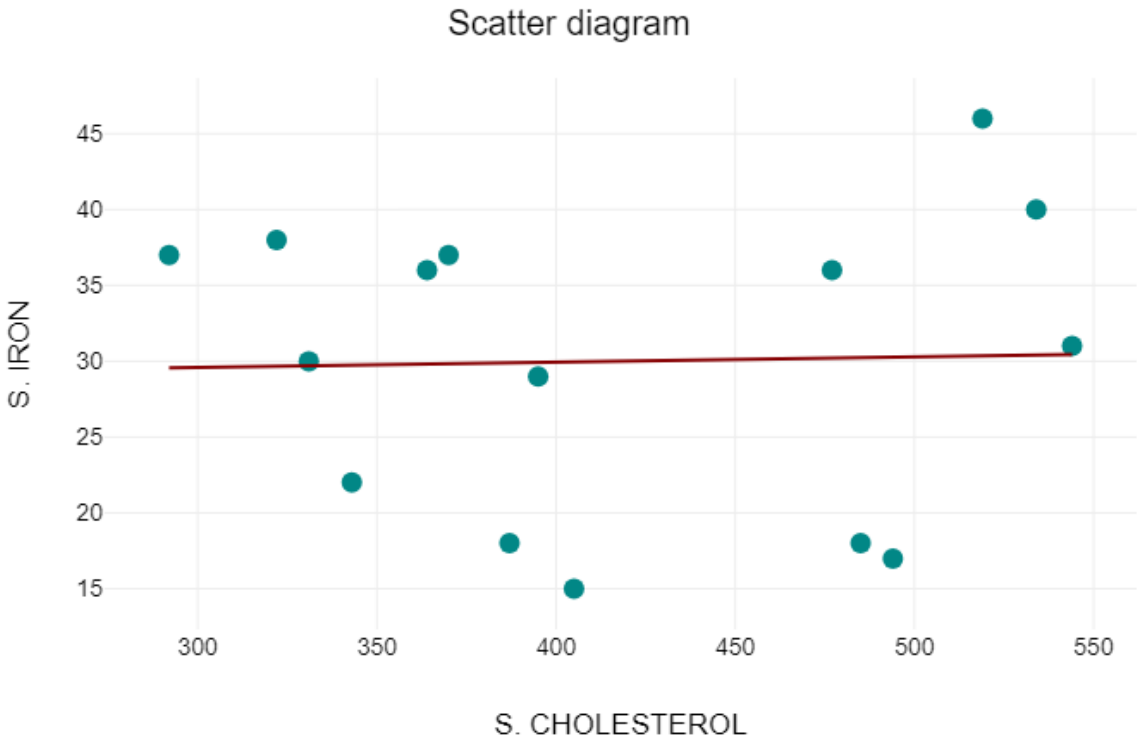
Graph 5



Correlation between serum cholesterol and serum iron
The result of Pearson correlation revealed negligible, not significant direct correlation between serum cholesterol and serum iron.

	r	p
S. cholesterol and S. iron	0.03	.916

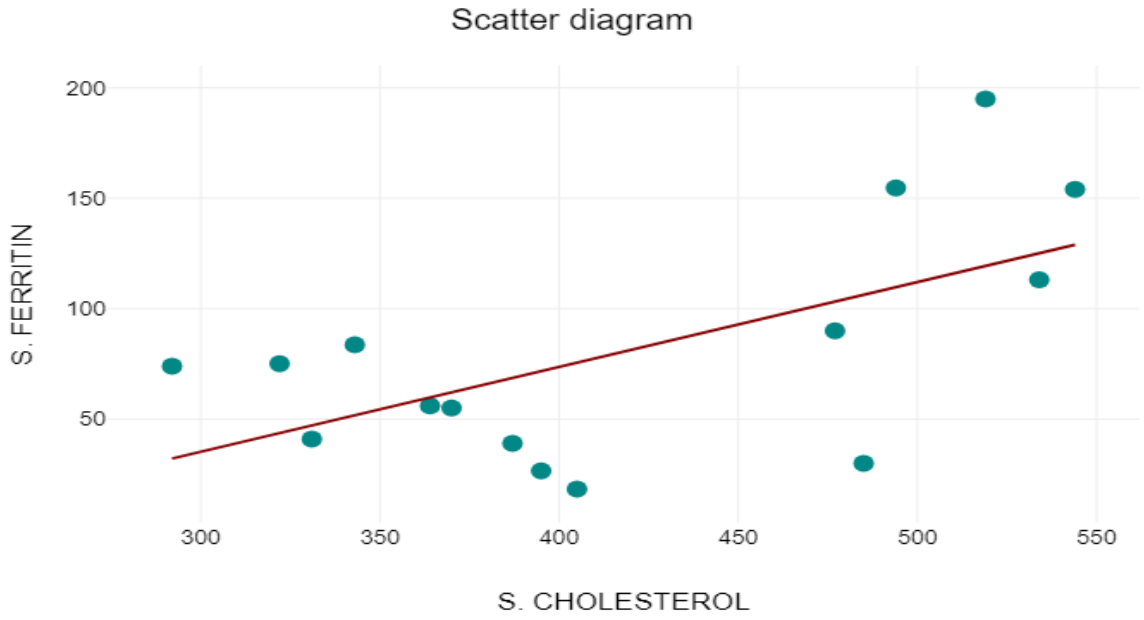
Graph 6



Correlation between serum cholesterol and serum ferritin
The result of Pearson correlation revealed high, significant direct correlation between serum cholesterol and serum ferritin.

	R	p
S. cholesterol and S. ferritin	0.61	.016

Graph 7

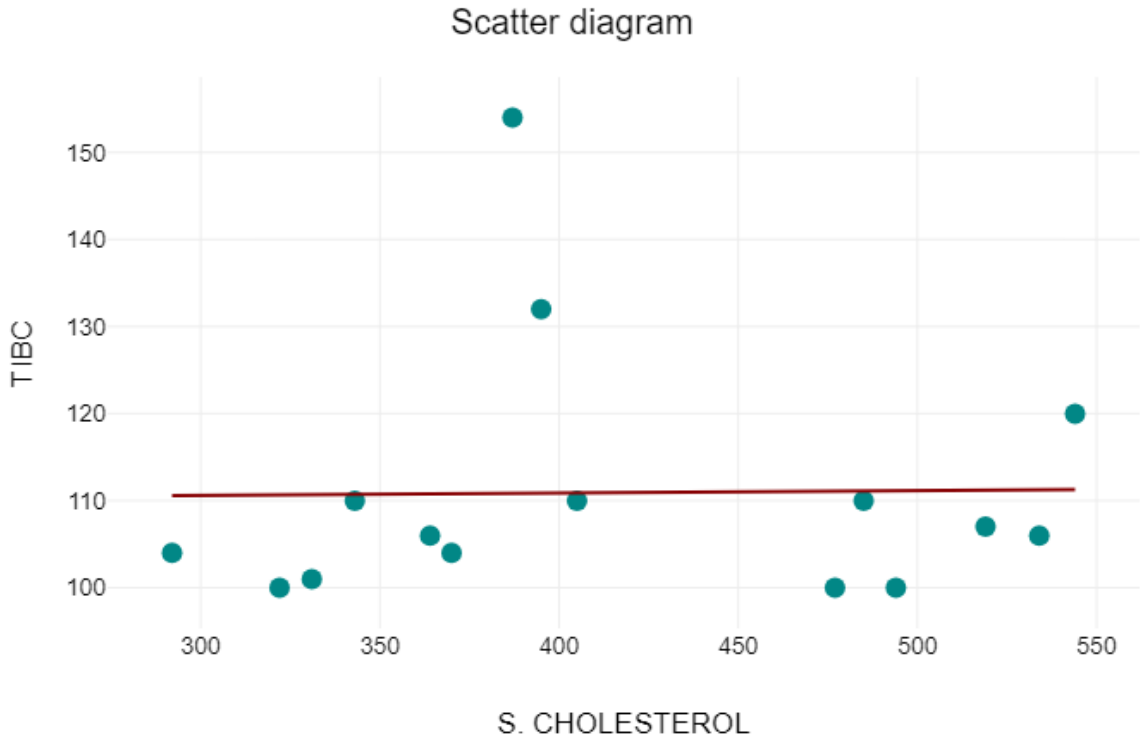


Correlation between serum cholesterol and TIBC

The result of Pearson correlation revealed negligible, not significant direct correlation between serum cholesterol and TIBC.

	r	P
S. cholesterol and TIBC	0.02	.953

Graph 8

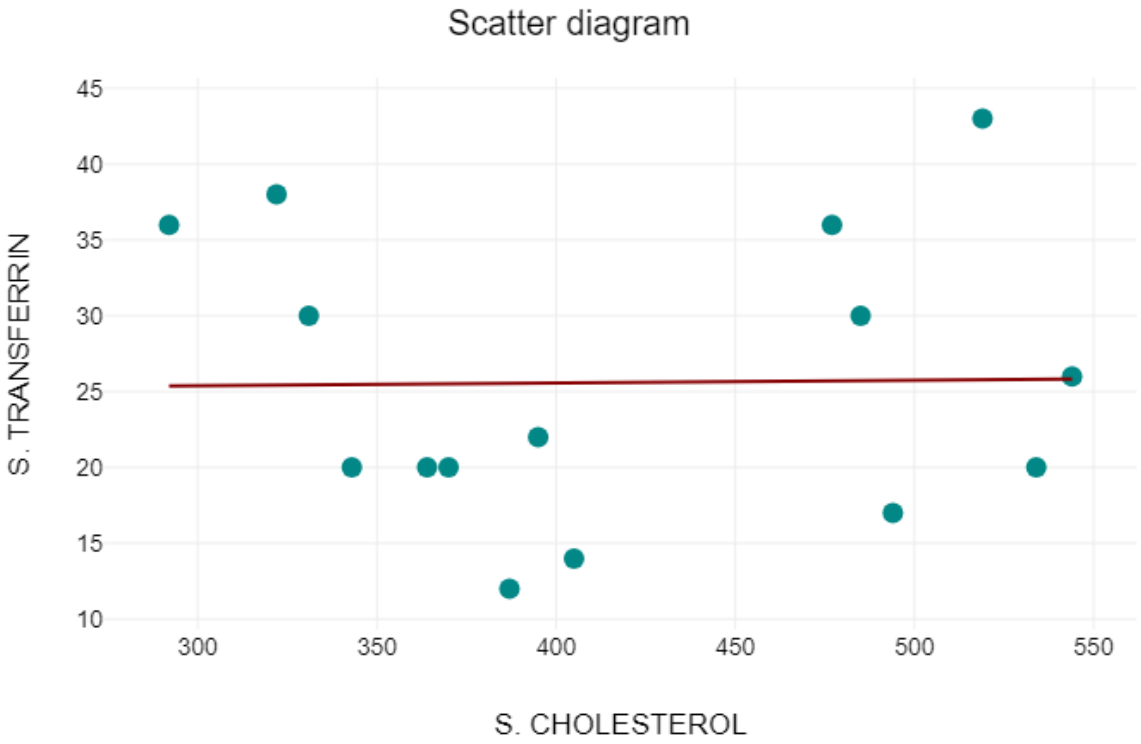


Correlation between serum cholesterol and transferrin saturation

The outcome of Pearson correlation revealed negligible, not significant direct correlation between serum cholesterol and transferrin saturation.

	r	P
S. cholesterol and Transferrin saturation	0.02	.955

Graph 9



Findings:

1. Commonest age group found in the study was between 6 and 10 years. (Chart 2)
2. Out of 15 patients who were included in the study, 7 patients were anaemic. (Chart 3)
3. As per RBC indices, out of those 7 patients who were anaemic, 4 were having microcytic hypochromic anaemia (chart 4) and all 4 were having low serum iron while serum ferritin was low in 2 of them.
4. Pearson correlation between s. albumin and s. cholesterol, serum iron, s. ferritin and transferrin saturation were negative and it was not significant. (Graph 1, 2, 3 and 5 respectively)
5. There was direct significant correlation between serum albumin and TIBC. (Graph 4)
6. Pearson correlation between s. cholesterol and s. iron, TIBC and transferrin saturation were positive and it was not significant. (Graph 6, 8 and 9 respectively)
7. There was positive significant correlation between s. cholesterol and s. ferritin. (Graph 7)

Discussion

In my study there was low and inverse correlation between s. albumin and serum iron which was not significant. (r=-0.29, p= 0.286). There was moderate inverse correlation between s. albumin and transferrin saturation which was not significant. (r= -0.33, p=0.224) There is high direct correlation between s. albumin and TIBC which was significant (r= 0.71, p=0.003), however it could not be explained. Significant weak inverse correlation was seen between s. albumin and s. ferritin (r= - 0.368, P= 0.019). There was moderate negative correlation between serum albumin and serum ferritin (r= -0.45, p= 0.93).

Mayada Kadhim et. al.1 in their study in 2022 found iron deficiency as the most possible complications of NS and it can be as severe to cause IDA. However, they found more frequency of iron deficiency anaemia in steroid resistant NS as it was very difficult to control proteinuria and loss of iron in them. Significant moderate direct correlation was seen between s. albumin and s. iron (r = 0.426, P= 0.006) and s. albumin and transferrin saturation (r = 0.463, P= 0.003).

Sreekanth et. Al2. in their cross-sectional study in 2021 found that iron deficiency and iron deficiency anaemia were very common in nephrotic syndrome. They also suggested that all cases whether newly diagnosed or follow ups should be routinely (3-6 monthly) assessed for this deficiency.

Moftah Mohamed Rabeea et. al.3 in their study in 2019 concluded that evidence of IDA in NS is more during the active stage of disease. In children with active NS, the reliable parameter for prediction of iron deficiency anaemia is urinary transferrin. Urinary transferrin was not done in my study.

In my study, there is negligible negative correlation between s. albumin level and s. cholesterol level which was not significant. (r= -0.07, p= 0.813). Sabyasachi Som and Abhishek Roy4 in 2018 concluded analytically significant inverse correlation between s. cholesterol and s. albumin level.

P Anil Kiran and B Deeva Kumar5 in their study in 2017 found male predominance of childhood nephrotic syndrome and commonest age group included in study were between 2 to 8 years old.

There was female predominance but commonest age group was same.

Sofia Feinstein et al6 in their in 2001 concluded anaemia as common manifestation of persistent NS, prolonged transferrin and iron losses lead to the depletion of iron loss and anaemia.

Conclusion

Commonest age group of presentation of idiopathic NS is between 2 to 8 years of age.

Microcytic hypochromic anaemia is commonly seen in idiopathic NS and iron deficiency may be a reason.

High serum Ferritin may be due to coexisting infections.

Prevalence of iron deficiency anaemia is very difficult to conclude as sample size is less.

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