

Hepatitis B and C virus infections among pregnant women in Arab and African countries

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Abstract

Introduction: The epidemiology of viral hepatitis during pregnancy is of paramount importance for health planners and program managers. Data on viral hepatitis during pregnancy are not readily available in many African and Arab countries. Both regions have their own unique geography, and comprise over 59 states with crossover and interaction of different cultures.

Methodology: A systematic electronic search of the published literature was conducted and data on epidemiology and risk factors of maternal hepatitis B virus (HBV) infection and hepatitis C (HCV) infection in Arab and African countries were extracted from relevant studies.

Results: The serology of hepatitis viruses varies greatly among these countries, with different viral genotype patterns. Such a variation in prevalence could be explained by the different risk factors involved. Sexual contact, perinatal infection, blood and its derivatives, hemodialysis, intravenous and percutaneous drug use, and occupational, habitual, and social behavior have been identified as risk factors for hepatitis transmission in various settings in these countries.

Conclusions: Infection from hepatitis B and C viruses imposes major socioeconomic and even political burdens on such young and dynamic societies. Thus strategies and clear policies of intervention are required to combat the consequences of hepatitis B and C at both the regional and national levels.

Key words: hepatitis B; hepatitis C; epidemiology; Africa; Arab; Middle East; hepatitis B serology; hepatitis C serology

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Introduction

Hepatitis B virus (HBV) is a member of the Hepadnaviridae family; it is a DNA virus with partially double-stranded DNA and a core antigen surrounded by a shell containing hepatitis B surface antigen (HBsAg) [1]. HBV has numerous antigenic components such as HBsAg, hepatitis B core antigen (HBcAg), and hepatitis B e antigen (HBeAg). The HBV genome harbors 3200 nucleotides and it can encode four groups of proteins and their regulatory components by shifting the reading frames over the same genetic matter [2]. Immunity against HBV infection is via a response to HBcAg and HBsAg. Antibodies to HBcAg (anti-HBc) are indicative of infection: IgM anti-HBc signifies recent infection and usually disappears within six months, whereas IgG anti-HBc persists for life and indicates past infection. The presence of antibody against HBsAg (anti-HBs) appears after clearance of HBsAg or after immunization. HBsAg persisting for a period exceeding six months is defined as chronic HBV infection [3].

Despite availability of a vaccine and antiviral treatment, HBV infection is still a major health problem causing considerable morbidity and mortality [4-6]. The World Health Organization (WHO) estimates the burden of HBV infection to be approximately 2 billion, >350 million chronically infected with HBV, and 500,000–700,000 patients die annually as a result of HBV-related liver disease, such as liver cirrhosis, end-stage liver disease, or hepatocellular carcinoma, with most of these deaths in developing countries [7,8].

Hepatitis C virus (HCV) infection is another major worldwide public health concern. The WHO estimates that around 3% of the world's population has chronic HCV infection, with more than one million new cases annually, the majority of which occurring in Africa [9,10]. Direct percutaneous inoculation is the most efficient mode of transmission of HCV, but sexual, household, occupational, and vertical transmission may also be important [11].

Viral hepatitis during pregnancy is closely related to high risks of maternal complications including

premature contractions, placenta praevia, preterm delivery, placental separation, premature rupture of membranes, vaginal bleeding, preterm labor, gestational diabetes mellitus and mortality [12-15], with a high rate of vertical transmission leading to fetal and neonatal hepatitis [12-15]. The epidemiological data for these viruses might be essential to program managers, health planners, and relevant for helping to develop vaccine and screening packages in antenatal care clinics.

It is also important to consider the weaknesses of regional studies in African and Arab countries, where most of the epidemiological investigations are performed on individuals based upon studying the seroprevalence of HBV and HCV among specific groups such as blood donors, health-care employees, or patients undergoing hemodialysis. Thus the current review aims to investigate the prevalence and possible risk factors for HBV and HCV infection among pregnant women in African and Arab countries.

Methodology

A systematic electronic search of the published literature was conducted and data on the epidemiology and risk factors for maternal HBV and HCV infection in Arab and African countries were extracted from relevant studies. The databases were searched with the words “Hepatitis B virus”, “Hepatitis C virus”, “Arab”, “Africa” and “pregnancy” used interchangeably in MEDLINE, Pubmed, MiPc library and Google, and sometimes also including names of particular countries.

Epidemiology of HBV and HCV among pregnant women in Arab countries

The Arab world is made up of heterogeneous states with variable levels of development and different approaches of concepts and priorities in health care. Basic health service facilities vary among these countries, with some successfully adopting modern methods of infection control, while others fail to incorporate such recommendations [16]. Failure to implement international standards is the rule in the institutions and health services in most Arab countries. This failure can be attributed to a group of factors including the bureaucracy and hierarchy among their health systems and education, lack of knowledge, and lack of basic skills [16,17]. HBV and HCV infections are a persistent issue in the entire Arab world, where the average prevalence rate of HBV infection ranges from 2% to more than 8% [18,19], while the prevalence of HCV ranges between 0.4-23% [19]. Prevalence shows great variability from one region to another, and even among countries of the same region.

HBV and HCV during pregnancy have a high vertical transmission rate, causing fetal and neonatal hepatitis and maternal mortality [20]. Neonatal hepatitis can lead to chronic virus carriage, which in turn may lead to liver cirrhosis and hepatocellular carcinoma in young adults [21,22]. Acute HBV carries a particular risk, not only for the mother, but also for the newborn. Acute HCV during pregnancy is not commonly seen, and its transmission rate is low [21,22] (Tables 1 and 2; Figures 1 and 2).

Table 1. Prevalence and genotypes of HBV among pregnant women in Arab countries

Region /country	Prevalence of HBV%	Reference	Predominant genotype	Reference
Saudi Arabia	1.6	21	D	39
Oman	7.1	24	D	36
Qatar	1	24	D	36
UAE	1.5	24	D	40
Yemen	10.8	23	D	36
Lebanon	2.9	25	D	42
Jordan	4.3	26	D	43
Sudan	5.6	29	D and E	30
Egypt	4.0	28	D	31
Libya	1.5	32	D	44
Algeria	1.6	55	D	45
Tunisia	4.0	35	D	35
Mauritania	10.7	39	D	39

Table 2. Prevalence and genotypes of HBV among pregnant women in African countries

Region /country	Prevalence of HBV%	Reference	Genotype	Reference
Tanzania	6.3	69	A	118
Uganda	4.9	78	A	122
Rwanda	2.4	78	A	121
Malawi	13	66	A	122
Zambia	6.5	65	A	122
Zimbabwe	3.3	64	A	122
Nigeria	6.08-12.5	89,99	E	122
Cameroon	7.85	74	E	122
Ghana	16	76	E	122
Burkina Faso	9.8	79	E	122
South Africa	4.6	70	A	122
Congo-Brazzaville	6.5	73	E	122
Sierra Leone	6.2	77	A	122
Mali	8	80	E	122
Ivory Coast	8	81	E	122

Figure 1. Prevalence of HBV among pregnant women in Arab and African countries

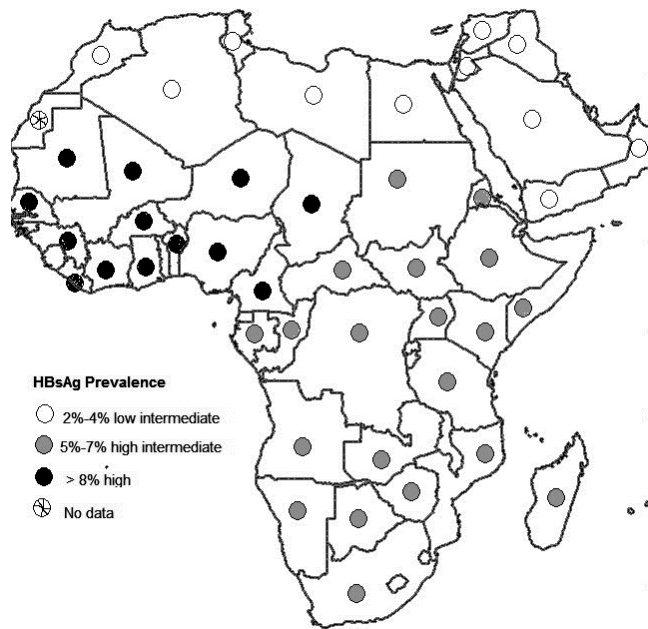
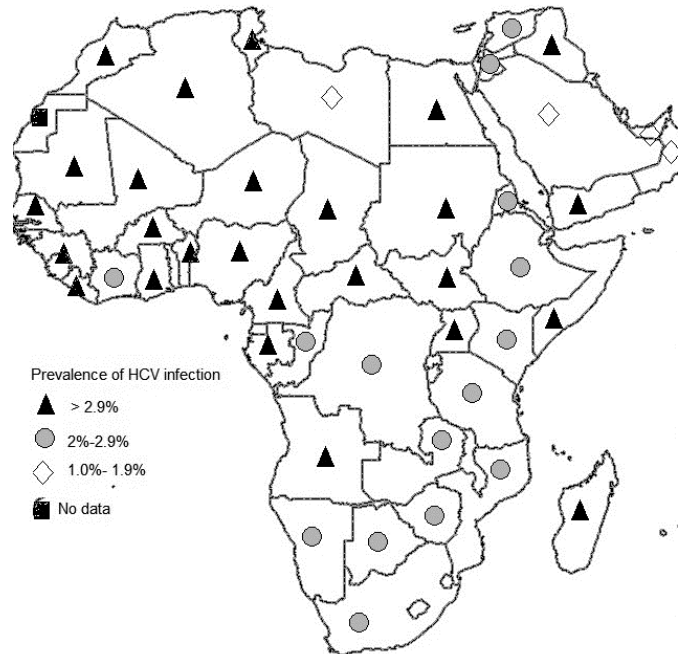


Figure 2. Prevalence of HCV among pregnant women in Arab and African countries



HBV among pregnant women in the Arabian Peninsula region

The Arabian Peninsula comprises Saudi Arabia, Yemen, Oman, Qatar, Bahrain, the United Arab Emirates, and Kuwait. It is a unique and distinct geographical area comprising about 35% of the Arab world, and its coastal areas are the world’s largest single source of crude oil. The prevalence of HBV among pregnant women in this region ranges from 1% to 7.1%, which is considered a low to intermediate range in worldwide terms [23-26]. There have been few studies (with the exception of Saudi Arabia) of HBV among pregnant women in this area.

HBV among pregnant women in Bilad ash-Sham

Bilad ash-Sham region of the Arab world comprises Syria, Lebanon, Jordan, and Palestine. Iraq is usually not included in this historical region; however, it will be included in this group for the purpose of this manuscript. Different studies have been performed in this region, where the prevalence of HBV among pregnant women is 2.9% to 4.3% [26,27].

HBV among pregnant women in the Arabian Nile River region

Sudan and Egypt are the two countries in the Arabian Nile River region. HBV is extensively studied in Egypt, where appreciable efforts have been made in this setting [28]. Although there is a high prevalence of HBV (6.7%) among the general population in Egypt [28], the prevalence among pregnant women is only 4% [29]. The prevalence of HBV among pregnant Sudanese women (5.6%) is comparable to the prevalence in Egyptian women [30].

Therefore, the prevalence of HBV in the River Nile region is in the intermediate endemic range, with

Egypt being at the lower end of the spectrum and Sudan at the upper end. Genotype D is predominant although other genotypes are seen [31,32].

HBV among pregnant women in North African (Maghreb) region

The Maghreb region comprises Libya, Tunisia, Algeria, the Kingdom of Morocco, and Mauritania. The prevalence of HBV and its genotypes varies among the different populations of the Maghreb countries. It is least prevalent in Libya (1.5%), followed by Algeria (1.6 %) and Tunisia (4%), while it was 10% among pregnant women in Mauritania. Therefore, further studies are needed to determine the prevalence of HBV among the general population. The small number of subjects included in the studies we referred to might explain this variation; thus, larger more detailed studies are needed to gather reliable data [33-36].

Genotypes

D is the most common genotype among the different settings throughout the previously mentioned Arab states [37-46].

HCV among pregnant women in the Arabian Peninsula region

HCV prevalence varies greatly among prosperous and poor states in the Arabian Peninsula (Table 3; Figure 2). For example, it is reported to be 0.7% and 8.5% among Saudi and Yemeni pregnant women, respectively [24,47]. It is evident that in the less-developed countries, there is a need for detailed studies on HCV, because the magnitude of the HCV problem is not well documented. Furthermore, lack of knowledge about the impact of foreign workers on the

Table 3. Prevalence and genotypes of HCV among pregnant women in Arab countries

Region/country	Prevalence of HCV%	Reference	Predominant genotype	Reference
Saudi Arabia	0.7	46	4	18
Yemen	8.5	23	4	18
Iraq	3.21	47	4	18
Sudan	0.6	29	4	18
Egypt	8.6	49	4	18
Libya	0.36	53	4	18
Tunisia	0.5	54	4	18
Algeria	2.5	55	4	18
Morocco	1	58	1b	18

prevalence of HCV is clouding the picture, particularly as a considerable number of these workers come from regions where HCV is considered to be endemic.

HCV among pregnant women in Bilad ash-Sham region

While there is lack of data on HCV infection among pregnant women in Bilad ash-Sham region, a prevalence of 3.21% was observed in Iraq [48]. The scarcity of data on HCV among pregnant women might reflect a lack of appreciation of the magnitude of the problem in this region.

HCV among pregnant women in the Arabian Nile River region

Considerable effort to investigate the epidemiology of HCV is undertaken in Egypt, which has a high prevalence of HCV among pregnant women (8.6%) [23,49,50]. In Sudan, the prevalence of HCV among pregnant women (0.6%) is lower than that in the general population (2.2% to 3%) [30,51,52]. Therefore, the northern part of the River Nile region is considered to be a highly endemic area for HCV and the southern part is less endemic, with a very low prevalence among pregnant women. Genotype 4 is the predominant (90%) genotype among the Egyptians [53] (Table 2; Figure 2).

HCV among pregnant women in North African (Maghreb) region

The epidemiology of HCV among pregnant women in the Maghreb region varies from one country to another. It is least prevalent in Libya, followed by Tunisia, the Kingdom of Morocco, Algeria, and Mauritania [54-57] (Table 3). HCV genotype 4 is the most prevalent among Libyans, while genotype 1 is more common in the rest of the Maghreb countries [58-61]. It is difficult to explain this variation, because there is much interaction between the people in these countries, and it is sometimes difficult to differentiate between them, apart from one aspect that might provide an explanation; namely, interaction with European communities in the later Maghreb countries, where there are more open communities than in Libya. Differences in reported prevalence could also be due to the type of study conducted; i.e., whether was a cross-sectional study, survey, or other type. Moreover, proximity to countries where a particular genotype is predominant can further explain the genotype situation in Libya where type 4 is more prevalent towards the eastern borders while type 1 predominates in the western regions [62].

Epidemiology of HBV and HCV among pregnant women in African countries

Heterogeneity in religion, culture and practices, and high HIV burden in sub-Saharan Africa are factors that might influence the epidemiology of HBV and HCV. For the purpose of simplification, we have divided Africa into five different geographical regions: the northern, eastern, southern, central and western regions. The northern region is entirely occupied by the Arab states and the status of HCV and HBV infection has already been described. Most of the countries in the other four regions suffer from political conflicts, drought, and famine, leading to large numbers of internally and externally displaced people, which might increase the prevalence of sexually transmitted diseases [63,64] (Tables 2 and 4).

HBV among pregnant women in Africa

Eastern region

The eastern region of Africa comprises: (1) Tanzania, Kenya, Uganda, Rwanda, and Burundi, which are form the area around the great African lakes; an area where major conflicts have taken place in the past decade; (2) Djibouti, Eritrea, Ethiopia, and Somalia, which are collectively known as the Horn of Africa; (3) Mozambique and Madagascar, which are often considered part of Southern Africa; (4) Malawi, Zambia, and Zimbabwe (formerly the Central African Federation), which are also often included in Southern Africa; and (5) Comoros, Mauritius, and the Seychelles, which are small island nations in the Indian Ocean, along with Réunion and Mayotte, which are French overseas territories also in the Indian Ocean. This region is characterized by being one of the most politically unstable areas, where conflicts tend not to cease. HBV prevalence among pregnant women in the region mimics the epidemiology among the general population, and most countries fall in the moderate endemic zone apart from Somalia, where a high prevalence (37%) was reported in 1987 [65-71]. Therefore it is clear that there is lack of information in this area.

Southern region

This southern region of Africa comprises Angola, Botswana, Lesotho, Namibia, South Africa, and Swaziland. With exception of South Africa, which has a high prevalence (4.6 %) [71], published studies on HBV in pregnancy are scarce in this group of countries. This area lies in the zone of moderate endemic when considering the general population with an estimated prevalence between 2% and 2.9% [72].

Table 4. Prevalence and genotypes of HCV among pregnant women in African countries

Region /country	Prevalence of HCV%	Reference	Predominant genotype	Reference
Tanzania	5	69	4	117
Kenya	?		1a	118
Uganda	2	78	N/A	
Rwanda	4.9	78	N/A	
Burundi	?		4	128
Ethiopia	?		1,2,3,4, 5	129
Somalia	?		3H	130
Mozambique	?		1a, 2a, 4 and 5a	132
Madagascar	?		1b,2	131
Malawi	16.5	66	N/A	
Nigeria	9.2	111	2	128
Cameroon	?		4	123
South Africa	?		5,6	124
Democratic Republic of the Congo	6.6	88	4	123
Ivory Coast	1	81	2	128
Equatorial Guinea, São Tomé and Príncipe	?		4	123
Gabon	2.	90	4	123

Central region

The central region is composed of Cameroon, Central African Republic, Republic of Chad, Republic of Congo, Democratic Republic of Congo, Equatorial Guinea, Gabonese Republic, and São Tomé and Príncipe. HBV prevalence among pregnant women varies from one country to another, and mostly ranges between 6% and 9.5% [73-75].

Western region

The western region comprises Benin, Burkina Faso, Cape Verde, Ivory Coast, and Republic of Gambia, Republic of Ghana, Guinea-Bissau, Republic of Liberia, Mali, Niger, Federal Republic of Nigeria, Senegal, Sierra Leone, Togo, and the Canary Islands. HBV prevalence among pregnant women is high in this region and varies between 6.2% and 16% with preponderance toward the upper end [76-82].

HCV among pregnant women in Africa

Eastern region

Studies of HCV prevalence in the eastern region of Africa have been scarce and controversial, with some reports showing the prevalence to be in the high to intermediate range (2-2.9%) [72], while others show it in the very low range (0% to 2%) [83]; this discrepancy could be explained by the use of more

specific tests and investigating a healthy population in the latter study.

Southern region

HCV prevalence in the southern region of Africa has not been well studied, but estimates put the region in the intermediate group in terms of endemic [72]. Another important feature of this part of Africa is the high prevalence of HIV infection, especially among pregnant women, with prevalence rates approaching 28% [84,85]. Nevertheless, the prevalence of co-infection was low (0.001%-0.1%) [86,87]. The scarcity of published data makes clear the need for more studies in this region.

Central region

The central region of Africa is considered to be one of the most heavily infected parts in the world, with prevalence rates approaching more than 13% of the general population in some areas [88]. Cameroon has the highest prevalence (13.8%), followed by Burundi (11.3%) and Gabon (9.2%) [88]. Prevalence in this region has reached 4.3% among pregnant women [89-91]. The risk factors involved were mainly infected blood and its products (likely in the past), intravenous drug abuse, transfusion of untested blood, unsterile medical and dental procedures, and the use of traditional procedures where blood exposure is

involved [88]. Despite being an area of high prevalence for HCV, studies have been scarce, which could be explained by lack of resources.

Western region

HCV in the western region of Africa is considered to be highly endemic, and the prevalence among pregnant women is 3% in Nigeria [92] and 2.2% in Burkina Faso [93]. Different studies classified this region among the high endemic regions [72].

Factors associated with transmission of HBV and HCV among pregnant women in Africa and Arab countries

The epidemiology of HBV and HCV among pregnant women in African and Arab countries does not differ greatly from that in other developing countries, apart from some particular factors in the Arab countries, where the influence and intermingling of religious and cultural influences might play an important role. A variety of risk factors have been found to be associated with high prevalence rates for both HBV and HCV; however, the emphasis on these risk factors varies greatly from one country to another.

Factors associated with transmission of HBV among pregnant women in Africa and Arab countries

Blood and blood products

HBV is a blood-borne virus. The main routes of HBV transmission are the sexual and parenteral routes [94]. Blood and its products remain major causes of HBV transmission in Arab countries; most of which fail to fulfill the criteria of a modern, safe blood transfusion system. However, there is a great controversy in studies conducted in different Arab countries concerning the impact of blood transfusion on the status of HBV infection. Studies from Egypt have reported that HBV infection was found to be associated with blood transfusion among pregnant women along with the finding that it is also associated with HBV infection in patients with chronic hematological disorders requiring frequent blood transfusions [29,95]. Several other studies have reported higher prevalence among those dependent on blood and blood products, especially when compared with reports of a decline in seroprevalence [96-101]. In contrast to the above-mentioned findings, studies of HBV infection in pregnant women in Sudan, Yemen, and Mauritania have failed to show any evidence of blood transfusion being a risk factor for virus transmission [24,30,39]. This difference might be

explained by better safety precautions being taken for blood donation, where screening for the virus is regularly undertaken. The available current data indicate that screening for HBV markers is mandatory today in all blood banks throughout Arab countries, although in some clinics patients might be required to pay for such tests.

Circumcision

Female circumcision, although legally condemned by several Arab governments, is performed at home by midwives or health workers on young women, and might well be a source of infection in women. It is a risk factor for HBV infection in Yemen [24], but this observation contradicts the findings of some other studies in Arab and African countries, for example among pregnant Sudanese and Nigerian women [30,100]. This discrepancy might be explained by the difference in hygiene and aseptic precautions regarding materials used in the procedures among the different countries.

Sociodemographic factors

Sociodemographic factors such as age, education level, and gravidity have been found not to be significant factors associated with transmission of HBV [24,30,39,100,101]; however, some reports have stated that becoming sexually active at an early age is a risk factor as has been found by Rabiou *et al.* among Nigerian pregnant women [100]. Other important sociodemographic risk factors for HBV infection that cannot be ignored are history of intravenous drug abuse, imprisonment, and history of multiple partners. These risk factors have not been studied, likely because of the religious and cultural backgrounds of such communities.

Medical or surgical risk factors

Medical and surgical risk factors such as surgical procedures, home delivery, dental procedures, and history of jaundice were all found not to be significant [24, 30,39, 100,101].

Factors associated with transmission of HCV among pregnant women in Africa and Arabian countries

Blood and blood products

Before 1992, blood transfusion was one of the major risk factors for HCV transmission, but the risk has declined since the start of screening for HCV in 2001. Risk of HCV infection from a single unit of transfused blood has declined to less than one per

million transfused units [102]. However, the risk of HCV transmission through blood still exists in some developing countries because of failure to adequately screen donors due to financial constraints [29,103]. However, most studies have found that blood transfusion is no longer a risk factor for HCV in pregnancy [50,104], and the same is generally true in Arab countries [24], although some Arab countries have found it to be a risk factor [50]. In contrast, blood transfusion might well be a risk factor among African countries, such as Ghana and Kenya, and probably a number of others, because of budget shortfalls [105,106,107].

Sociodemographic factors

Sociodemographic factors in HCV transmission have shown great variation among studies, depending on the factor itself. Some researchers have found that increasing age is a risk factor, which might be explained by the cumulative effect phenomena, probably attributed to the use of unsterile injections and other instruments used in traditional scarification and tattooing [10,50], but others have found no association [24]. Although specific data on age are scarce, the literature shows some variations in different geographical regions throughout the world [50]. Some researchers have found an association with low parity [24], whereas others have found no such relation [50]. Another sociodemographic factor of concern is educational level. It has been found that women who have received less than secondary school level education are at higher risk [24], and an Egyptian group has found that a low level of maternal education is a risk factor for HCV infection of children [106]. Being the long-term steady sex partner of an HCV-infected individual is not a risk factor [108], as the role of sexual transmission itself in HCV infection needs validation [109]. An important but controversial risk factor is intrafamilial exposure [52,95,100, 110]. In Iraq, repeated abortion has been shown to be a risk factor [48], probably because of the possibility of curettage and blood transfusion. Other important sociodemographic factors, such as intravenous drug abuse and multiple sexual partners, have not been investigated, probably because of hindrance by the cultural background.

Mother-to-infant transmission

Vertical transmission from mothers to infants is definite in HBV infection. However, this mode of transmission awaits confirmation for HCV, although some studies have assumed this possibility. One such

investigation detected antibodies to HCV in the umbilical cord while another studied various viral parameters among two of the babies born to Hepatitis C positive mothers and concluded that vertical transmission is seen among HCV infected pregnant mothers without the presence of human immune deficiency virus [111,112].

Tattoos, scarification, and tribal marks

Tattoos, scarification, and tribal marks are widespread practices in Africa, and have been linked to HCV transmission by some researchers [113].

Strategies and preventive measures to control HBV and HCV infection among pregnant women in Arab and African countries

The status of HBV and HCV in pregnant women in Arab and African countries is a persistent issue for all sectors involved in public health, in particular, those that are involved in health strategic planning. There is great variation among African and Arab countries concerning the prevalence of HBV and HCV and other problematic issues, which should be taken into consideration regarding the prevention of HBV and HCV in each country. Major measures to be implemented are to encompass immediate primary intervention strategies and long-term prevention plans. Such targeted prevention strategies have reduced transmission of HBV in developed countries, particularly among high-risk groups. Risk-reduction counseling and HBV screening programs should be directed at specific populations, as suggested by the Centers for Disease Control in the United States. Universal and specific infection control measures that are directed towards nosocomial infection and units or persons in hospitals and health-care centers that are rendered prone to HBV and HCV infection are necessary. Specific prevention programs should be implemented by adopting better and more efficient cleansing and standard sterilization practices to stop nosocomial and iatrogenic transmission of HBV and HCV. Risky patient care practices associated with higher HBV and HCV prevalence among pregnant women should be identified, and recommendations and appropriate precautions in these settings should be adopted.

Although blood transfusion was not strongly suspected in most of the studies conducted to date, advanced laboratory screening methods for blood and blood products should be central to any further programs, to further reduce or at least maintain the low number of transfusion-related transmissions. Once

patients are discovered to have hepatitis B or C, they require counselling and proper clinical evaluation to eliminate the risk of transmission and halt the progression of the disease. Therefore, countries that lack such programs must adopt them.

Vaccination

Since the launch of the first universal hepatitis B vaccination program for infants in July 1984 in Taiwan, infant immunization programs in different countries have resulted in marked reductions in the incidence and prevalence of hepatitis B among younger members of these populations [114-117]. This has been marked in Arab countries such as Libya, where the prevalence among pregnant women dropped from 2.8% to 2.1% in three years from 2003, and then to 1.5% in 2010, which is likely owing to the effect of vaccination, which has been provided since 2000 [33]. The picture might be changing in the rest of the Arab states because of vaccination. Previous data shed light on the efficacy of hepatitis B vaccine among some of the Arab and African countries (reference is required), and on the need to adhere to and reinforce such programs to achieve full and lasting serological protection.

Future challenges and conclusion

HBV and HCV are serious growing problems in African and Arab countries, and they have great socioeconomic impact that might affect future generations and influence the infrastructure of such dynamic states. Despite their great economic and natural resources, unfortunately none of the countries studied has shown meticulous and clear national strategic or regional scientific plans to meet the future challenges that HBV and HCV may bring. Prevalence of HBV and HCV is destined to increase further among African and Arab countries, especially when considering the issue of vertical transmission, which should be an incentive for further measures. Hence there is a great need to conduct studies that will guide proper planning to deal with the health issues connected with HBV and HCV.

We conclude that there are many gaps in our knowledge about the prevalence of HBV and HCV in pregnant women in Arab and African countries that are waiting to be filled. Most of the previous studies have demonstrated a high prevalence of both HBV and HCV, although most of these studies were small; therefore, larger studies are needed in most of these countries. Finally, it is noticeable that HBV prevalence

in several countries is on the decline, reflecting the positive effect of immunization.

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