Hepatitis B Immunization Rate from 2013 to 2020 among High-Risk U.S Adults

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BACKGROUND

- Hepatitis-B virus (HBV) infection poses a significant health burden in general as well as in older adults.
- In 2015, the number of reported cases of acute HBV infection in the United States increased by 20.7% from the previous year.
  - Despite a slight decrease in 2016, the number of acute HBV infection incidents persisted.
- The evidence suggests poor vaccination coverage among the adult population, particularly those at high risk of infection.
- Sixty-ninth World Health Assembly endorsed the Global Health Sector Strategy to eliminate viral hepatitis by 2030, and the Centers for Disease Control and Prevention (CDC) recommends HBV vaccination for adults at high risk for infection across all age groups.
- However, there is a data gap regarding the prevalence and predictors of HBV vaccination in high-risk adults in the US.

OBJECTIVE

This study examined the prevalence and predictors of HBV immunization in high-risk US adults.

METHODS

- ***Data sources***: This retrospective, cross-sectional study used the National Health and Nutrition Examination Survey (NHANES) from 2013-2020.
- ***Study population***: The study included adults (≥ 18 years) classified as high-risk and non-high-risk populations based on the American Association for Study of Liver Disease & US-Preventive Task Force.
- These high-risk populations include patients (1) with diabetes-mellitus, (2) pregnancy, (3) elevated aspartate-aminotransferase or alanine-aminotransferase, (4) sexually transmitted diseases, (5) illicit drug users, and (6) dialysis.
- Participants having multiple sexual partners, inmates of correctional facilities, healthcare workers, and persons needing immunosuppressive therapy were not included due to a lack of data.
- ***Outcomes***: Adults were considered immunized, defined by positive anti-HBs results (serological HBV-antibody titer >10mIU/mL).
- ***Analyses***: Multivariate logistic regression was used to examine the predictors of HBV immunization in high-risk older populations based on the Andersen Behavioral Model (ABM) conceptual framework.
  - All analysis was performed by using SAS version 9.4.

RESULTS

- According to 2013-2020 NHANES, an estimated 23.3% (95%CI:23.1%-23.5%) high-risk US non-institutionalized adults had vaccine-induced immunity to HBV, while 27.3% adults (95%CI:26.4%-28.0%) in the non-high-risk group, were vaccinated.
- The prevalence of vaccine-induced immunity among high-risk adults increased significantly from 22.04% in 2013-2014 (95%CI:21.8-22.3) to 23.89% in 2017-2020 (95%CI:22.8-24.8) (P<0.001).
- Older-age (OR=0.16, 95%CI:0.13-0.18) female sex (OR=1.37, 95%CI:1.16-1.61), Asian (OR=2.55, 95%CI:1.93-3.38) & Black (OR=1.31, 95%CI:1.12-1.54) race, college education ((OR=1.72, 95%CI:1.52-1.95) and having public insurance (OR=1.29, 95%CI:1.03-1.61) were strong predictors of being immunized for HBV.

Table 1: Prevalence of HBV Immunization among High-Risk Adults in the US

	Overall		2013-2014[1]		2015-2016		2017-2020[1]	
	HBV Immunization n (%)		HBV Immunization n (%)		HBV Immunization n (%)		HBV Immunization n (%)	
High-risk group	No n = 181,709,009 (74.58%)	Yes n = 61,914,520 25.41(%)	No n = 177,441,446 (74.67)	Yes n = 60,173,140 (25.3)	No n = 180,760,270 (75.18)	Yes n = 59,654,377 (24.81)	No n = 183,820,321 (74.17)	Yes n = 64,015,375 (25.83)
No	20,517,931 (86.89%)	3,095,806 (13.12%)	86,703,439 (71.5%)	34,515,329 (28.5%)	88,648,089 (74.38%)	30,526,990 (25.6%)	89,871,084 (72.24%)	34,526,027 (27.75)%
Yes	37,585,614 (85.9%)	6,130,972 (14.02%)	90,738,007 (77.95%)	25,657,811 (22.04%)	92,112,181 (75.97)%	29,127,387 (24.02%)	93,949,236 (76.11%)	29,489,348 (23.89%)

1 p-value: < 0.05 was considered significant

Table 2. Baseline Characteristics of individuals by HBV Immunization Status

		No HBV Immunization (n=181,709,009)	HBV Immunization (n=61,914,520)	Adjusted OR	95% CI	p-value[1]
High-risk group	No	88,901,104 (48.93)	33,508,118 (54.12)	Reference	--	--
	Yes	92,807,905 (51.08)	28,406,402 (45.88)	1.04	0.92--1.17	0.5573
Sex	Male	89,998,156 (49.53)	27,428,071 (44.30)	Reference	--	--
	Female	91,710,853 (50.47)	34,486,449 (55.70)	1.21	1.067--1.37	0.0035
Age	18-29 Years	29,168,285 (16.05)	21,826,723 (35.25)	Reference	--	--
	20-44-Years	42,889,834 (23.60)	18,844,046 (30.44)	0.49	0.412--0.58	<.0001
	44-64 Years	67,970,108 (37.41)	14,977,675 (24.19)	0.24	0.209--0.29	<.0001
	≥ 65 Years	41,680,783 (22.94)	5,286,586 (8.54)	0.16	0.138--0.19	<.0001
Race	White	135,003,919 (74.30)	41,352,456 (66.79)	Reference	--	--
	Hispanic	12,310,929 (6.78)	4,229,656 (6.83)	0.99	0.806--1.23	0.9551
	Black	19,945,411 (10.98)	7,974,752 (12.88)	1.21	1.088--1.34	0.0006
	Asian	8,095,168 (4.46)	5,880,348 (9.50)	2.02	1.644--2.48	<.0001
	Multi-Racial	6,353,582 (3.50)	2,477,309 (4.00)	1.14	0.933--1.39	0.1962
Country was born	US	32,436,756 (17.85)	12,631,874 (20.40)	Reference	--	--
	Non-US	149,272,253 (82.15)	49,282,646 (79.60)	1.1	0.96--1.26	0.1667
Education	Less than high school	26,887,567 (14.80)	5,678,062 (9.17)	Reference	--	--
	High School	46,212,558 (25.44)	11,694,629 (18.89)	1.13	0.978--1.30	0.0965
	College	105,997,659 (58.35)	43,699,060 (70.59)	1.88	1.631--2.18	<.0001
	Other	2,574,292 (1.42)	831,358 (1.34)	1.09	0.712--1.66	0.696
Marital Status	Married	112,112,162 (61.70)	35,806,079 (57.83)	Reference	--	--
	Widowed	35,864,517 (19.74)	8,098,999 (13.08)	0.99	0.858--1.14	0.8828
	Never married	28,228,899 (15.54)	16,143,742 (26.07)	0.98	0.805--1.19	0.807
	Other	5,503,430 (3.03)	1,865,700 (3.01)	0.53	0.4--0.69	<.0001
Insurance	No Insurance	27,074,292 (14.90)	8,864,395 (14.32)	Reference	--	--
	Public	46,514,647 (25.60)	15,478,029 (25.00)	1.35	1.162--1.56	0.0002
	Private	108,120,070 (59.50)	37,572,096 (60.68)	1.17	0.976--1.39	0.0897
Income	High Income	106,177,820 (58.43)	35,958,067 (58.08)	Reference	--	--
	Middle Income	20,992,991 (11.55)	7,446,466 (12.03)	1.04	0.915--1.18	0.5544
	Poor/Low Income	40,751,058 (22.43)	14,023,081 (22.65)	1	0.869--1.15	0.9796
	Other	13,787,140 (7.59)	4,486,907 (7.25)	0.97	0.778--1.22	0.7984
Year	2013-2014	49,289,291 (27.13)	16,714,761 (27.00)	Reference	--	--
	2015-2016	50,211,186 (27.63)	16,570,660 (26.76)	0.96	0.842--1.09	0.5188
	2017-2020	82,208,532 (45.24)	28,629,098 (46.24)	1.04	0.927--1.16	0.5326
Healthcare visits within last year	No	27,936,972 (15.37)	9,754,164 (15.75)	Reference	--	--
	Yes	153,772,037 (84.63)	52,160,356 (84.25)	1.13	0.99--1.29	0.0699

1 p-value: chi sq test & < 0.05 was considered significant

a: Education other category = missing information, refused & not ascertained

Table 3. Predictors of Vaccine-Induced Immunity in High-risk US Adults

		Adjusted Odds Ratio	95% CI	p-value[1]
Age	18-29 Years	Reference	--	--
	20-44 Years	0.47	0.36--0.61	<.0001
	44-64 Years	0.24	0.19--0.29	<.0001
	≥ 65 Years	0.16	0.12-0.20	<.0001
Sex	Male	Reference	--	--
	Female	1.37	1.16--1.61	0.0003
Race	White	Reference	--	--
	Hispanic	1.04	0.85--1.28	0.6862
	Black	1.31	1.12--1.54	0.0012
	Asian	2.55	1.93--3.38	<.0001
	Multi-Racial	1.39	0.98--1.99	0.0678
Country was born	US	Reference	--	--
	Non-US	1.01	0.83--1.22	0.9538
Education	Less than high school	Reference	--	--
	High School	0.98	0.84--1.14	0.7984
	College	1.72	1.52--1.95	<.0001
Marital Status	Married	Reference	--	--
	Never Married	0.82	0.64--1.05	0.1198
	Widowed	0.90	0.69--1.18	0.4296
Insurance	No Insurance	Reference	--	--
	Public	1.29	1.03--1.61	0.0286
	Private	1.26	1.00--1.61	0.0548
Income	High Income	Reference	--	--
	Middle Income	0.87	0.73--1.02	0.0872
	Low Income	1.00	0.84--1.19	0.9594
Year	2013-2014	Reference	--	--
	2015-2016	1.15	0.99--1.33	0.0762
	2017-2020	1.17	1.01--1.36	0.038
Healthcare visits within last year	No	Reference	--	--
	Yes	0.96	0.77--1.20	0.7141

1 p-value < 0.05 was considered significant

LIMITATIONS

The NHANES did not survey institutionalized populations. There were no data regarding country origins. The estimates can be affected by unmeasured variables i.e., sexual partners, inmates of correctional facilities, and immunosuppression.

CONCLUSION

Despite periodic releases of HBV immunization guidelines in the high-risk population, the prevalence of vaccine-induced immunity remains low in older adults in the US. Concerted efforts are needed to improve the immunization rate in the high-risk older adult population.