

Prevalence of Hepatitis B Virus Infection among Egyptian Pregnant Women - A Single Center Study

Mortada EL-Shabrawi (MD)¹, Mohamed Farouk Mohamed (MD)^{1*}, Mona Salah El Din Hamdi (MD)², Mohamed Ehab (MD)³, Shaimaa Shaaban Khamiss (MSc)⁴, Hanaa El-Karaksy (MD)¹

¹Department of Pediatrics, Faculty of Medicine, Cairo University, Egypt

²Department of Clinical Pathology, Cairo University, Egypt

³Department of Gynecology and Obstetrics, Cairo University, Egypt

⁴Ministry of Health and Population, Cairo, Egypt

ABSTRACT

Background: Hepatitis B virus (HBV) infection still has a relatively high incidence and prevalence worldwide. In the post-vaccination era in developing countries, perinatal vertical transmission remains the most common mode of transmission. Prevention of mother-to-child transmission requires screening for HBV surface antigen (HBsAg) in pregnant women to identify which newborns that must be immunized.

Aim: This study aimed to evaluate the prevalence of HBV infection among pregnant mothers who were attending outpatient clinic of the Obstetric Department, Cairo University Hospital for routine antenatal care and Social and Preventive Medicine Center.

Methods: A cross sectional study included 2000 pregnant women. A rapid screening test for HBV "One Step HBsAg Rapid Test" was done for all women and all HBsAg-positive cases were confirmed by ELISA for HBsAg. A structured questionnaire for risk factors for HBV acquisition was filled for every pregnant mother positive for HBsAg and a control group of HBsAg negative mothers.

Results: Out of 2000 pregnant women, 35 (1.75%) were positive by the rapid test, out of whom 32/35 cases (91.43) were confirmed to be positive by the confirmatory test representing 1.6% of the study population. Family history of HBV, previous intravenous (IV) injections, medical clinic attendance, hospital admission, and surgeries were the risk factors for acquiring HBV infection ($P= 0.001, 0.003, 0.002, 0.000, \text{ and } 0.011$, respectively). **Conclusion:** HBV infection is prevalent among pregnant mothers attending our outpatient services. Therefore, and we recommend screening for HBV in all Egyptian pregnant mothers to prevent neonatal infection by immunoprophylaxis.

Keywords

Prevalence; Epidemiology; Egypt; Hepatitis B; Perinatal infection; Pregnancy

*Telephone: (00965) 99957203

Email: m.farouk76@yahoo.com

1. INTRODUCTION

Of estimated 350 million individuals chronically infected with HBV worldwide, it is generally accepted that at least 50% acquired their infections either perinatally or in early childhood, especially in countries where HBV is endemic [1]. Perinatal vertical transmission is the most common mode of transmission worldwide [2]. Vertically transmitted HBV infection is becoming an important risk factor for acquisition of HBV among children born after the era of mass vaccination in Egypt [3]. High maternal viral load and maternal serum HBV envelope antigen (HBeAg) positivity increase the risk of perinatal transmission [4]. Infants born to mothers known to carry HBV can be treated with HB immunoglobulin. When given with the vaccine within 12-24 hours of birth, the risk of acquiring HBV is reduced by 90% [5]. Prevention of mother-to-child transmission requires screening for HBsAg in pregnant women to identify which newborn should be immunized [6].

This study aimed to evaluate the prevalence of HBV infection among pregnant mothers, and to identify risk factors that may lead to HBV acquisition among these women.

2. Patients and Methods

In this cross sectional study, randomly chosen 2000 pregnant women performing routine antenatal care at the outpatient clinic of the Obstetric Department of Cairo University and Social and Preventive Medicine Center were screened for HBV from May 2010 to July 2011.

The Institutional Ethical Committee approved the study, and informed consent was obtained from each participant. All data were confidential for the research use only.

All pregnant women were screened for HBV infection by One Step HBsAg Rapid Test - ACON HBsAg; Cat. No.IHB sg-302 (San Diego, CA, USA) at the antenatal care clinic. All HBsAg positive cases with rapid test were confirmed by enzyme-linked immunoassay (ELIZA) for HBsAg using the AbbottAxSYM System (Abbott Laboratories, Abbott Park, Chicago, IL, USA.).

In order to know the risk factors that may lead to acquiring HBV infection; a questionnaire for risk factors for HBV acquisition was filled for every pregnant mother confirmed positive for HBsAg and a control group of HBsAg negative mothers in a ratio of 1 (case): 2 (controls) (Table 1). Three pregnant women with HBV infection who came to Pediatric Hepatology Outpatient clinic for consultation about immunoprophylaxis for their babies were also included in that comparison.

Also positive cases were instructed how to avoid transmission of infection to other family members and they were referred to Adult Hepatology unit for further evaluation and follow up. Screening for other family members was recommended. All family members were instructed about how to avoid contracting or transmitting the infection.

2.1 Statistical methods

Data were statistically described in terms of mean $\pm$ SD, frequencies and percentages when appropriate. Comparison of numerical variables between the study groups was done using Student t test for independent and for categorical data, χ^2 test was performed. Exact test was used instead when the expected frequency is <5 . Multivariate logistic regression analysis was done to determine the preferential effect of important independent variables on the occurrence of HBV infections. *P*-values <0.05 were considered statistically significant. All statistical calculations were done using computer programs SPSS (Statistical

Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 15 for Microsoft Windows.

3. Results

This study was carried out on 2,000 pregnant women aged between 16 and 46 years (mean±SD, 26.75±5.75 years). Out of them, 35 (1.75%) were positive by the rapid test, out of whom 32/35 cases (91.43%) were confirmed to be positive by the confirmatory test representing 1.6% of the whole study population, while 3/35 (8.57%) cases were negative for HBsAg by the confirmatory test. Thirty-five confirmed HBsAg positive cases (32 newly discovered and confirmed HBsAg positive women in addition to the previously mentioned 3 known HBsAg positive pregnant women who came to the outpatient clinic seeking for immunoprophylaxis of their babies) were compared with randomly selected HBsAg negative pregnant females serving as controls (n=70).

Figure 1 demonstrates the frequency distribution of cases and controls according to age groups. Although HBsAg was detected at a higher rate in pregnant women aged ≥25 years [(38.33% (23 out of 60)] than in women aged <25 years [(26.66% (12 out of 45)], the difference was not statistically significant (p-value=0.20).

Regarding gravidity status and occupation, no significant differences were detected between both groups (Table 2).

Regarding the distribution of our study populations according to their residence, most of our cases (22/35) and controls (37/70) were living in rural areas representing 62.9% and 52.9% of their populations respectively. None of our cases had previously received HBV vaccine but 4.3% (3 out of 70) of controls had previously received HBV vaccine.

A positive family history of HBV infection was reported in a significant number of HBV-positive cases (P-value 0.001). Therefore, a pregnant woman with a family history of HBV infection had a greater chance of acquiring HBV infection (Table 3).

Figure 2 demonstrates distribution of HBV infection among family members of both cases and controls. HBV infection of the husband or infection of a close family member (father, mother, brother, or sister) could be an important risk factor for acquiring infection.

Table 4 compares HBsAg positive cases with HBsAg negative controls regarding other risk factors for HBV infection. All HBsAg positive mothers (100%) had at least one of the risk factors for infection. Previous IV drugs, medical clinic attendance (for antenatal care, and other medical problems), hospital admission, and surgeries were the risk factors for acquiring HBV (P-value = 0.003, 0.002, 0.000, and 0.011, respectively). All cases and controls (100%) had history of ear piercing and none of them had a past history of Schistosomiasis and none of the cases had past history of hepatitis but 1.4% of controls (1 out of 70) had past history of hepatitis.

In order to know how acquisition of HBV varied with family history, previous IV drugs, medical clinic attendance, hospital admission, and surgeries; multiple regression analysis was done where the results showed that none of the risk factors had the significant contribution for the acquisition of HBV infection (P-value >0.05) (Table 5).

4. Discussion

The prevalence of HBV varies between 2% in developed countries where the prevalence is low to about 8% in developing countries where infection is endemic with sex, age and socioeconomic status as important risk factors for infection [7, 8]. Countries are classified as having low endemic rates (<2%), intermediate endemic rates (2-8%), or high endemic rates (>8%) positive for HBsAg [9]. The prevalence of HBV in Egypt is of intermediate endemicity (2-8%) [10, 11]. Badawy and El-Salahy [12] reported a rate of materno-fetal transmission in 51.8% of HBsAg-positive women in Egypt.

Our study showed that out of 2,000 pregnant women, 35 were positive by rapid screening test (1.75%), out of whom 32/35 cases (91.43%) were positive by confirmatory test representing 1.6% of the whole study population. This result was in agreement with Khalil et al., from Saudi Arabia [13] and EL-Magrahe et al., from Libya [14] who reported that 2.4% and 1.5% of their studied women were positive for HBsAg, respectively. Eke et al., from Nigeria [15], and Sharifi-Mood et al., from Iran [16], reported higher prevalence rates of HBV of 8.3%, and 6.5% respectively. Other studies from the North Africa and Middle East reported rates of 4% from Tunisia [17], 4.3% from Jordan [18]. From Pakistan, Taseer et al., [19] and Azhar et al., [20] also reported prevalence rates of seropositive HBsAg among pregnant women of 4.6% and 5.7%, respectively. High prevalence rates of HBsAg were also reported from Ghana (10.5%) [21] and Yemen (13.2%) [22]. Prevalence of HBV infection varies in different parts of the world. In addition, this prevalence varies from country to country, from one region to another region and from one group to another group in a country [23]. Factors influencing incidence and prevalence of HBV infection in a particular community in addition to ethnicity and immigration patterns include intravenous drug use and high-risk sexual activity [24].

The age of acquiring infection is the major determinant of the incidence and prevalence rates [25]. In our study, although HBsAg was detected at a higher rate in pregnant women aged >25 years than in women aged <25 years, the difference was not statistically significant. Habiba and Memon [26] from Pakistan also reported that the majority of those that tested positive to HBsAg were in the age range 25-35 years. Other studies also observed a high prevalence rate of HBV in pregnant women >25 years than those <25 years [14, 19]. The increased age among HBsAg positive mothers may be due to increase the chance of exposure to HBV for each pregnancy. However, Eke et al., [15] reported a highest prevalence of HBsAg among pregnant women whose age ranged 20-24 years. The authors attributed that difference to the early marriage and pregnancy of women in South-Eastern Nigeria. Hence, those positive to HBsAg are likely to be picked when screened during their antenatal care.

Pregnant women are considered at a higher risk due to increased exposure to risk factors (as blood transfusion, intravenous drugs or surgical procedures) [27]. However, our results showed that 91.42% of cases, 82.85% of controls were multigravidae with no significant difference between both. These were in agreement with Eke et al., [15] and Buseri et al., [28]. However, Azhar et al., [20] reported a higher frequency of HBV infection among multigravidae. It might be at increased risk of HBV infection among multigravidae because of their past pregnancies, hospital admission blood transfusion and/or any surgical procedure in the past [29]. Therefore, with each pregnancy and childbirth chances of exposure to HBV become greater.

Occupation is a known predisposing factor for HBsAg infection [30]. Compared with the general population, physicians (7.4% fold) and other medical staff (16 fold) are exposed to a considerably higher risk of contracting acute viral hepatitis from contact with HBV infected

patients [31]. In our study, 97.1% of cases and 94.3% of controls were housewives and only 2.9% of cases and 5.7% of the controls were working. No significant difference was detected between both groups. Our results are nearly similar to Sharifi-Mood et al., [16] and Taseer et al. [19]; however, Eke et al., [15] reported that eight out of the 36 health care workers screened were positive to HBsAg; this was statistically significant. Those HBsAg-positive women were midwives at maternity centers and they were exposed to body fluids from women during delivery and possibly acquired the infection from body fluids from these women at delivery.

Rural residence could be a risk factor for HBV infection. Socioeconomic conditions among the poor and less educated, and crowded living condition especially in the rural areas, may contribute to HBV exposure [32, 33]. In our study, most of HBsAg-positive women and controls were belonging to rural areas with poor socioeconomic and low educational status with no significant difference between them. In addition, none of our cases and controls had previously received HBV vaccine; this is because they were not oriented about the importance of the vaccine. Woodruff et al., [34] also concluded that the prevalence of HBV did not differ by educational level, occupation, or rural versus urban residence.

None of our cases and 4.3% of the controls had previously received HBV vaccine. Other studies also reported lower HBV vaccination rates among their studied pregnant mothers [15, 20]. This lower vaccination rate could be explained by the fact that our pregnant women were born before introducing hepatitis B vaccine within our national immunization program.

HBV can be transmitted between family members within households; HBsAg contamination of surfaces is widespread in homes of chronically infected persons, which may explain the interpersonal spread of HBV such as among household contacts [35]. In our study, a positive family history of HBV infection was reported in 48.6% of cases, which was statistically significant. The role of family history as an important risk factor in acquiring HBV infection had been previously identified in other studies [15, 16, 36].

Inadequate sterilization of medical and dental instrument and unsafe injection practice continues to be a problem and may account for a majority of HBV infections [37]. In our study, previous history of dental extraction, filling, or gum treatment was not a significant risk factor for acquiring HB infection. Similar observations were reported by other studies [13, 14, 19, 20, 38].

In our study, previous history of intravenous drug administration was reported in 80% of cases and 48.6% of controls with a statistically significant difference between both. Taseer et al. [19] reported that multiple injection therapy was the second important risk factor in HBV transmission.

History of previous surgeries was reported in 80% of our cases and 54.3% of controls, which was also significant. History of previous surgeries is a major risk factor for transmission of HBV [19]. However, Khalil et al. [13] and Vázquez-Martínez et al. [39] reported a nonsignificant distribution of previous surgeries in the transmission of HBV infection among their studied women.

Blood transfusion continues to cause hepatitis B infection in countries, where blood donor is not screened. Transmission of HBV from transfusion of unscreened blood continues to be a problem and may account for a majority of infections among children and adults [37]. In our study, history of previous blood transfusion was not observed in a significant number of cases. Our study comes in agreement with Khalil et al., [13] and Vázquez-Martínez et al., [39]. However, other studies reported that blood transfusion was an important risk factor for acquiring HBV infection [19, 36].

In our study, previous hospital admission was reported in 82.9% of cases, and in only 45.7% of controls. This difference between both groups was highly significant. From Iran, Ahmadi et al., [40] also reported that previous surgery and hospitalization were observed in a higher percent of HBsAg positive cases than HBsAg negative controls but the difference between both groups was not of statistical significance.

None of our cases had a past history of symptoms of hepatitis. This is similar to Sharifi-Mood et al., [16]. However, Vázquez-Martínez et al., [39] reported that 8% of the whole study reported signs and symptoms supporting hepatitis infection. In addition Shamsuddin and Marmuji [36] stated that 198 out of 7172 (whole study) had previous history of jaundice, 4.5% were HBsAg positive, and that was statistically significant. A very few number of pregnant women which had previous signs and symptoms of hepatitis is because most cases of hepatitis are asymptomatic.

5. Conclusion and recommendations

In the post-vaccination era, HBV infection is of low prevalence among pregnant females in Egypt. Family history of HBV infection, previous IV injections, medical clinic attendance, hospital admission, and surgeries could be risk factors for acquiring HBsAg infection. Most of HBV-infected pregnant women are asymptomatic and unaware of their infection until being unraveled by screening; therefore, antenatal screening of pregnant women for HBsAg is important to identify which newborn should be immunized. The “One Step HBsAg Rapid Test” could serve as a reliable screening test for HBV.

The study is considered as a pilot study, to help in implementing a national program for prevention of vertical transmission of HBV as the schedule of HBV vaccine in our country is at the age of 2, 4, 6 months.

Conflicts of interest: None

Source of funding: self-funded by authors

All authors have revised and approved this manuscript.

References

1. Alter MJ. Epidemiology of hepatitis B in Europe and worldwide. *J Hepatol* 2003; 39 (Suppl. 1): 64-69.
2. Mast EE, Weinbaum CM, Fiore AE, Alter MJ, Bell BP, Finelli L, Rodewald LE, Douglas JM Jr, Janssen RS, Ward JW. A comprehensive immunization strategy to eliminate transmission of hepatitis B virus infection in the United States: recommendations of the Advisory Committee on Immunization Practices (ACIP) Part II: immunization of adults. *MMWR Recomm Rep* 2006; 55: 1-3.
3. El-Raziky MS, El-Hawary MA, Salama KM, El-Hennawy AM, Helmy HM, Fahmy ME, Hassanin FM, El-Karaksy HM. Patterns of hepatitis B infection in Egyptian children in the era of obligatory hepatitis B vaccination. *Arab J Gastroenterol*. 2012;13(1):1-3.
4. Chowdhury SD, Eapen CE. Perinatal transmission of Hepatitis B. *Hep B Annual* 2009; 6: 80-88.
5. Libbus MK, Phillips LM. Public health management of perinatal hepatitis B virus. *Public Health Nursing* (Boston, Mass). 2009; 26:353–361.

- 284 6. Jara P, Bruguera M. Hepatitis B in pregnant women and children. *Enferm Infecc*
285 *Microbiol Clin* 2008; 26: 675.
- 286
- 287 7. Odusanya OO, Alufohai FE, Meurice FP, Wellens R, Weil J, Ahonkhah VI. Prevalence of
288 hepatitis B surface antigen in vaccinated children and controls in rural Nigeria. *International*
289 *J Infect Dis* 2005; 9: 139-143.
- 290
- 291 8. Alikor EA and Erhabor ON. Seroprevalence of hepatitis B surface antigenaemia in
292 children in a tertiary health institution in the Niger delta of Nigeria. *Niger J Med* 2007; 16:
293 250-251.
- 294
- 295 9. Sharma P, Steele RW. Pediatric Hepatitis B. Available online at:
296 <http://emedicine.medscape.com>. 2011 (accessed on July16, 2011).
- 297
- 298 10. Attia MA. Prevalence of hepatitis B and C in Egypt and Africa. *Antivir Ther* 1998; 3: 1-9.
- 299 El-Zayadi A. Hepatitis B Virus Infection the Egyptian Situation. *Arab J Gastroenterol* 2007;
300 8: 94-98.
- 301
- 302 11. Badawy HA, El-Salahy E. Materno-fetal transmission of hepatitis B infection. *J Egypt*
303 *Public Health Assoc* 2000; 75: 357-67.
- 304
- 305 12. Khalil MK, Al-Mazrou YY, Al-Jeffri M, Al-Ghamdi YS, Mishkhas A, Bakhsh M, Eisa M,
306 Nageeb M, Tumsah S. Serosurvey of hepatitis B surface antigen in pregnant Saudi women.
307 *East Mediterr Health J*. 2005;11: 640-647.
- 308
- 309 13. El-Magrahe H, Furarah AR, El-Figih K, El-Urshfany S, Ghenghesh KS. Maternal and
310 neonatal seroprevalence of Hepatitis B surface antigen (HBsAg) in Tripoli, Libya. *J Infect*
311 *Dev Ctries* 2010; 4: 168-170.
- 312
- 313 14. Eke AC, Eke UA, Okafor CI, Ezebialu IU, Ogbuagu C. Prevalence correlates and
314 pattern of hepatitis B surface antigen in a low resource setting. *Virol J*. 2011; 8: 12.
- 315
- 316 15. Sharifi-Mood B, Keykhah F, Moghadam ES, Salehi M, Kohpayeh HR, Nayini RA,
317 Metatnat M, Khosravani S, Khsdemi R. Prevalence of Hepatitis B Surface Antigen in
318 Pregnant Women in Zahedan, Iran. *Hepat Mon*. 2004; 4: 161-163.
- 319
- 320 16. Hannachi N, Bahri O, Mhalla S, Marzouk M, Sadraoui A, Belguith A, Triki H, Boukadida
321 J. Hepatitis B virus infection in Tunisian pregnant women: Risk factors and viral DNA levels
322 in HBe antigen negative women *Pathol Biol (Paris)*. 2009;57:e43-47.
- 323
- 324 17. Batayneh N, Bdour S. Risk of perinatal transmission of hepatitis B virus in Jordan.
325 *Infect Dis Obstet Gynecol* 2002; 10: 127-132.
- 326
- 327 18. Taseer IU, Ishaq F, Hussain L, Safdar S, Mirbahar AM, Faiz SA. Frequency of anti-
328 HCV, HBsAg and related risk factors in pregnant women at Nishtar Hospital, Multan. *J*
329 *Ayub Med Coll Abbottabad*. 2010;22:13-16.
- 330
- 331 19. Azhar T, Khan IA, Mohsein S, Usman J. Antenatal screening for hepatitis B and C virus
332 infection in pregnant women in a tertiary care hospital of Rawalpindi. Available on line at:
333 <http://www.pafmj.org>, 2011 (accessed on March 18, 2012).
- 334
- 335 20. Damale NKR, Lassey AT, Bekoe V. Hepatitis B virus seroprevalence among parturients
336 in Accra, Ghana. *Intern J Gynecol and Obstet* 2005;90: 240-241.

- 337 21. Al-Shamahy HA. Prevalence of hepatitis B surface antigen and risk factors of HBV
338 infection in a sample of healthy mothers and their infants in Sana'a, Yemen. *Ann Saudi*
339 *Med* 2000; 20: 464-467.
340
- 341 22. Merat S, Malekzadeh R. Hepatitis B in Iran. *Arc Irn Med J* 2003; 4: 192-201.
342 Wright TL. Introduction to Chronic Hepatitis B Infection. *Am J Gastroenterol.* 2006; 101
343 (Suppl 1): S1–S6.
344
- 345 23. Ezegbudo CN, Agbonlahor DE, Nwobu GO, Igwe CU, Agba MI, Okpala HO and
346 Ikaraoha CI. The Seroprevalence of hepatitis B surface antigen and Human
347 immunodeficiency virus among pregnant women in Anambra State, Nigeria. *Shiraz E-*
348 *medical Journal* 2004; 5: 1-25.
349
- 350 24. Habiba SA, Memon MA. Prevalence of Hepatitis B infection in pregnant women in a
351 tertiary care hospital. *Infectious Disease Journal of Pakistan* 2007: 35-38.
352
- 353 25. Beasley RP, Hwang LY, Lee GC, Lan CC, Roan CH, Huang FY. Prevention of
354 perinatally transmitted hepatitis B virus infections with hepatitis B immune globulin and
355 hepatitis B vaccine. *Lancet* 1983; 2: 1099-1102.
356
- 357 26. Buseri F, Seiyaboh E, Jeremiah Z. Surveying Infections among Pregnant Women in the
358 Niger Delta, Nigeria. *J Glob Infect Dis.* 2010; 2: 203–211.
359
- 360 27. Khattak ST, Ali Marwat M, Khattak ID, Khan TM, Naheed T. Comparison of frequency
361 of hepatitis b and hepatitis c in pregnant women in urban and rural area of district Swat. *J*
362 *Ayub Med Coll Abbottabad* 2009;21: 12-15.
363
- 364 28. Ajayi AO, Komolafe AO, Ajumobi K. Sero-prevalence of Hepatitis B among health care
365 workers in a Nigerian tertiary health institution. *Nigerian Journal of clinical practice* 2007;
366 10: 287-289.
367
- 368 29. Kuntz E, Kuntz HD, eds. *Hepatology: Principles and Practice*, 1st ed. Springer, 2002.
369
- 370 30. Bwogi J, Braka F, Makumbi I, Mishra V, Bakamutumaho B, Nanyunja M, Opio A,
371 Downing R, Biryahwaho B, Lewis RF. Hepatitis B infection is highly endemic in Uganda:
372 findings from a national serosurvey. *Afr Health Sci.* 2009; 9: 98-108.
373
- 374 31. Gray Davis L, Weber DJ, Lemon SM. Horizontal transmission of hepatitis B virus.
375 *Lancet.* 1989;1: 889-893.
376
- 377 32. Woodruff BA, Popovici F, Beldescu N, Shapiro CN, Hersh BS. Hepatitis B virus
378 infection among pregnant women in northeastern Romania. *Int J Epidemiol.* 1993;22:923-
379 926.
380
- 381 33. Petersen NJ, Barrett DH, Bond WW, Berquist KR, Favero MS, Bender TR, Maynard JE.
382 Hepatitis B surface antigen in saliva, impetiginous lesions, and the environment in two
383 remote Alaskan villages. *Appl Environ Microbiol.* 1976; 32: 572–574.
384
- 385 34. Shamsuddin K, Marmuji L Z. Weighted analysis of prevalence and risk factors of
386 hepatitis B infection among antenatal mother in Ipoh. *Singa pore Med J.* 2010; 51: 800.
387
- 388 35. Prescott LM, Harley JP, Klein DA, eds. *Hepatitis B in: Microbiology* 5th ed. London:
389 MacGraw/Hill 2002: 889.

390 36. Elsheikh R M, Daak A A, Elsheikh M A, Karsany M S and Adam I. Hepatitis B virus and
391 hepatitis C virus in pregnant Sudanese women. Virology Journal 2007; 4:104.
392
393 37. Vázquez-Martínez JL, Coreño-Juárez MO, Montaña-Estrada LF, Attlan M, Gómez-
394 Dantés H.. Seroprevalence of hepatitis B in pregnant women in Mexico. Salud Publica Mex.
395 2003; 45: 165-170.
396
397 38. Ahmadi M,Toghyani R, Shahidi S, Izadi M, Reza Merasi M, Agdak P, MeshkatyM,
398 Nikkhahfard M. Prevalence of HBsAg and high-risk behaviors in pregnant women referring
399 to Urban Health Centers in Isfahan province. IJNMR 2011; 16: 47-54.
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438

439
440
441
442

APPENDIX

Table 1. Questionnaire for risk factors for HBV acquisition*

Case No.								
Name								
Age								
Gestational age								
Address								
Tel. number								
Expected date of delivery								
Work	Housewife		Previous urinary catheter	No				
	Medical staff			Yes				
	Other			Previous blood transfusion	No			
					Yes			
					Previous endoscopy	No		
						Yes		
					Previous visit to dentist		No	
							tooth extraction	
							gum treatment	
							fillings	
tooth extraction+ filling								
gum treatment + filling								
HBV vaccination status	No		tooth extraction + gum treatment + filling					
	Yes			others				
IV drugs & usage of syringes	No		History of schistosoma mansoni		No			
	Yes			Yes				
Medical clinic attendance	No		History of schistosoma hematobium	No				
	Yes			Yes				
Previous hospital admission	No		Previous nail care	No				
	Yes			Yes				
Previous sutures	No		Cauterization	No				
	Yes			Yes				
Previous surgeries	No		Past history of hepatitis	No				
	Yes			Yes				
Previous drained abscess	No							
	Yes							
Family history of HBV infection	No							
	Yes							
	If yes specify							

443 * This was filled for every pregnant mother positive for HBsAg by screening test and a control group
444 of HBsAg negative mothers in a ratio of 2:1.

Table 2. Comparison between cases and controls regarding gravidity status and occupation

Item	Cases (n= 35)	Controls (n=70)	χ^2	P-Value
	Number (%)	Number (%)		
Gravidity status				
• Primigravida	3 (8.57%)	12 (17.14%)	0.78	0.37
• Multigravida	32 (91.42%)	58 (82.85%)		
Occupation				
• Housewife	34(97.1%)	66 (94.3%)	4.020	0.13
• Working	1 (2.9%)	4 (5.7%)		

*P value less than 0.05 is considered statistically significant.

Table 3: Comparison between cases and controls regarding family history of hepatitis B infection

Family history	Cases (n= 35)	Controls (n=70)	χ^2	P-Value	Odds ratio (95% CI)
	N (%)	N (%)			
No	18 (51.4%)	57 (81.4%)	10.29	0.001*	4.14 (1.69-10.14)
Yes	17(48.6%)	13 (18.6%)			

CI = Confidence interval

*P value less than 0.05 is considered statistically significant.

465
466

Table 4. Assessment of risk of HBV infection among cases and controls

Variables	Cases (n=35)	Controls (n=70)	χ^2	P- Value	Odds ratio (95% CI)
	N (%)	N (%)			
Previous abortions	8 (22.8%)	24 (34.3%)	0.95	0.33	0.57 (0.22-1.4)
IV drug administration	28 (80%)	34 (48.6%)	9.53	0.003*	4.24 (1.64-10.97)
Medical clinic attendance	31 (88.6%)	41 (58.6%)	9.74	0.002*	5.48 (1.74-17.23)
Previous hospital admission	29 (82.9%)	32 (45.7%)	13.22	0.00*	5.74 (2.12-15.56)
Previous sutures	29 (82.9%)	47 (67.1%)	2.88	0.108	2.37 (0.86-6.50)
Previous surgeries	28 (80%)	38 (54.3%)	6.60	0.011*	3.37 (1.30 -8.73)
Previous abscess drainage	4 (11.4%)	5 (7.1%)	0.54	0.47	1.677 (0.42-6.69)
Previous urinary catheterization	20 (57.1%)	29 (41.4%)	2.31	0.15	1.89 (0.83-4.29)
Previous blood transfusion	3 (8.6%)	6 (8.6%)	0.00	1.00	1.00 (0.23-4.26)
Previous endoscopy	3 (8.6%)	3 (4.3%)	0.79	0.39	2.09 (0.40-10.96)
Previous nail care	5 (14.3%)	6 (8.6%)	0.81	0.50	1.78 (0.50-6.29)
Previous cauterization	0 (0.0%)	1 (1.4%)	0.50	1.00	0.65 (0.03-16.44)
Previous visits to dentist	23 (65.7%)	33 (47.1%)	2.53	0.11	2.15 (0.93-4.98)

467 HBV = Hepatitis B virus; IV = Intravenous
468 *P-value less than 0.05 is considered statistically significant.

469
470
471
472
473
474
475
476
477

478 **Table 5. Multiple regression for predictors of HBV infection**

Risk factors	P value
Hospital admission	0.09
Surgeries	0.10
Medical clinic attendance	0.20
Family history	0.68
Previous IV drugs	0.80

479 *HBV = Hepatitis B virus*

480 **P-value less than 0.05 is considered statistically significant.*

481

482

483

484

485

486

487

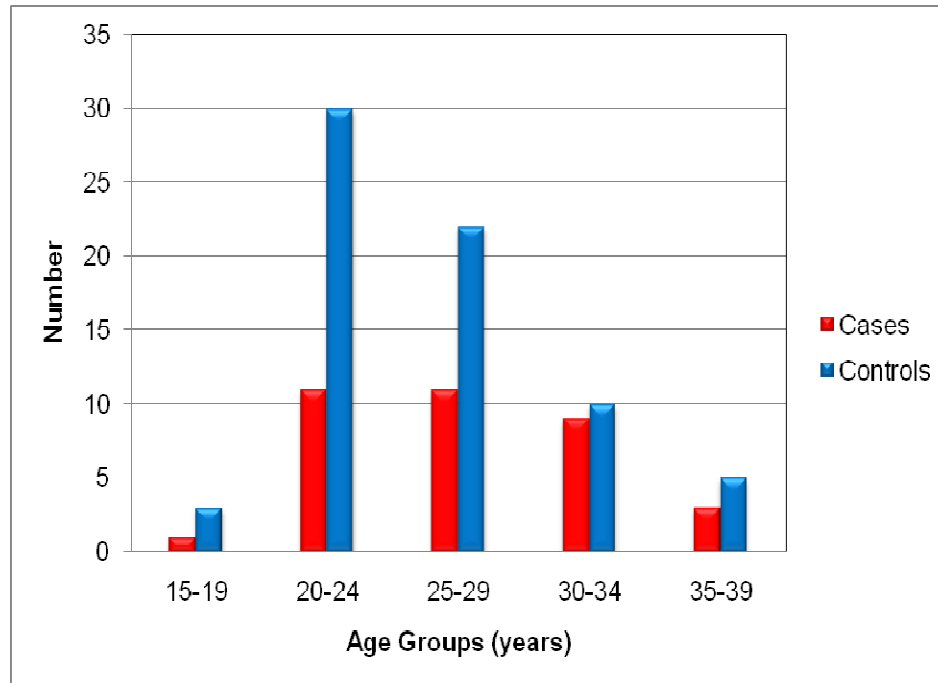


Figure 1. Frequency distribution of cases and controls according to age groups

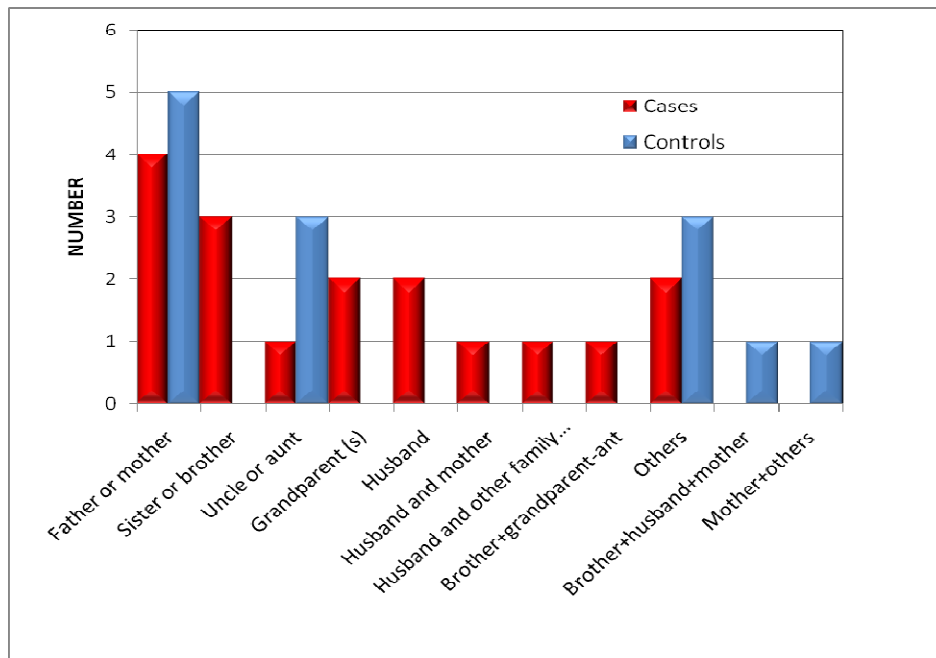


Figure 2. Positive family history of hepatitis B virus infection among cases and controls