

## PREVALENCE OF HBV, HCV AND HIV-1, 2 INFECTIONS AMONG PATIENTS IN SALADIN GOVERNORATE, IRAQ

Taghreedkhudhur Mohammed<sup>1\*</sup>, Mohammed Abed Jwad<sup>2</sup>, Ali Hafedh Abbas<sup>3</sup> and Muntadher Fadhil Jassim<sup>4</sup>

<sup>1</sup>Institute of Medical Technology, Al Mansour, Baghdad, Iraq.

<sup>2</sup>Al-Nosor University, Baghdad, Iraq.

<sup>3</sup>Biological Research Unit, College of Science, University of Baghdad, Baghdad, Iraq.

<sup>4</sup>Balad General Hospital, Saladin Governorate, Iraq.

e-mail : ali\_habbas@sc.uobaghdad.edu.iq

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**ABSTRACT :** Hepatitis B and Hepatitis C viruses are the major health problem in the worldwide. In the Middle East, the prevalence of HBV in general population with the chronic infections is 2–5%, whereas the prevalence of HCV is about 1% in Arabian Gulf countries. World Health Organization (WHO) revealed that the risks of HBV and HCV transmission as well as human immunodeficiency virus (HIV) through the transfusion of contaminated blood and blood products is high, because of the fragility of health services in these countries. Several viral diseases are transported by different modes like blood transfusion, sexual contact, and unsafe injections. The most common blood-transmitted viruses are hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV); which cause fatal and chronic disorders. The prevalence of these viruses varies in Asia and developing countries depending on nationality, geography and lifestyle, sex, race, and educational levels. For all these previous causes, this study designed to know the seroprevalence of HBV, HCV and human retroviruses (HIV-1, 2) among inpatients and outpatients of Balad General Hospital in Saladin governorate in Iraq. The study conducted in Balad General Hospital. Subjects with hepatitis C, B viruses, and HIV recorded from January 2017 to December 2017. The age of patients ranged from 6 to 70 years; and the total number of tested serum samples was 32,942 serum samples. The highest percentage of HBV prevalence was in July by using ELISA technique (11.1%) for outpatients followed by 15.40% for outpatients in May by using anti-HBV strip. While the highest percentage of HCV prevalence was recorded in July by using ELISA technique (11.73%) for outpatients followed by 14.76% for outpatients in May by using anti-HCV strip. The percentage of patients infected with HBV in both sexes (females and males) was higher than the percentage of patients infected with HCV (1.80% vs. 0.57%, respectively). Also, the present study indicated the seroprevalence of HBV (anti-HBV) was 38.27% for female and 41.02% for male with age range 21–30 years, and this significantly higher than in HCV which the percentage of the seropositive cases were 37.03% in female and 39.13% in male with age range 41–50 years. There were no significant differences between the seroprevalences of each of anti-HCV Ab, anti-HBV Ab and HBsAg, and only 2 cases (0.03%) were seropositive for HIV-1, 2.

Although, the HBV and HCV in Iraq are a major problem for the community and viral infectious diseases; the current study revealed that Iraq has a low prevalence for HBsAg, HBV, HCV and HIV.

**Key words :** Hepatitis B, hepatitis C, HIV, Iraq.

### INTRODUCTION

Viral hepatitis is a widespread disease in the world, and the epidemiological rate of the disease varies depending on the age, sex, health, educational and social levels, in addition to the type of virus transmission modes (World Health Organization, 2013, 2016).

Different viral diseases can be transmitted through an infected blood, blood products, sexual contact, food and direct contact with infected patients. The most common diseases that are transmitted through blood are HBV, HCV

and Human Immunodeficiency viruses (HIV) (Ali, 2009). In Iraq, many studies had been done to understand the prevalence of HBV, HCV and HIV. It was found that Iraq has intermediate prevalence regarding type B (5.5%) and (8.6%) for type C (Al-Hamdani *et al.*, 2012). Decreasing in viral hepatitis prevalence among general population in Iraq compared with other countries in the Middle East may be due to application of the prevention and control programs, like introduction of vaccination program. But, there are many new positive cases appear and this referred to the presence of reservoirs of chronically infected persons. So, serologic tests for surface antigen (HBsAg)

\*Corresponding author: e-mail : taghreidkheder@gmail.com

and antibody to hepatitis B virus (anti-HBV), antibody to hepatitis C virus (anti-HCV) and antibody for HIV must require for all blood donators, engaged couples and before surgical operation (Al-Hawaz *et al*, 2014).

According to the Communicable Disease Control Center (CDCC) in Baghdad, Iraq, the researchers found that out of 495, 648 blood donors in 2010, only 3,258 (0.65%) were positive for HBV and 933 (0.19%) for HCV. The prevalence of HBsAg was higher in men (0.7%) than in women (0.5%). While, the prevalence of anti-HCV was higher in women (0.4%) than in men (0.2%) and most of the affected blood donors were between 20-40 years' age (Ali, 2009). The examination for HBsAg is the commonly used for screening test. However, testing blood for HBsAg does not give the risk of totally HBV transmission; because during the core window period, the HBsAg cannot be detected in the blood, although HBV infection is present. Many studies have proved that HBV infection may occur in patients with seronegative for HBsAg, and serologically seronegative for HBsAg does not indicate the HBV eradication (Mahmoud, 2013).

In Iraq, HBs-Ag detection assay was by ELISA technique, it was only the mandatory test to detect HBV infection in blood of donors. In 2011, 25782 of blood samples were collected from 25294 male donors and 488 female donors in the National Blood Transfusion Center at Baghdad, their mean age was ranged from 20 to 65 years. Their results showed that the prevalence of the HBV in Iraq is 4.6% as intermediate region at first time and (185) blood samples were positive for HBsAg (Hassab *et al*, 2016). The results of other study at the blood bank in Baqubah Teaching Hospital, Diyala governorate showed that from 89 HBsAg seropositive blood donation, 66 cases were males and 23 cases were females with age range from 19 to 60 years examined by using different ELISA kits during a period from January 2016 until 17<sup>th</sup> January 2017 (Hadi *et al*, 2017). While in Mosul governorate, the prevalence of HBV and HCV among 140 chronic renal failure patients for both sexes and different ages, from the period of March 2015 to April 2016, were 16.4% and 14.2% for HBV and HCV respectively (Sharif *et al*, 2017). The present study aimed to know the seroprevalence of HBV, HCV and human retroviruses (HIV-1, 2) among inpatients and outpatients of Balad General Hospital in Saladin governorate in Iraq. Balad General Hospital is one of the hospitals located in the Saladin governorate in Iraq that provided the data of the patients, who infected with different viral infections from the areas of Dujail, Dhuluiya and Al-Ishaqi. Dujail is situated about 65 kilometers (40 miles) north of Iraq's capital, Baghdad. Whereas, Dhuluiya is a town situated

on the left bank of the Tigris, about 76 km (47 miles) north of Baghdad. Al-Ishaqi is a small town in Balad district of the Saladin governorate of Iraq, about 96 km (60 miles) north of Baghdad (Malone, 2008; Thavasu *et al*, 1992).

## MATERIALS AND METHODS

### Study population and sample collection

The study was conducted in a period from January 2017 to December 2017. Venous blood samples of 32,942 patients were collected from Inpatients and Outpatients attended to Balad General Hospital in the governorate of Salahdin, Iraq. All patients were not previously vaccinated against hepatitis virus, with age range (6–70) years, such the patients suffered from various types of anemia, arthritis and liver diseases, in addition to blood donors and engaged couples. The living locations of the patients were from Dhuluiya, Dujail, Balad and Al Ishaqi.

Five ml of venous blood was dropped from each patient. The blood sample was centrifuged at 3000 rpm for 5 minutes to obtain the serum for serological examinations of hepatitis viruses (HBsAg, anti-HBV and anti-HCV) and anti-human immunodeficiency virus type 1 and 2 (anti-HIV-1,2) detecting (Fainboim *et al*, 1999).

### Serological tests

Serum samples were tested for viral markers by commercially available enzyme-linked immunosorbent assay technique (ELISA), to detect the HBsAg ELISA Kit (BIOMerieux, France), anti-HBV ELISA Kit (BIOMerieux, France), anti-HCV ELISA Kit (BIOKITS, Spain), anti-HIV-1,2 ELISA Kit (BIO Merieux, France), HBsAg strip (CTK Biotech Inc., USA), anti-HBV strip (CTK Biotech Inc., USA), anti-HCV strip (CTK Biotech Inc., USA), anti-HIV-1,2 (CTK Biotech Inc., USA). The serological tests were performed according to manufacturer's instructions.

### Statistical analysis

IBM SPSS version 25 was used to analyze the data, the Kruskal-Wallis test, Pearson's chi-square ( $\chi^2$ ) test and Fisher's exact probability were used to compare the prevalence rates of HBsAg, anti-HCV, anti-HBV and Anti-HIV-1,2 positivity. A test for linear trend was conducted to determine whether positivity tended to change with age and sex. A  $p < 0.05$  was considered significant.

## RESULTS AND DISCUSSION

The results of the current study referred that the highest percentage of the patient's distribution was at Balad General Hospital for the purpose of ascertaining

their type of viral hepatitis (especially HBV). In addition, the results of HBV diagnosis by ELISA technique showed that the highest percentage of patient's distribution was in July (11.1% for outpatients), while the highest percentage of the inpatients was in April (17.03%). In contrast, the results of HBV detection by strips demonstrated that the highest percentage was in May for outpatients (15.40%), while in the inpatients was 13.22% in July. The highest percentage of patients coming to the hospital was in July (1,004 patients) for the purpose of conducting the examination of Hepatitis B virus by using two methods for detection (ELISA technique and Strips) (Table 1).

The results in Table 2 showed the distribution of patients according to months for Anti-HCV. The results recorded the highest percentage of the outpatient's

distributions for anti-HCV diagnosis by ELISA technique in July (11.73%), while the highest percentage of anti-HCV for inpatients was 17.60 % in April. In contrast, the results of anti-HCV by strips showed that the highest percentage was in May (14.76%), and 13.22 % in July for inpatients. The highest number of patients coming to the hospital was in July (1,004 patients) for the purpose of conducting the examination of Hepatitis C virus by using both methods for detection (ELISA technique and Strips) and this compatible with results in Table 1.

The results in Table 3 showed the distribution of patients according to months for HBsAg tests, that recording the highest percentage of the HBsAg for the outpatient's in August by using HBsAg strips (17.70%), followed by 16.66% for inpatients by using HBs ELISA technique in May, then 14.16% for inpatients by HBsAg strips and

**Table 1 :** Patients distribution according to months for hepatitis B virus detection tests (HBV).

Test Month	HBV (%) ELISA (outpatients)	HBV (%) ELISA (inpatients)	HBV (%) Strip (outpatients)	HBV (%) Strip (inpatients)	Total
January	393 (8.45)	45(7.66)	81(4.62)	105(5.69)	624
February	321(6.90)	47(8.00)	88(5.01)	160(8.67)	616
March	305(6.56)	46(7.83)	74(4.22)	180(9.75)	605
April	400(8.60)	100(17.03)	116(6.61)	200(10.84)	816
May	312(6.71)	41(6.98)	270(15.40)	200(10.84)	823
June	300(6.45)	40(6.81)	170(9.69)	150(8.13)	660
July	516(11.1)	74(12.60)	170(9.69)	244(13.22)	1,004
August	479(10.30)	46(7.83)	200(11.40)	95(5.14)	820
September	400(8.60)	43(7.32)	116(6.61)	116(6.28)	675
October	473(10.17)	39(6.64)	186(10.61)	126(6.82)	824
November	314(6.75)	20(3.40)	172(9.81)	130(7.04)	636
December	434(9.33)	46(7.83)	110(6.27)	139(7.49)	729
Total (%)	4,647(100)	587(100)	1,753(100)	1,845(100)	8,832

**Table 2 :** Patient's distribution according to the months for hepatitis C virus detection test (HCV).

Test Month	HCV (%) ELISA (outpatients)	HCV (%) ELISA (inpatients)	HCV (%) Strip (outpatients)	HCV (%) Strip (inpatients)	Total
January	244(5.54)	33(5.80)	172(9.40)	107(5.79)	556
February	321(7.29)	47(8.27)	98(5.35)	160(8.67)	626
March	293(6.66)	46(8.09)	84(4.59)	180(9.75)	603
April	400(9.09)	100(17.60)	90(4.92)	200(10.84)	790
May	312(7.09)	41(7.21)	270(14.76)	200(10.84)	823
June	212(4.81)	33(5.80)	170(9.29)	150(8.13)	565
July	516(11.73)	74(13.02)	170(9.29)	244(13.22)	1,004
August	479(10.89)	46(8.09)	200(10.93)	95(5.14)	820
September	400(9.09)	43(7.57)	116(6.34)	116(6.25)	675
October	473(10.75)	39(6.86)	177(9.67)	126(6.82)	815
November	314(7.13)	20(3.52)	172(9.40)	130(7.04)	636
December	434(9.80)	46(8.09)	110(6.01)	137(7.42)	727
Total (%)	4,398(100)	568(100)	1,829(100)	1,845(100)	8,640

**Table 3 :** Patient's distribution according to months for hepatitis (HBsAg) tests.

Test Month	HBsAg (%) ELISA (outpatients)	HBsAg (%) ELISA (inpatients)	HBsAg (%) Strip (outpatients)	HBsAg (%) Strip (inpatients)	Total
January	393(8.74)	45(7.5)	81(4.46)	105(6.09)	624
February	479(10.65)	46(7.66)	200(11.03)	95(5.51)	820
March	510(11.33)	74(12.33)	170(9.37)	244(14.16)	998
April	312(6.93)	41(6.83)	270(14.89)	200(11.61)	823
May	400(8.88)	100(16.66)	116(6.39)	200(11.61)	816
June	394(8.75)	43((7.16)	116(6.39)	116(6.73)	669
July	314(6.97)	20(3.33)	172(9.48)	130(7.54)	636
August	312(6.93)	47(7.8)	321(17.70)	47(2.72)	727
September	321(7.13)	47(7.8)	88(4.85)	160(9.29)	616
October	305(6.77)	46(7.66)	74(4.08)	180(10.45)	605
November	434(9.64)	46(7.66)	110(6.06)	139(8.07)	729
December	320(7.11)	45(7.5)	95(5.24)	106(6.15)	566
Total (%)	4,494(100)	600(100)	1,813(100)	1,722(100)	8,629

**Table 4 :** Patients with positive hepatitis B and C virus according to their ages and gender.

Age (year)	Positive HBV		Probability	Positive HCV		Probability	Total
	F (%)	M (%)		F (%)	M (%)		
≤10	0(0)	2(2.56)	P > 0.05	0(0)	1(4.34)	P > 0.05	3
11-20	9 (11.11)	6(7.6)	P > 0.05	0(0)	1(4.34)	P > 0.05	16
21-30	31(38.27)	32(41.02)	P > 0.05	4(14.81)	4(17.39)	P > 0.05	71
31-40	16(19.75)	14(17.94)	P > 0.05	4(14.81)	5(21.73)	P > 0.05	39
41-50	11(13.58)	11(14.10)	P > 0.05	10(37.03)	9(39.13)	P > 0.05	41
>50	14(17.28)	13(16.66)	P > 0.05	9(33.33)	3(13.04)	P > 0.05	39
Total	81(100)	78(100)		27(100)	23(100)		209

11.33% for outpatients by using ELISA technique in March respectively. The highest number of patients coming to the hospital was in March, they were 998 patients for the purpose of conducting the examination of HBsAg by using ELISA and Strip methods.

The results of the current study referred that the patient's seroprevalence percentage with HBV in both sexes (females and males) was higher than the patient's seroprevalence percentage with HCV (38.27 and 41.02 vs. 37.03 and 39.13, respectively) (Table 4), the total number of HBV patients seroprevalence for the both sexes were 159, whereas the total number of HCV patients seroprevalence for the both sexes was 50. So, the percentage of positive HBV cases was (1.80%) and (0.57%) for HCV cases.

The total number of patients infected with HBV and HCV were 209 (1.19%). The prevalence of both viruses was approximately twice more to that recorded in blood donors at Baghdad city (0.26%) (Ata Allah *et al*, 2013), and it slightly higher than to the recorded in a healthy population study (0.4%) (Ata Allah *et al*, 2011). The prevalence of anti- HCV Ab was lower in Iraqi Kurdistan,

Karbala and Basrah (<0.3%), while it higher in Babylon and ThiQar (> 0.9%) (Ata Allah *et al*, 2013). The results of the present study were agreed with Alsamarai *et al*. which they found that the anti-HCV Ab seroprevalence was 0.54%, also they referred that the higher seroprevalence was at 2013 that form 0.81%, followed by 0.64% at 2012 and 0.21% at 2011 (Alsamarai *et al*, 2016). Also, the current results agreed with Alsamarai *et al* (2016), which they found that no significant differences between females and males in the prevalence of anti-HCV Ab at 2011. In contrast, there was a higher significant prevalence in females compared to males at 2013 (1.44% vs. 0.57%, respectively). The researchers also revealed that the higher prevalence HCV (1.62%) was in the age group 45 – 60 years, followed by the age group of 1 – 4 years (1.22%).

The prevalence of HCV was 0.2% in general population (<1%) in the Middle East countries including (0.12-1.3%) in blood donors (10.6-63.8%) in patients with thalassemia (Shakeri *et al*, 2013), 24.8% in hemodialysis patients in Iran (Tamaddoni *et al*, 2007). Whereas in Qatar, HCV prevalence was 44.6% in patients with dialysis (Al-Jamal *et al*, 2009). In Basra, blood donors (69658 males and 257 females) underwent screening for

**Table 4 :** Patients with positive hepatitis B and C virus according to their ages and gender.

Age (year)	Positive HBV		Probability	Positive HCV		Probability	Total
	F (%)	M (%)		F (%)	M (%)		
≤10	0(0)	2(2.56)	P > 0.05	0(0)	1(4.34)	P > 0.05	3
11-20	9 (11.11)	6(7.6)	P > 0.05	0(0)	1(4.34)	P > 0.05	16
21-30	31(38.27)	32(41.02)	P > 0.05	4(14.81)	4(17.39)	P > 0.05	71
31-40	16(19.75)	14(17.94)	P > 0.05	4(14.81)	5(21.73)	P > 0.05	39
41-50	11(13.58)	11(14.10)	P > 0.05	10(37.03)	9(39.13)	P > 0.05	41
>50	14(17.28)	13(16.66)	P > 0.05	9(33.33)	3(13.04)	P > 0.05	39
Total	81(100)	78(100)		27(100)	23(100)		209

**Table 5 :** Patients with positive HB<sub>s</sub>Ag according to their ages and gender.

Age (year)	PositiveHB <sub>s</sub> Ag		Total	X <sup>2</sup>	Probability
	F (%)	M (%)			
≤10	0(0)	0(0)	0	-	-
11-20	2(7.4)	1(5)	3	0.11	P > 0.05
21-30	14(51.85)	12(60)	26	0.31	P > 0.05
31-40	5(18.5)	4(20)	9	0.02	P > 0.05
41-50	4(14.8)	2(10)	6	0.24	P > 0.05
>50	2(7.40)	1(5)	3	0.11	P > 0.05
Total	27(100)	20(100)	47		

The present study indicates that the tested peoples for HB<sub>s</sub>Ag alone is not sufficient to eliminate HBV infection (Table 5) and this compatible with Al-Rubaye *et al* (2016) in Basra city. Another study found that the people in Al-Chibayish Marsh reality in Dhi-Qar governorate southern of Iraq were infected with HBV, the seroprevalence percentage was 5.29%, while no seropositive HCV and HDV cases were detected. Also, the incidence of HBV was higher in male (4.11%) compared to female (2.35%) by using ELISA technique and this disagreement with current study (Jassim *et al*, 2011).

**Table 6 :** Month distribution of patients for HIV1-2 tests.

Test Month	HIV (%) ELISA (outpatients)	HIV (%) ELISA (inpatients)	HIV (%) Strip (outpatients)	HIV (%) Strip (inpatients)	Total
January	352(9.53)	34(7.60)	58(5.56)	50(3.01)	494
February	290(7.85)	33(7.38)	82(7.86)	136(8.19)	541
March	271(7.34)	42(9.39)	54(5.17)	180(10.84)	547
April	268(7.26)	88(19.68)	42(4.02)	200(12.04)	598
May	270(7.31)	30(6.71)	45(4.31)	200(12.04)	545
June	260(7.04)	31(6.93)	42(4.02)	210(12.65)	543
July	—	—	—	—	—
August	448(12.13)	62(13.87)	127(12.17)	223(13.43)	860
September	387(10.48)	32(7.15)	147(14.09)	90(5.42)	656
October	420(11.37)	43(9.61)	115(11.02)	115(6.92)	693
November	445(12.05)	32(7.15)	160(15.34)	126(7.59)	763
December	280(7.58)	20(4.47)	171(16.39)	130(7.88)	601
Total (%)	3,691(100)	447(100)	1,043(100)	1,660(100)	6,841

HBV and HCV infections; their age ranged from 18 to 70 years. Positive HBV in female was higher than in male donors, 1625 (2.3%) donors were serologically positive for HBV and 150 (0.2%) donors had positive results for HB<sub>s</sub>Ag (Al-Rubaye *et al*, 2016). The results of current study are agreement with the results of Kutrani *et al* (2007) in Libyan Arab Jamahiriya, which showed high prevalence of HBV and HCV in age group 16-30 years, this may be indicated the low educational levels of people and have had low awareness of hepatitis transmission.

The results in the current study showed there were no statistical differences between the age of the studied groups and the genders regarding to HB<sub>s</sub>Ag positivity ( $P > 0.05$ ) (Table 5) and this result agreed with Alim *et al* (2009), which done among engaged couples in Turkey.

The ratios differences among the various studies in Iraq and other countries, including the current study, may be due to the area nature from which the clinical samples were lived, the infection prevalence in the region, the study accuracy, the number of clinical samples and the health

and social levels of the infected patients.

Only 2 cases (0.03%) were seropositive for HIV-1, 2. The first case was detected in April (Inpatient) and the second case detected in August (Outpatient) by using ELISA technique (Table 6).

In a University Hospital at Saudi Arabia, Samargandy *et al* (2016) had been studied the epidemiology of HBV, HCV, and HIV, they found that the total number of bloodcases reported was 326 cases, of which 302 (92.6%) were per cutaneous, 21 (6.5%), mucocutaneous and 3 (0.9%), bites. Nursing staff/students had the highest rate of exposure (45.6%), followed by physicians (17.5%). Whereas the prevalence of HCV in Libya was 1.6% among the general populations, 1.2% among blood donors, 2% among hospital health care workers and 20.5% among renal dialysis patients (Daw *et al*, 2002).

The results of the current study were disagreed with the results of Al-Zaidyat ThiQar province, he found that no seropositive case infected with HIV and revealed the presence of 176 (8.8%) hepatitis seropositive cases, distributed on three years (from 2005-2007). HBV had the highest prevalence (5%), followed by HCV (3.2%) in patients suffering from liver diseases. In addition, the highest seroprevalence of HBV and HCV were found in patients with age group 16-30 years (Al-Zaidy, 2008).

Another study in Egypt, demonstrated that the highest prevalence rates was found in HCV infection, the prevalence ranged from 16% to 18% (Elgharably *et al*, 2017). While, in Saudi Arabia kingdom, the prevalence rates of HBV and HCV infections were 1.5% and 0.4% respectively and 0% for HIV 1 and 2 infections. Also, the prevalence of viral hepatitis was not significantly higher in male than in female patients. Hepatitis B surface antigen (HBsAg) and anti-HCV positivity increased with the age and they were more prevalent among non-Saudi compared to Saudi people (El-Hazmi, 2004).

Also, the present results disagreed with another study that determined the prevalence of HBV and HCV, that showed a significantly higher seroprevalence of hepatitis was in males than females in The Qar, this may a result of male's exposure to virus through razors and shaving at barber (Abbas, 200AD). In addition, the results of Hussein in Samara province, Iraq showed that the seropositive of Anti-HAV Ab was (71%), (9.63%) for Anti-HCV Ab and the HBsAg prevalence was (19.2%) among healthy donors (Hussein, 2012). In Diyala governorate, Raham *et al* (2011) found that the prevalence of HCV was 26.4% and significant associations were found with male gender and young age group.

In conclusions, the current results indicated that

Dujail, Dhuluiya and Al-Ishaqi area were the lowest prevalence of HBV, HCV and HIV among the other infected areas in Iraq. Further studies are needed to provide more details for the status of HBV, HCV and HIV infections in other provinces of Iraq by using modern techniques such as a polymerase chain reaction technique (PCR), which that more sensitive screening technique than ELISA and strips for viral hepatitis infections and AIDS detection.

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