RESULTS

The present study included 100 patients suffering from acute coronary syndrome who presented to National Heart Institute during the period from January 2012 to July 2012.

The patients' age ranged from 33 to 75 years with a mean age of 59.06 ± 8.67 years. There were 84 (84%) males and 16 (16%) females.

According to WHO classification was 50 patients (50%) were anemic.

As regards presentation, 49 (49%) patients presented with ST segment elevation MI, 13 (13%) presented with NSTEMI infarction and 38 (38%) presented with unstable angina.

History of intake of beta-blocker was present in 47 (47%), nitrates in 23 (23%), ACE/ARBs in 34 (34%), aspirin in 32 (32%), Clopidogril in 9 (9%), statins in 33 (33%).

Forty five (45%) patients were non-diabetic while 37 (37%) were type 1 diabetics and 18 (18%) were type 2 diabetics. Family history was present in 33 (33%) of cases.

Hemoglobin level ranged from 8.5 to 16.7 g with a mean value of 12.52 ± 1.86 g, Hematocrit ranged from 25.5 to 39.7 % with a mean value of 33.66 ± 2.82 %, random blood sugar ranged from 69 to 459 mg/dl with a mean value of 179 ± 86.31 mg/dl. Serum creatinine ranged from 0.8 to 2.1 mg/dl with a mean value of 1.18 ± 0.23 mg/dl. Blood urea ranged from 23.0 to 75.0 mg/dl with a mean value of 37.71 ± 9.80 mg/dl. INR ranged from 1 to 1.8 with a mean value of 1.17 ± 0.159. Serum albumin ranged from 3.0 to 4.9 mg/dl with a mean value of 4.04 ± 0.418 mg/dl. Triglycerides ranged from 90.0 to 574.0

mg/dl with a mean value of 246.75 ± 92.13 mg/dl. Cholesterol ranged from 125.0 to 590.0 mg/dl with a mean value of 277.74 ± 89.56 mg/dl.

The EF by echo ranged from 23.0 to 68.0% with a mean value of 48.2 ± 8.18%.

Table (1): Comparison between non-anemic and anemic groups in the present study regarding age

	Non-anemic group (n=50)	**Anemic group (n=50)**	***t***	***P*-value**
Age (years) Range *X*±SD	 33-75 57.74±10.12	 40-72 59.29±7.53	0.32	0.748 (NS)

X±SD: Mean standard deviation *t*: T-test NS: nonsignificant at p > 0.05

This table shows that the age in the non-anemic group ranged from 33 to 75 years with a mean value of 57.74 ± 10.12 years, while in the anemic group it ranged form 40 to 72 years with a mean value of 59.29 ± 7.53. There was no statistically significant difference in age between the two groups (*t*=0.32, p=0.74).

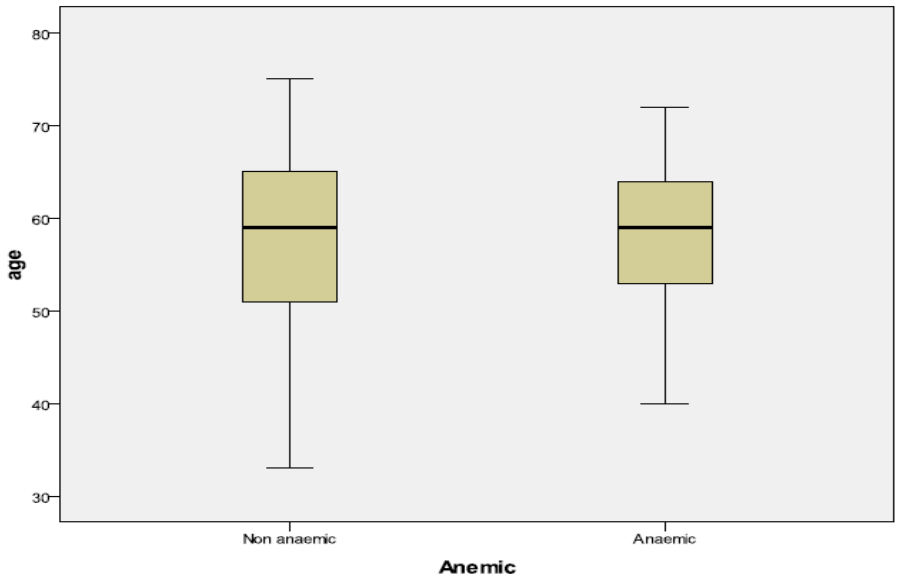

Figure (1): Box and whisker plot of the age of the two studied groups (non-anemic and anemic).

The thick horizontal line represents the median; the box represents the inter-quartile range (between 25th and 75th percentiles) which contains 50% of the data, while the whisker represents the minimum and maximum values.

Table (2): Comparison between hemoglobin level in the non-anemic and anemic groups

	Non-anemic group (n=50)	**Anemic group (n=50)**	***t***	***P*-value**
Haemoglobin (g) Range *X*±SD	 13.1-16.7 14.37±0.86	 8.50-10 11.19±1.08	17.81	0.000* (S)

* S: significant at p < 0.05

In this table, the hemoglobin level (selecting variable) in the non-anemic group ranged from 13.1 to 16.7 g with a mean value of 14.37 ± 0.86 g, while in the anemic group it ranged form 8.50 to 12.7 g with a mean value of 11.19 ± 1.08 g . As selecting variable, there was statistical significant difference in hemoglobin between the two groups (*t*=17.81, *p*=0.000)

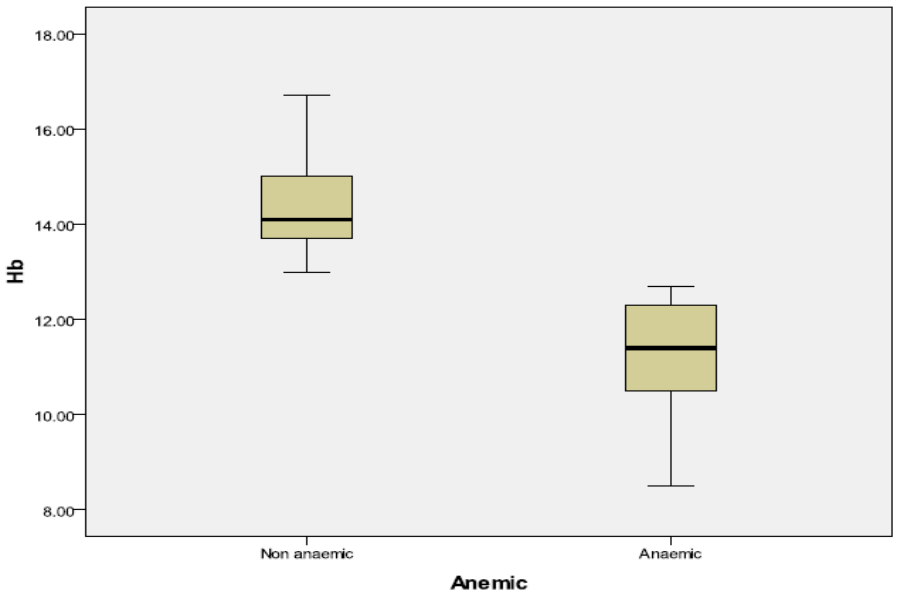

Figure (2): Box and whisker plot of the hemoglobin level of the two studied groups (non-anemic and anemic).
The thick horizontal line represents the median; the box represents the inter-quartile range (between 25th and 75th percentiles) which contains 50% of the data, while the whiskers represent the minimum and maximum values.

Table (3): Comparison between hematocrit value in the non-anemic and anemic groups

	Non-anemic group (n=50)	**Anemic group (n=50)**	***t***	***P*-value**
HCT (%) Range *X*±SD	33.1-39.7 35.86±1.98	25.5-39.0 32.09±2.22	9.6	0.000* (S)

* S: significant at p < 0.05

In this table the hematocrit level in the non-anemic group ranged from 33.1 to 39.7 % with a mean value of 35.86 ± 1.98 %, while in the anemic group it ranged form 25.5 to 39.0 % with a mean value of 32.09 ± 2.22 %. There was statistically significant difference in hematocrit level between the two subgroups (*t*=9.553, *p*=0.000)

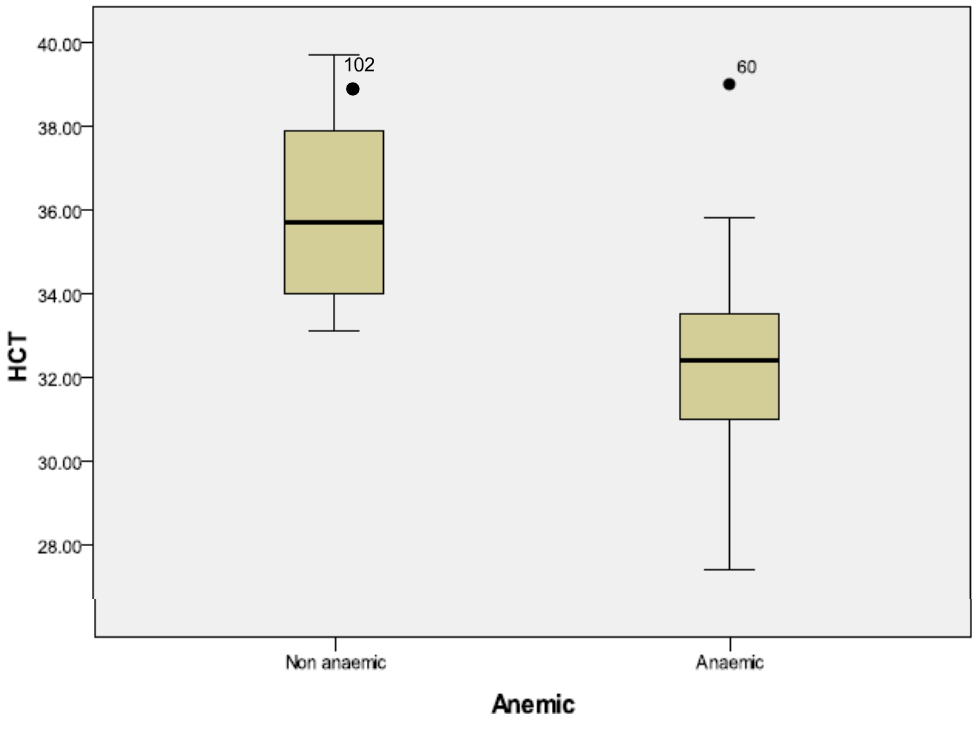

Figure (3): Box and whisker plot of the HCT of the two studied groups (non-anemic and anemic).

The thick horizontal line represents the median, the box represents the inter-quartile range (between 25th and 75th percentiles) which contains 50% of the data, while the whiskers represents the minimum and maximum values but after excluding the outliers (which is represented by a dark-filled circle).

Table (4): Comparison between random blood sugar in the non-anemic and anemic groups

	Non-anemic group (n=50)	**Anemic group (n=50)**	***t***	***P*-value**
RBS (mg/dl) Range *X*±SD	69.0-459.0 177.72±92.97	76.0-392.0 180.18±81.89	0.15	0.878 (NS)

NS: nonsignificant at p > 0.05

This table shows the random blood sugar level in the non-anemic group ranged from 69.0 to 459.0 mg/dl with a mean value of 177.72 ± 92.97 mg/dl, while in the anemic group it ranged form 76.0 to 392.0 mg/dl with a mean value of 180.18 ± 81.89 mg/dl. There was no statistically significant difference in random blood sugar level between the two groups (*t*=0.154, *p*=.881)

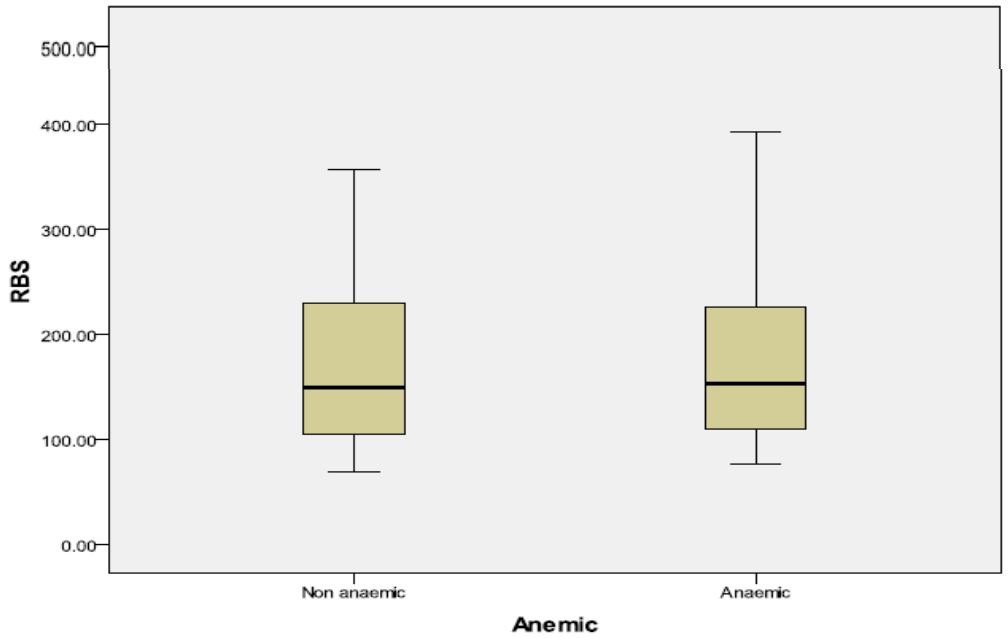

Figure (4): Box and whisker plot of the random blood sugar of the two studied groups (non-anemic and anemic).
The thick horizontal line represents the median;the box represents the inter-quartile range (between 25th and 75th percentiles) which contains 50% of the data, while the whiskers represent the minimum and maximum values.

Table (5): Comparison between Plasma creatinine non-anemic and anemic groups

	Non-anemic group (n=50)	**Anemic group (n=50)**	***t***	***P*-value**
Plasma creatinine (mg/dl) Range *X*±SD	 0.8-1.5 1.15±0.20	 0.8-2.10 1.21±0.24	1.37	0.174 (NS)

NS: nonsignificant at p > 0.05

This table shows the plasma creatinine level in the non-anemic group ranged from 0.8 to 1.5 mg/dl with a mean value of 1.15 ± 0.20 mg/dl, while in the anemic group it ranged form 0.8 to 2.1 mg/dl with a mean value of 1.21 ± 0.246. There was no statistically significant difference in plasma creatinine level between the two groups (*t*=1.368, *p*=0.174)

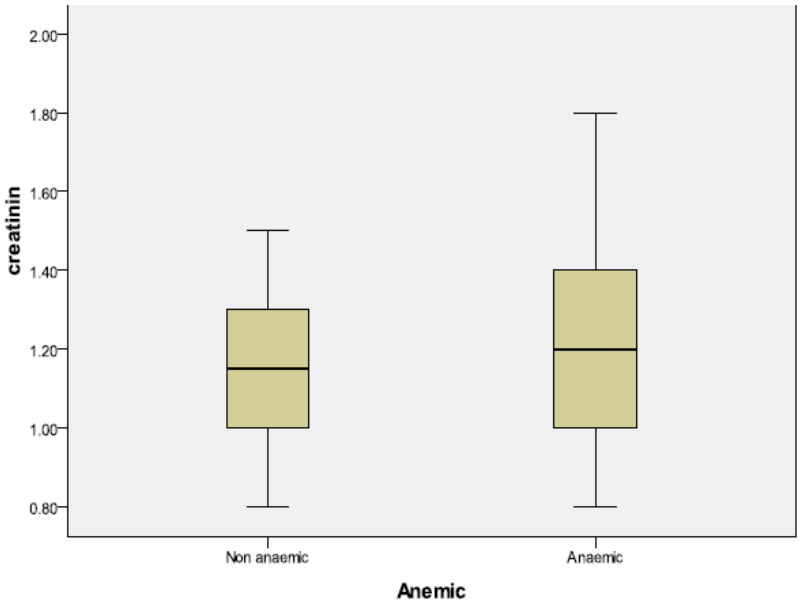

Figure (5): Box and whisker plot of the creatinine of the two studied groups (non-anemic and anemic).
The thick horizontal line represents the median; the box represents the inter-quartile range (between 25th and 75th percentiles) which contains 50% of the data, while the whiskers represent the minimum and maximum values.

Table (6): Comparison between non-anemic and anemic groups in the Serum urea level

	Non-anemic group (n=50)	**Anemic group (n=50)**	***t***	***P*-value**
Serum urea (mg/dl) Range *X*±SD	 24.0-45.0 36.28±7.52	 23.0-75.0 38.74±11.09	1.4	0.176 (NS)

NS: nonsignificant at p> 0.05

This table shows the urea level in the non-anemic group ranged from 24.0 to 45.0 mg/dl with a mean value of 36.28 ± 7.52 mg/dl, while in the anemic group it ranged form 23.0 to 75.0 mg/dl with a mean value of 38.74 ± 11.09. There was no statistically significant difference in serum urea level between the two groups (*t*=1.361, *p*=0.176)

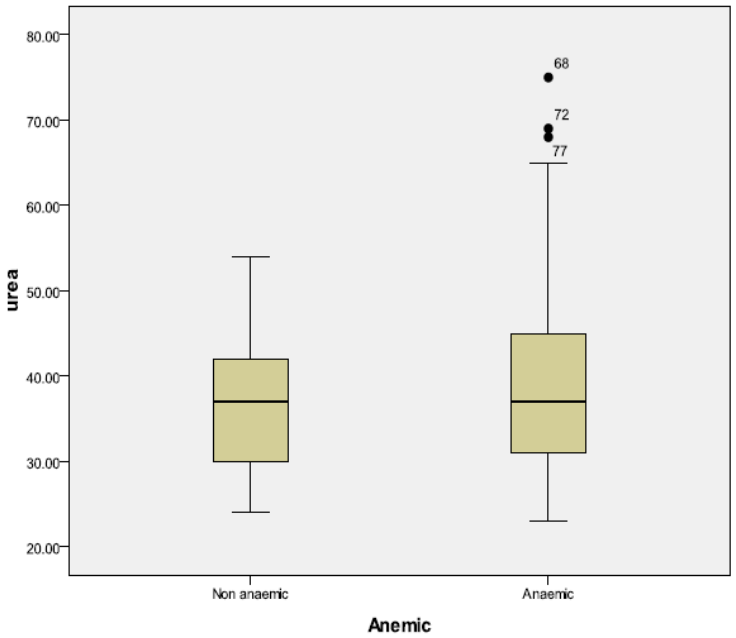

Figure (6): Box and whisker plot of the serum urea of the two studied groups (non-anemic and anemic).

The thick horizontal line represents the median, the box represents the inter-quartile range (between 25th and 75th percentiles) which contains 50% of the data, while the whiskers represents the minimum and maximum values but after excluding the outliers (which is represented by a dark-filled circle).

Table (7): Comparison of INR level between non-anemic and anemic groups

	Non-anemic group (n=50)	**Anemic group (n=50)**	***t***	***P*-value**
INR Range *X*±SD	1.0-1.4 1.13±0.125	1.0-1.8 1.20±0.17	2.2	0.031* (S)

* S: significant at $p < 0.05$

In this table the INR level in the non-anemic group ranged from 1.0 to 1.4 with a mean value of 1.13 ± 0.125, while in the anemic group it ranged form 1.0 to 1.8 with a mean value of 1.20 ± 0.175. There was a statistically significant difference in INR level between the two groups (*t*=2.182, *p*=0.031)

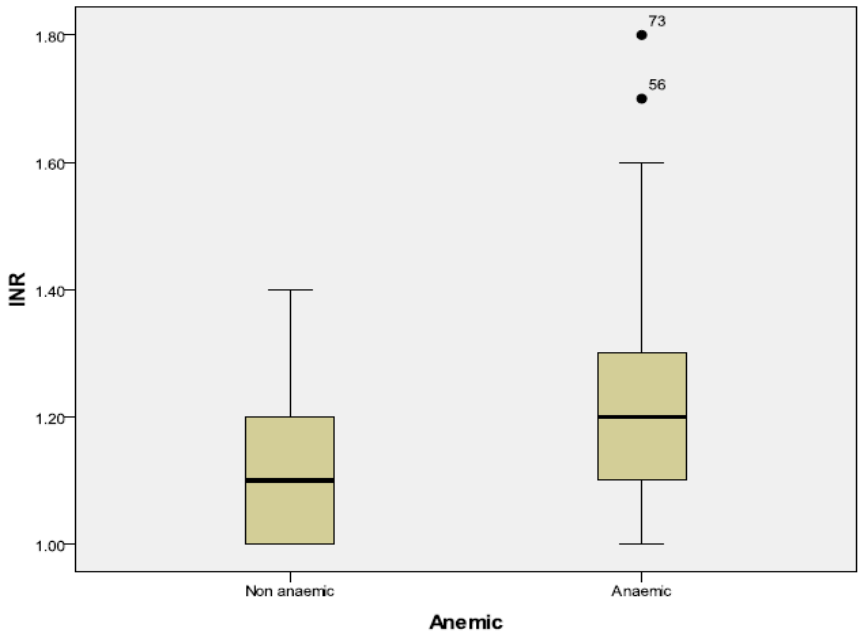

Figure (7): Box and whisker plot of the INR of the two studied groups (non-anemic and anemic).

The thick horizontal line represents the median, the box represents the inter-quartile range (between 25th and 75th percentiles) which contains 50% of the data, while the whiskers represents the minimum and maximum values but after excluding the outliers (which is represented by a dark-filled circle).

Table (8): Comparison in serum albumin level between non-anemic and anemic groups

	Non-anemic group (n=50)	**Anemic group (n=50)**	***t***	***P*-value**
Albumin (mg/dl) Range *X*±SD	 3.4-4.8 4.09±0.32	 3.0-4.90 4.01±0.47	0.98	0.330 (NS)

NS: nonsignificant at p > 0.05

In this table, serum albumin level in the non-anemic group ranged from 3.4 to 4.8 mg/dl with a mean value of 4.09 ± 0.32 mg//dl; while in the anemic group it ranged form 3.0 to 4.9 mg/dl with a mean value of 4.01 ± 0.47. There was no statistically significant difference in serum albumin level between the two groups (*t*=0.978, *p*=0.330)

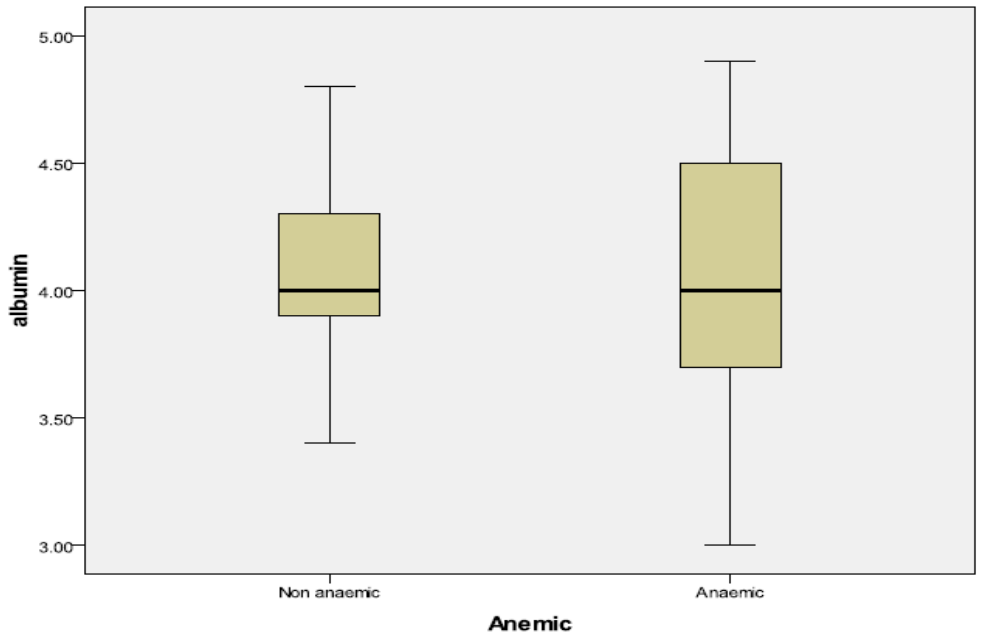

Figure (8): Box and whisker plot of the serum albumin of the two studied groups (non-anemic and anemic).
The thick horizontal line represents the median; the box represents the inter-quartile range (between 25th and 75th percentiles) which contains 50% of the data, while the whiskers represent the minimum and maximum values.

Table (9): Comparison in serum Triglycerides between non-anemic and anemic groups

	Non-anemic group (n=50)	**Anemic group (n=50)**	***t***	***P*-value**
Triglyceride (mg/dl) Range *X*±SD	 90.0-445.0 220.5±77.46	 113.0-574.0 265.2±97.64	2.7	0.008* (S)

* S: significant at p < 0.05

Serum triglycerides level in the non-anemic group ranged from 90.0 to 445.0 mg/dl with a mean value of 220.5 ± 77.46 mg/dl, while in the anemic group it ranged form 113.0 to 574.0 mg/dl with a mean value of 265.20 ± 97.64. There was statistically significant difference in serum triglycerides level between the two groups (*t*=2.688, *p*=0.008)

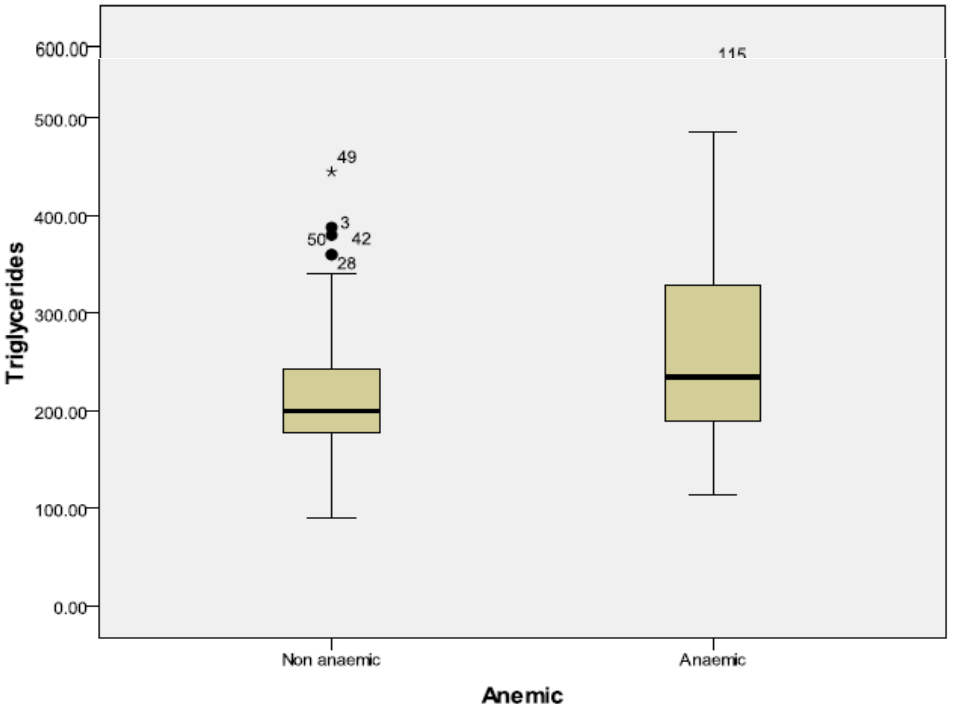

Figure (9): Box and whisker plot of the serum triglycerides of the two studied groups (non-anemic and anemic).

The thick horizontal line represents the median; the box represents the inter-quartile range (between 25th and 75th percentiles) which contains 50% of the data, while the whiskers represents the minimum and maximum values but after excluding the outliers (which is represented by a dark-filled circle) and the extremes (which is represented by asterisks).

Table (10): Comparison of serum cholesterol level between non-anemic and anemic groups

	Non-anemic group (n=50)	**Anemic group (n=50)**	***t***	***P*-value**
Cholesterol (mg/dl) Range *X*±SD	 125.0-460.0 245.3±79.46	 150.0-590.0 300.9±89.70	3.5	0.001* (S)

* S: significant at $p < 0.05$

Serum cholesterol level in the non-anemic group ranged from 125.0 to 460.0 mg/dl with a mean value of 245.3 ± 79.46 mg/dl, while in the anemic group it ranged form 150.0 to 590.0 mg/dl with a mean value of 300.90 ± 89.70. There was statistically significant difference in serum cholesterol between the two subgroups (t=3.507, p=.001)

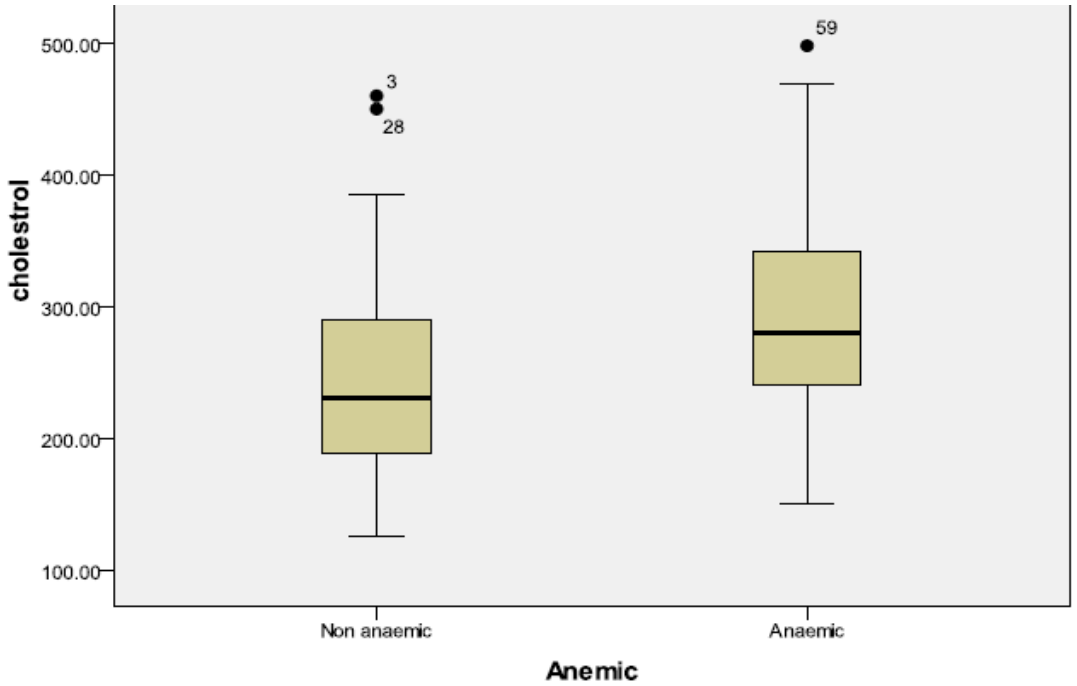

Figure (10): Box and whisker plot of the serum cholesterol of the two studied groups (non-anemic and anemic).

The thick horizontal line represents the median, the boxrepresents the inter-quartile range (between 25th and 75th percentiles) which contains 50% of the data, while the whiskers represents the minimum and maximum values but after excluding the outliers (which is represented by a dark-filled circle).

Table (11): Comparison of ejection fraction between non-anemic and anemic group

	Non-anemic group (n=50)	**Anemic group (n=50)**	***t***	***P*-value**
Echo ejection fraction (%) Range *X*±SD	 30.0-68.0 50.18±8.19	 23.0-65.0 46.78±7.93	2.279	0.024* (S)

* S: significant at $p < 0.05$

The ejection fraction in the non-anemic group ranged from 30.0 to 68.0% with a mean value of 50.18 ± 8.19%, while in the anemic group it ranged form 23.0 to 65.0% with a mean value of 46.78 ± 7.93%. There was statistically significant difference in ejection fraction between the two groups (*t*=2.279, *p*=0.024)

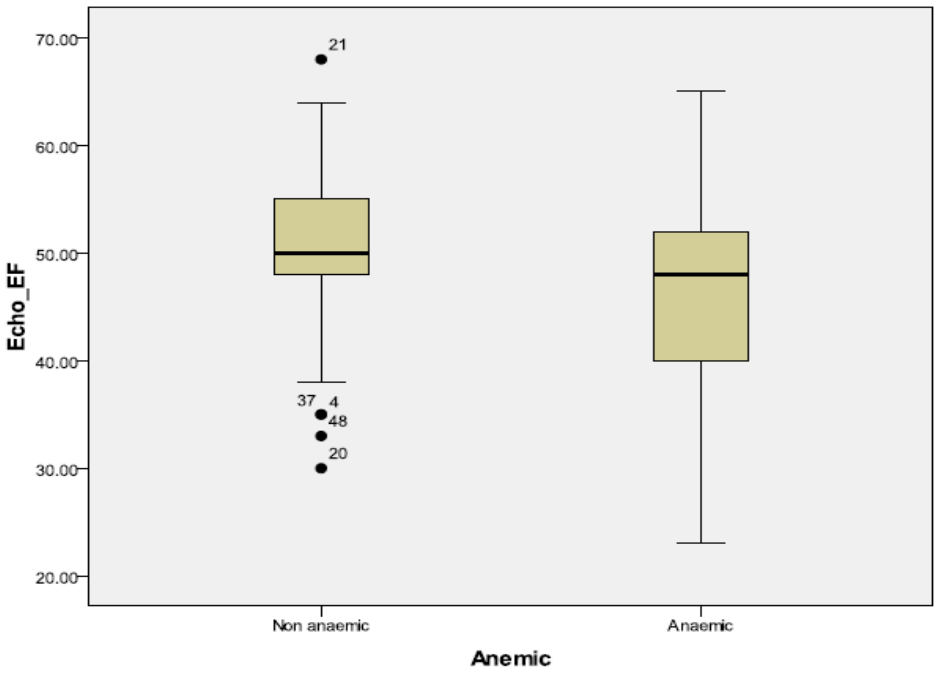

Figure (11): Box and whisker plot of the echo ejection fraction of the two studied groups (non-anemic and anemic).

The thick horizontal line represents the median; the box represents the inter-quartile range (between 25th and 75th percentiles) which contains 50% of the data, while the whiskers represents the minimum and maximum values but after excluding the outliers (which is represented by a dark-filled circle).

Table (12): Comparison between non-anemic and anemic groups regarding the studied categorical variables (sex and presentation)

Variable	**Non-anemic group (n=50)**		**Anemic group (n=50)**		χ^2	***P*-value**
	N	**%**	**N**	**%**		
Sex						
Male	37	74.0	47	94.0	7.4	0.006* (S)
Female	13	26.0	3	6.0		
Presentation						
Elevation MI	27	54.0	22	44.0		
NSTEMI	5	10.0	8	16.0	1.3	0.51 (NS)
Unstable angina	18	36.0	20	40.0		

* S: significant at $p < 0.05$ NS: nonsignificant at $p > 0.05$

This table shows that there was statistically significant difference between sex distribution between anemic group and non anemic group male represented 94% of anemic group and 74% in non anemic group. Also this table shows that there was no statistically significant difference between the two groups regarding presentation, ST elevation MI was the most prevalent presentation in both group.

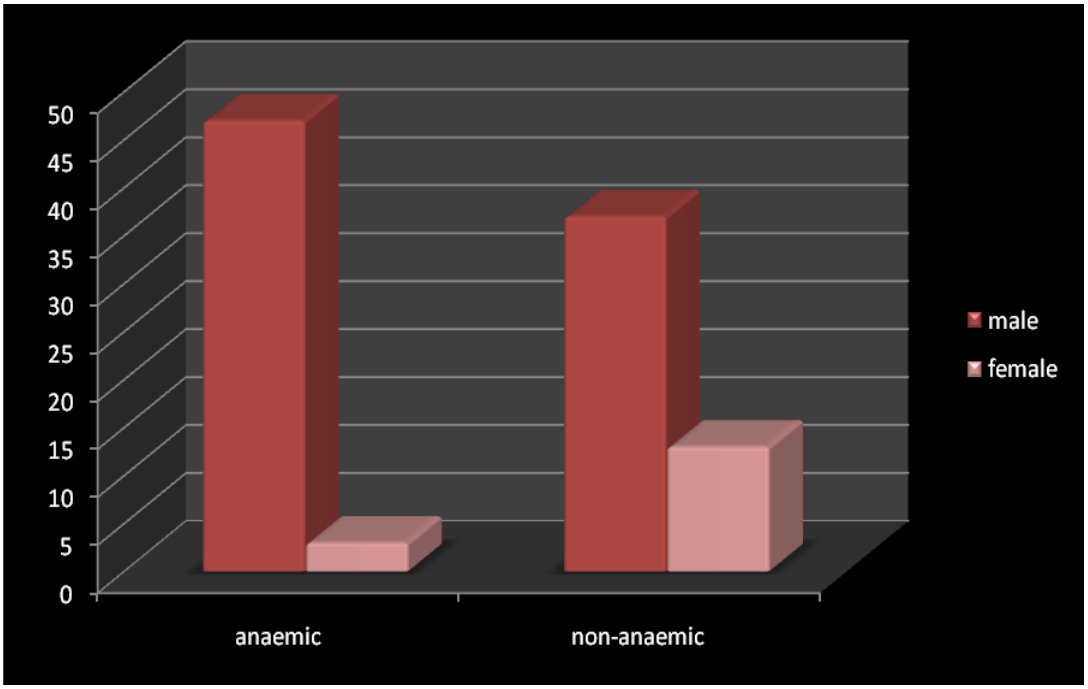

Figure (12): Bar chart showing sex distribution

This figure shows that male percentage was 94% in the anemic group and was 74% in non anemic group.The female percentage was 6% in the anemic group and 26% in the non-anemic group.

Table (13): Comparison between the cardiac history of the patients in the non-anemic and anemic patients

Variable	Non-anemic group (n=50)		Anemic group (n=50)		χ^2	*P*-value
	N	%	N	%		
Myocardial infarction	4	14.0	3	6.0		FET 0.19 (NS)
Unstable angina	12	24.0	4	8.0	4	0.04* (S)
PCI	10	20.0	3	6.0	3.9	0.05* (S)
CABG	1	2.0	8	16.0	5.4	0.01* (S)
No history	20	40.0	32	64.0	2.7	0.09 (NS)

* S: significant at $p < 0.05$ NS: nonsignificant at $p > 0.05$ P-FET= p value of Fisher's Exact Test

This table shows that there was statistically significant difference between the two groups regarding distribution of unstable angina, PCI and CABG, but there was no statistically significant difference between the two groups in myocardial infarction or past history.

Table (14): Comparison between drug use in the non-anemic and anemic groups

Variable	Non-anemic group (n=50)		Anemic group (n=50)		χ^2	*P*-value
	N	%	N	%		
BB	25	50.0	22	44.0	0.19	0.66 (NS)
Nitrates	13	26.0	10	20.0	0.39	0.05 (NS)
ACE/ARBs	11	22.0	23	46.0	4.2	0.39* (S)
Aspirin	16	32.0	16	32.0	0.000	1 (NS)
Clopidogril	5	10.0	4	8.0		FET 0.73 (NS)
Statins	14	28.0	19	38.0	0.75	0.38 (NS)

* S: significant at $p < 0.05$ NS: nonsignificant at $p > 0.05$ P-FET= p value of Fisher's Exact Test

This table shows that there was no statistically significant differences between non-anemic and anemic groups regarding to drug use of the patient except in ACE/ARBs**.**

Table (15): Comparison between risk factors in the non-anemic and anemic groups

Variable	Non-anemic group (n=50)		Anemic group (n=50)		χ^2	*P*-value
	N	%	N	%		
Diabetes (any type)	27	54.0	28	56.0	0.01	0.89 (NS)
Family history	17	34.0	16	32.0	0.03	0.86 (NS)
Dyslipidemia	19	38.0	23	46.0	0.3	0.5 (NS)
Obesity	17	34.0	12	24.0	0.68	0.35 (NS)
Smoking (ever)	42	84.0	39	78.0	0.11	0.73 (NS)
Hypertension	15	30.0	17	34.0	0.12	0.75 (NS)

NS: nonsignificant at $p > 0.05$

This table shows that there was no statistically significant difference between the two groups regarding risk factors and smoking was the most prevalent factor in both groups.

Table (16): Comparison between in hospital complication in the non-anemic and anemic groups

Variable	Non-anemic group (n=50)		Anemic group (n=50)		χ^2	*P*-value
	N	%	N	%		
Arrhythmias	31	62.0	38	76.0	0.7	0.34 (NS)
Post infarction angina	12	24.0	17	34.0	0.86	0.35 (NS)
Heart failure	10	20.0	13	26.0	0.39	0.53 (NS)
Death	3	5.0	9	12.0	0.28	0.39 (NS)

NS: nonsignificant at p > 0.05

This table shows that the in-hospital complications were higher in the anemic group but with no statistically significant differences between the two groups. And arrhythmias were the most prevalent complication in both groups.

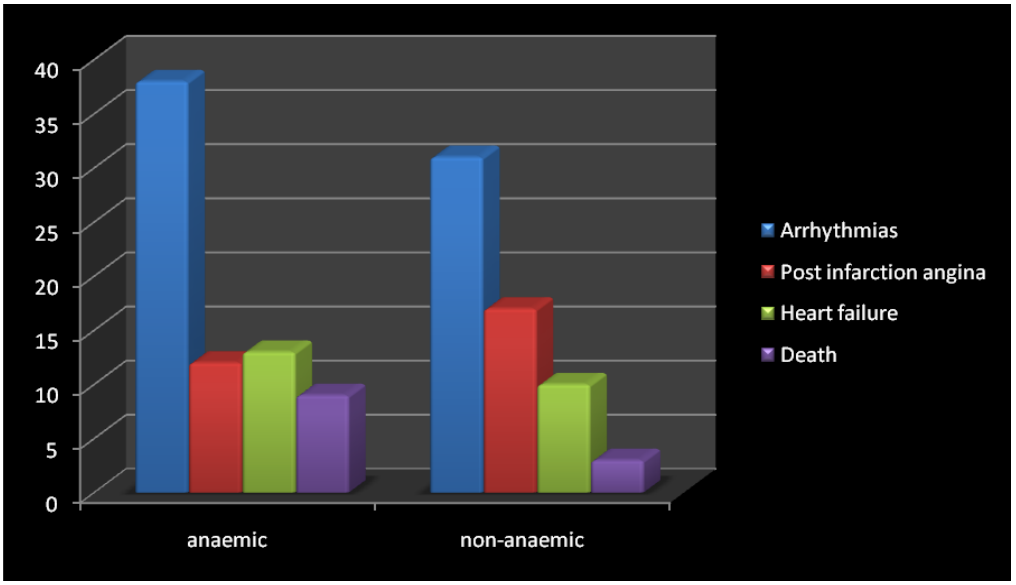

Figure (13): bar chart for distribution of in hospital complication

This figure shows that arrhythmias were the most prevalent complication in the two groups and number of deaths was more in anemic group.