RESULTS

RESULTS

A Total of 202 volunteers blood donors were enrolled in this study . The blood donors were classified into 2 groups .

Group 1, included 112 volunteer blood donors from El-Gharbia blood banks .

Group 2, included 90 volunteer blood donors from El-Kalubeia blood banks .

The selected blood donors were examined for , elevation of serum aminotransferase (ALT) , presence of hepatitis B surface antigen (HBsAg) , presence of hepatitis B core antibody (HBcAb) , and detection of antibody to hepatitis C virus (anti-HCV) .

The results of these tests , for the volunteer blood donors from El-Gharbia blood banks (Group 1) ,were presented in table (2) and graph (1)., and for the volunteer blood donors from El-Kalubeia blood banks (Group 2) , were presented in table (3) and graph (1).

Table (2) : Results of ALT , HBsAg , HBcAb and Anti-HCV in blood donors from El-Gharbia blood banks :

Sample No.	ALT	HBsAg	HBcAb	Anti-HCV
1	Normal	-	-	-
2	Normal	-	-	+
3	Elevated	-	+	-
4	Normal	-	-	-
5	Normal	-	-	-
6	Elevated	+	+	-
7	Normal	-	-	-
8	Normal	-	-	-
9	Normal	-	-	-
10	Normal	-	-	-
11	Elevated	-	+	+
12	Normal	-	+	-
13	Normal	-	-	-
14	Normal	-	-	-
15	Normal	-	-	+
16	Elevated	-	+	+
17	Elevated	-	+	-
18	Normal	-	+	-
19	Normal	-	-	-
20	Normal	-	-	-
21	Normal	-	-	-
22	Normal	-	-	-
23	Elevated	-	+	+
24	Normal	-	-	-
25	Normal	-	-	-
26	Normal	-	-	-
27	Normal	-	-	-
28	Elevated	-	+	-
29	Elevated	-	-	-
30	Normal	-	-	-
31	Elevated	-	-	-
32	Normal	-	-	+

Table (2) : cont.

Sample No.	ALT	HBsAg	HBcAb	Anti-HCV
33	Normal	-	-	-
34	Normal	-	-	-
35	Elevated	+	+	-
36	Elevated	-	+	-
37	Normal	-	-	-
38	Normal	-	-	+
39	Elevated	-	+	+
40	Normal	-	-	-
41	Normal	-	-	+
42	Normal	-	+	-
43	Normal	-	-	-
44	Elevated	-	+	-
45	Normal	-	-	-
46	Normal	-	-	+
47	Normal	-	-	-
48	Normal	-	+	-
49	Elevated	-	+	+
50	Normal	-	-	-
51	Normal	-	-	-
52	Normal	-	-	-
53	Normal	-	-	-
54	Normal	-	-	-
55	Elevated	-	+	+
56	Normal	-	-	-
57	Normal	-	-	-
58	Normal	-	+	-
59	Elevated	+	+	-
60	Normal	-	-	-
61	Normal	-	-	-
62	Normal	-	-	+
63	Elevated	-	+	+
64	Normal	-	-	-
65	Elevated	+	+	-
66	Elevated	-	+	+

Table (2) : cont.

Sample No.	ALT	HBsAg	HBcAb	Anti-HCV
67	Normal	-	-	-
68	Normal	-	-	-
69	Normal	-	-	-
70	Normal	-	-	-
71	Elevated	-	+	+
72	Normal	-	-	-
73	Normal	-	-	-
74	Normal	-	-	+
75	Normal	-	-	-
76	Normal	-	-	-
77	Elevated	-	-	+
78	Normal	-	-	+
79	Normal	-	-	-
80	Normal	-	-	-
81	Normal	-	-	-
82	Elevated	+	+	-
83	Normal	-	-	-
84	Normal	-	-	-
85	Normal	-	-	+
86	Elevated	-	-	+
87	Normal	-	-	-
88	Elevated	-	-	-
89	Normal	-	-	-
90	Normal	-	-	-
91	Elevated	+	-	-
92	Elevated	-	+	+
93	Normal	-	-	-
94	Normal	-	-	-
95	NormL	-	-	-
96	Elevated	-	+	-
97	Normal	-	-	-
98	Normal	-	-	-
99	Normal	-	-	-
100	Normal	-	-	+

Table (2) : cont.

Sample No.	ALT	HBsAg	HBcAb	Anti-HCV
101	Elevated	-	-	+
102	Normal	-	-	-
103	Normal	-	-	-
104	Elevated	-	+	+
105	Normal	-	-	-
106	Normal	-	-	-
107	Elevated	-	+	+
108	Normal	-	-	-
109	Normal	+	-	-
110	Normal	-	-	-
111	Normal	-	+	+
112	Normal	-	-	-

Table (3) : Results of ALT , HBsAg , HBcAb and Anti-HCV in blood donors from El-Kalubeia blood banks :

Sample No.	ALT	HBsAg	HBcAb	Anti-HCV
1	Normal	-	-	-
2	Elevated	-	+	+
3	Normal	-	+	-
4	Normal	-	-	-
5	Normal	-	-	+
6	Elevated	-	+	+
7	Elevated	-	+	-
8	Normal	-	-	-
9	Normal	-	-	-
10	Normal	-	+	-
11	Elevated	-	-	-
12	Normal	-	-	+
13	Normal	-	-	-
14	Normal	-	-	-
15	Elevated	+	+	-
16	Elevated	-	+	-
17	Normal	-	-	-
18	Normal	-	-	+
19	Elevated	-	+	+
20	Normal	-	-	-
21	Normal	-	-	-
22	Normal	-	-	-
23	Normal	-	-	-
24	Normal	-	-	-
25	Elevated	-	+	+
26	Normal	-	-	-
27	Normal	-	-	-
28	Normal	-	+	-
29	Elevated	+	+	-
30	Normal	-	-	-
31	Normal	-	-	-
32	Elevated	-	+	+
33	Normal	-	-	-

Table (3) : cont.

Sample No.	ALT	HBsAg	HBcAb	Anti-HCV
34	Normal	-	-	+
35	Normal	-	-	-
36	Normal	-	-	-
37	Elevated	-	-	+
38	Normal	-	-	+
39	Normal	-	-	-
40	Normal	-	-	-
41	Elevated	+	-	-
42	Elevated	-	+	+
43	Normal	-	-	-
44	Normal	-	-	-
45	Normal	-	-	-
46	Normal	-	-	-
47	Normal	-	-	-
48	Elevated	-	+	-
49	Normal	-	-	-
50	Elevated	-	-	+
51	Elevated	-	-	+
52	Normal	-	-	-
53	Normal	-	-	-
54	Elevated	-	+	+
55	Normal	-	-	-
56	Normal	-	-	-
57	Elevated	-	+	+
58	Normal	-	-	-
59	Normal	+	-	-
60	Normal	-	-	-
61	Normal	-	-	-
62	Normal	-	+	+
63	Elevated	-	-	+
64	Normal	-	+	-
65	Normal	-	-	-

Table (3) : cont.

Sample No.	ALT	HBsAg	HBcAb	Anti-HCV
66	Elevated	-	-	-
67	Normal	-	-	-
68	Normal	-	-	-
69	Normal	-	-	-
70	Elevated	-	-	-
71	Normal	-	-	-
72	Normal	-	+	-
73	Normal	-	-	-
74	Normal	-	-	+
75	Elevated	-	+	+
76	Normal	-	-	-
77	Normal	-	+	-
78	Elevated	-	-	+
79	Elevated	-	-	-
80	Normal	-	-	-
81	Normal	-	-	-
82	Normal	-	-	+
83	Normal	-	-	-
84	Elevated	-	+	+
85	Normal	-	-	-
86	Normal	-	-	-
87	Elevated	-	+	-
88	Normal	-	-	-
89	Normal	-	+	-
90	Normal	-	+	-

Incidance of elevated ALT in volunteer blood donors according to their location :

In this study , it was found that , in volunteer blood donors from El-Gharbia blood banks , (Group 1) , 30 out of 112 donors (26.8%) had elevated ALT , and 26 out of 90 donors (28.9 %) had elevated ALT , in volunteer blood donors from El-Kalubeia blood banks . So , a total of 56 out of 202 donors (27.7%) had elevaled ALT . Table (4) .

Table (4) : Incidence of elevated ALT in volunteer blood donors, according to their location .

Location	No. of blood donors	Bl. donors with elevated ALT	%
Group (1)	112	30	26.8 %
Group (2)	90	26	28.9 %
Total	202	56	27.7 %

Incidence of positive donors for HBsAg in volunteer blood donors according to their location :

In this study , it was found that , in volunteer blood donors from El-Gharbia blood banks (Group 1) , 7 out of 112 donors (6.25%) were positive to HBsAg , and 4 out of 90 donors (4.4%) were positive to HBsAg in volunteer blood donors from El-Kalubeia blood banks (Group 2) . So , a total of 11 out of 202 donors (5.4%) were positive to HBsAg . Table (5).

Table (5) Incidence of positive HBsAg in volunteer blood donors , according to their location .

Location	No. of blood donors	bl. donors with +ve HBsAg	%
Group (1)	112	7	6.25 %
Group (2)	90	4	4.4 %
Total	202	11	5.4 %

Incidence of positive donors for HBcAb in volunteer blood donors according to their location :

In this study , it was found that , in volunteer blood donors from El-Gharbia blood banks (Group 1) , 29 out of 112 donors (25.9 %) were positive to HBcAb , and 25 out of 90 donors (27.8 %) were positive to HBcAb in volunteer blood donors from El-Kalubeia blood banks (Group2) . So, a total of 54 out of 202 donors (26.7 %) were positive to HBcAb . Table (6) .

Table (6) : Incidence of positive HBcAb in volunteer blood donors , according to their location .

Location	No. of blood donors	Bl. donors with +ve HBcAb	%
Group (1)	112	29	25.9 %
Group (2)	90	25	27.7 %
Total	202	54	26.7 %

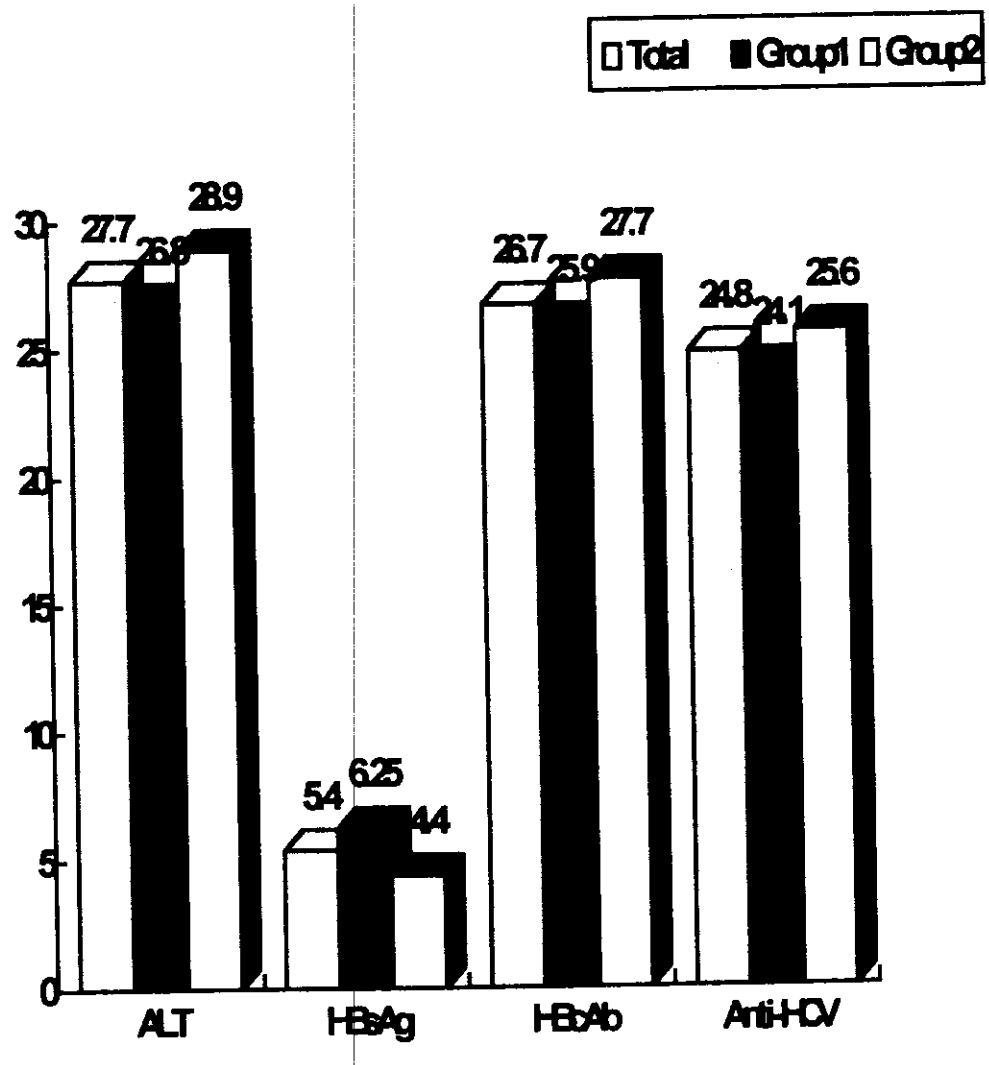
Incidence of positive donors for Anti-HCV in volunteer blood donors according to their location :

In this study , it was found that , in volunteer blood donors from El-Gharbia blood banks (Group 1) , 27 out of 112 donors (24.1 %) were positive to Anti-HCV , and 23 out of 90 donors (25.6 %) were positive to Anti-HCV in volunteer blood donors from El-Kalubeia blood banks (Group 2) . So a total of 50 out of 202 donors (24.8 %) were positive to Anti-HCV . Table (7) .

Table (7) : Incidence of positive Anti-HCV antibodies in volunteer blood donors according to their location :

Location	No. of blood Donors	Bl. donors with +ve Anti-Hcv	%
Group (1)	112	27	24.1 %
Group (2)	90	23	25.6 %
Total	202	50	24.8 %

Graph (1) : ***Results of ALT , HBsAg , HBcAb and Anti-HCV in blood donors***



Total incidence of non-A, non-B hepatitis in volunteer blood donors , according to their location by using the surrogate markers .

According to Koziod et al., 1986 and Marcellin et al., 1991., blood donors were considered preliminary positive for non-A, non-B hepatitis in patients which were negative to HBsAg but positive to one or both of the surrogate markers for non-A, non-B hepatitis, which are elevated ALT and positive for HBcAb .

In this study , after exclusion of positive donors to HBsAg , it was found that , in volunteer blood donors from El-Gharbia blood banks, Group (I), 7 out of 112 donors (6.3%) had elevated ALT only , 6 out of 112 donors (5.3%) was positive to HBcAb only and 18 out of 112 donors (16.1%) had both elevated ALT and positive HBcAb. So a total of 31 out of 112 donors (27.7%) were positive to one or both of surrogate markers to non-A , non-B hepatitis .

In volunteer blood donors from El-Kalubeia blood banks , Group (2) , 9 out of 90 donors (10%) had elevated ALT only , 9 out of 90 donors (10%) were positive to HBcAb only and 14 out of 90 donors (15.5%) had both elevated ALT and positive HBcAb . So , a total of 32 out of 90 donors (35.5%) were positive to one or both of the surrogate markers for non-A ,non-B hepatitis .

So, it was found that , a total of 63 out of 202 donors (31.2%) were suggested to be positive for non-A , non-B hepatitis . These result were shown in Table (8)

Table (8) : Total incidence of non-A , non-B hepatitis in volunteer blood donors , according to their location . (using the surrogate markers)

Location of Blood donors	No. of Blood Donors	Serological Finding	No. of Positive Donors	%
Group (1)	112	* Elevated ALT	7	6.3%
		* Positive HBcAb	6	5.3%
		* Elevated ALT + Positive HBcAb	18	16.1%
		Total	31	27.7%
Group (2)	90	* Elevated ALT	9	10%
		* Positive HBcAb	9	10%
		* Elevated ALT + Positive HBcAb	14	15.5%
		Total	32	35.5%
Total No.	202		63	31.2%

Relation between anti-HCV and the presence of the surrogate markers for non-A non-B hepatitis, in blood donors

(A) Relation between blood donors positive to surrogate markers for non-A non-B hepatitis, and anti-HCV positive donors, according to their location :

In this study , it was found that , in volunteer blood donors from El-Gharbia blood banks , Group (1) , a total of 27 donors were positive to Anti-HCV , among these donors , 3 out of 27 donors (11.1%) had elevated ALT only , 2 out of 27 donors (7.4%) were positive to HBcAb only , and 11 out of 27 donors (40.7%) had both elevated ALT and positive to HBcAb . So, a total of 16 out of 27 donors (59.2 %) , were positive to one or both of the surrogate markers .

In volunteer blood donors from El-Kalubeia blood banks ,(Group II) , a total of 23 donors were positive for Anti-HCV , among these donors , 5 out of 23 donors (21.7%) had elevated ALT only , 1 out of 23 donors (4.3%) was positive for HBcAb only , and 10 out of 23 donors (43.5%) had both elevated ALT and positive for HBcAb , So , a total of 16 out of 23 donors (59.5%) were positive for one or both of the surrogate markers of non-A,non-B hepatitis.

So, among positive donors for anti-HCV, a total of 64% (32/50) were positive to one or both of the surrogate markers of non-A , non-B hepatitis. These results were shown in table (9) .

(B) Relation between blood donors negative to surrogate markers for non-A non-B hepatitis, and anti-HCV positive donors, according to their location :

In this study , it was found that , in volunteer blood donors from El-Gharbia blood banks , Group (1) , a total of 27 donors were positive to Anti-HCV , among these donors , 11 out of 27 donors (40.8%) were negative to the surrogate markers .

In volunteer blood donors from El-Kalubeia blood banks ,(Group II) , a total of 23 donors were positive for Anti-HCV , among these donors , 7 out of 23 donors (30.5%) were negative for the surrogate markers of non-A,non-B hepatitis.

So, among positive donors for anti-HCV, a total of 36% (18/50) were negative to one or both of the surrogate markers of non-A , non-B hepatitis. These results were shown in table (10) .

(C) Relation between blood donors positive to surrogate markers for non-A non-B hepatitis, and anti-HCV negative donors, according to their location :

In this study , it was found that , in volunteer blood donors from El-Gharbia blood banks , Group (1) , a total of 85 donors were negative to Anti-HCV , among these donors , 3 out of 85 donors (3.5%) had elevated ALT only , 5 out of 85 donors (5.9%) were positive to HBcAb only , and 7 out of 85 donors (8.2%) had both elevated ALT and positive to HBcAb. So, a total of 15 out of 85 donors (17.6 %) , were positive to one or both of the surrogate markers .

In volunteer blood donors from El-Kalubeia blood banks ,(Group II) , a total of 67 donors were negative for Anti-HCV , among these donors , 4 out of 67 donors (6%) had elevated ALT only , 8 out of 67 donors (11.9%) were positive for HBcAb only , and 4 out of 67 donors (6%) had both elevated ALT and positive for HBcAb , So , a total of 16 out of 67 donors (23.9%) were positive for one or both of the surrogate markers of non-A,non-B hepatitis.

So, among negative donors for anti-HCV, a total of 20.4% (31/152) were positive to one or both of the surrogate markers of non-A , non-B hepatitis. These results were shown in table (11) .

Table (9) : **Relation between blood donors positive to surrogate markers for non-A non-B hepatitis, and anti-HCV positive donors, according to their location :**

Location of Blood donors	Bl. Donors +ve to Anti- HCV	Bl. Donors positive to surrogate markers among Anti-HCV positive donors		
		Serological Finding	No.	%
Group (1)	27	* Elevated ALT	3	11.1%
		* Positive HBcAb	2	7.4%
		* Elevated ALT + Positive HBcAb	11	40.7%
		Total	16	59.2%
Group (2)	23	* Elevated ALT	5	21.7%
		* Positive HBcAb	1	4.3%
		* Elevated ALT + Positive HBcAb	10	43.5%
		Total	16	69.5%
Total No.	50		32	64%

Table (10) : Relation between blood donors negative to surrogate markers for non-A non-B hepatitis, and anti-HCV positive donors, according to their location :

Location of Blood donors	Bl. Donors +ve to Anti- HCV	Bl. Donors negative to surrogate markers among Anti-HCV positive donors	%
Group (1)	27	11	40.8%
Group (2)	23	7	30.5%
Total No.	50	18	36%

Table (11) : Relation between blood donors positive to surrogate markers for non-A non-B hepatitis, and anti-HCV negative donors, according to their location :

Location of Blood donors	Bl. Donors negative to Anti- HCV	Bl. Donors positive to surrogate markers among Anti-HCV negative donors		
		Serological Finding	No.	%
Group (1)	85	* Elevated ALT	3	3.5%
		* Positive HBcAb	5	5.9%
		* Elevated ALT + Positive HBcAb	7	8.2%
		Total	15	17.6%
Group (2)	67	* Elevated ALT	4	6%
		* Positive HBcAb	8	11.9%
		* Elevated ALT + Positive HBcAb	4	6%
		Total	16	23.9%
Total No.	152		31	20.4%

DISCUSSION

Discussion

- Viral hepatitis is a major health problem throughout the world (*WHO Bulletin 1982*). In Egypt, the disease is endemic and appears to be increasing in frequency . Previous studies showed that, by maturity, most of the population has been infected with hepatitis A, and greater than 50% has been infected with hepatitis B virus (*Hyam et al., 1986*).

Once reliable diagnostic tests for hepatitis A and B infection has been developed , it was evident that there were other , presumed viral, causes of hepatitis . The cumbersome name non-A , non-B hepatitis was coined for these conditions .*(Peutherer 1992)*.

The name non-A, non-B hepatitis means infection of the liver by at least one of three viruses: hepatitis C virus (HCV) which is responsible for most cases of non-A , non-B hepatitis , hepatitis E virus which is the major etiologic agent of enteric non-A, non-B hepatitis and an unidentified virus which is a " Coagulation factor transmitted virus " (*Alter et al., 1988 , Ritter et al ., 1993 , Dana et al 1994*).

Non-A, non-B hepatitis is the major cause of post-transfusion associated hepatitis (*Shorey, 1985*). It accounts for about 90% of post transfusion hepatitis in countries where blood is screened only for HBsAg (*Feinman et al., 1988*).

- In Egypt now, the blood is screened for both hepatitis B surface antigen (HBsAg) and also for antibody to hepatitis C virus (anti-

HCV) to reduce the risk of post-transfusion hepatitis. However, these tests are not enough because, the development of anti-HCV antibodies is delayed and the mean delay is 9-12 weeks after transfusion or 15 weeks after the onset of clinical hepatitis . This prolonged delay suggests that some donors are capable of transmitting infection with non-A, non-B hepatitis before they will be detected by anti-HCV assay (*Alter et al., 1989. Garson et al., 1990*) . Also, sequential studies of samples indicate that , in acute stage , no more than 20% of patients have seroconverted , this rises to 60% by 6 months and almost 100% by 1 year . Thus , the test in its present form can be used for epidemiological studies and for the diagnosis of chronic infection , but may have limited use in the early stages of acute infection (Peutherer 1992) .

- A supplementary studies were found that, only a small proportion of anti- HCV antibodies positive donors , by ELISA test carry a risk of transmitting non-A , non-B hepatitis . (*Garson et al., 1990*) .

- On the other hand, it was found that hepatitis B surface antigen (HBsAg) is not enough to detect all cases which are capable of transmitting hepatitis B virus (HBV). It should be combined with HBcAb. This is because hepatitis B core antibodies (HBcAb) is the only hepatitis serum marker to be detected in the serological gap period in which both HBsAg and anti-HBs antibodies are negative inspite of the patient being infectious to hepatitis B virus

(*Zuckerman, 1980*). Also, HBcAb is a good epidemiological tool, since when measured in conjunction with HBsAg, it identified more cases of infection with hepatitis B virus (*Sherlock et al., 1985*).

According to Abbott , HCV learning guide 1990 , testing donor blood for elevated ALT levels and anti-HBc is useful for a number of reasons .

* HCV infection may not account for all non-A , non-B viruses transmitted by blood and blood product . A type of non-A , non-B hepatitis known for its short incubation period does not appear to be associated with hepatitis C infection , but its incidence may decrease with ALT screening .

* All units of blood positive for exposure to HBV need to be removed , as is done with anti-HBc testing . Post transfusion hepatitis B is a more severe disease than post-transfusion non-A , non-B hepatitis and is not completely prevented by screening for HBsAg alone .

* Antibody to HBc antigen appears to identify a population at high risk for HIV and other serious viral infections that may be transmitted by blood donation .

- Now, non-A, non-B hepatitis can be suspected by many ways, these include detection by exclusion, using the surrogate markers for non-A, non-B hepatitis and detection of anti-hepatitis C virus antibodies (Anti-HCV antibodies), by first generation ELISA test, second generation ELISA test , second generation (RIBA) test and

third generation (RIBA) test and detection of viral RNA by polymerase chain reaction (PCR) .

The results of this study showed that , the incidence of carriers state for hepatitis B virus , which were positive to HBsAg , were 5.4% (11/202) , it was ranged from 4.4% (4/90) in volunteer blood donors from El-Kalubeia blood banks (Group II), and 6.25% (7/112) in volunteer blood donors from El-Gharbia blood banks (GroupI) . These results are relatively similar to the results of McColum and Zuckerman 1981., who found that the incidence of carriers state of hepatitis B virus became established in approximately 5 - 10% of the infected adults.

Also , in this study , it was found that , the incidence of carriers state of hepatitis C virus , which were positive to Anti-HCV , were 24.8% (50/202) , it ranged from 24.1% (27/112) in volunteer blood donors from El-Gharbia blood banks (Group I), and 25.6% (23/90) in volunteer blood donors from El-Kalubeia blood banks (Group II). These results is nearly similar to the result of Darwish et al., 1993 who found that 22% of blood donors seen at one Cairo hospital were positive to HCV using second generation ELISA test .

On the other hand, these results is nearly two times higher compared to the finding of Kamel et al ., 1993., where they found that the prevalence of non-A , non-B hepatitis in Egyptian blood donors was 10.9% by using Anti-HCV ELISA tests . This

difference may be due to difference in locality, type of kits or sensitivity of performed test .

On the other hand , in this study ,The incidence of non -A, non-B hepatitis carrier state, by using the surrogate markers was 31.2% (63/202), this incidence ranged from 27.7% (31/112) in volunteer blood donors from El-Gharbia blood banks (Group I), and 35.5% (32/90) in volunteer blood donors from El-Kalubeia blood banks (Group II) .

By comparing the relation between positive donors for Anti-HCV and the presence of the two surrogate markers , it was found that , among 50 positive donors to Anti-HCV , 16% (8/50) had elevated ALT only this incidence was ranged from 11.1% (3/27) in Group1, to 21.7% (5/23) in Group2, 6% (3/50) were positive to HBcAb only this incidence was ranged from 7.4% (2/27) in Group1, to 4.3% (1/23) in Group2, and 42% (21/50) had both elevated ALT and positive to HBcAb this incidence was ranged from 40.7% (11/27) in Group1, to 43.5% (10/23) in Group2 . So, a total of 64% (32/50) were positive to one or both of the surrogate markers .

These results are similar somewhat to the results reported by Alter et al ., 1991 who said that approximately 50% of the potential donors infected with hepatitis C virus have been excluded by the ALT assay , the anti-HBc assay or both .

Also, it is similar somewhat to the results reported in Abbott HCV Learning Guide 1990 by Cuthbert at the University of Texas Southwest Medical Center , who reported that ; with elevated ALT alone , 15.4% of donors, were positive also for anti-HCV ; with positive HBcAb alone , 12.4% of donors, were positive also for Anti-HCV and with both markers present , 60% of donors, were positive also for anti-HCV .

So, examination of the surrogate markers status of the anti-HCV antibodies positive donors suggested assays by U.S blood banks was proper. This supported earlier predition of the surrogate assays. (*Alter et al., 1991*).

On the other hand , in this study , it was found that 40.8% (11/27) were negative to the surrogate markers among positive donors for Anti-HCV in (Group I) and 30.5% (7/23) were negative to the surrogate markers among positive donors for Anti-HCV in (Group II) . So, a total of 36% (18/50) were negative to the surrogate markers for Non-A, Non-B hepatitis among positive donors for Anti-HCV antibodies . So it was clear that the surrogate markers can not detect all cases infected with hepatitis C virus because it is not specific or the virus is still in the incubation period or it is not strong enough to destroy the liver cells .

By comparing the relation between negative donors for Anti-HCV and the presence of the two surrogate markers , it was found that , among 152 negative donors to Anti-HCV , 17.6% (15/85)

were positive to one or both of the surrogate markers in Group1 , 23.9% (16/67) were positive to one or both of the surrogate markers in Group2 . So, a total of 20.4% (31/152) were positive to one or both of the surrogate markers for non-A, non-B hepatitis among negative donors to Anti-HCV antibodies . This is because the detection of anti HCV may be delayed up to one year or because hepatitis C virus is not the only causitive agents of non-A non-B hepatitis, as there are other viruses which may be responsible of non-A non-B hepatitis, on the other hand positive surrogate markers may be due to hepatitis B virus infection which can not be detected by HBsAg . (Zuckerman, 1980 and Sherlock et al., 1985) .

Gila et al., 1993, reported that , the incidence of post transfusion hepatitis after screening for anti -HCV by ELISA-2 was 2.8% , there is probably an unidentified virus , hepatitis post transfusion non-A non-B, non -C (HPT NANBNC) which is responsible for the post transfusion hepatitis cases .

Cuthbert 1990, suggest that , the continuing use of the surrogate markers which are elevated ALT levels and the presence of HBcAb, beside the already used tests contributes to the continuing effort to safeguard the blood supply, and so, it is very effective in reduction of the incidence of post transfusion hepatitis in Egypt .