



Post-vaccination epidemiological analysis of hepatitis “B” viral infection among selected communities in the Central region of Ghana

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Abstract

Introduction: Hepatitis B viral infection (HBV) remains a global health threat. About 257 million people currently living with HBV worldwide. HBV is prevalent in sub-Saharan Africa with prevalence of >8% established including West Africa. Though Anti-HBV vaccines existed since 1982, as the single most important Hepatitis B prevention measure. Ghana started active mass immunization program on HBV in infants in 2002 with single-combined Expanded Program Immunization (EPI) (pentavalent vaccine). However, this do not cover persons outside the EPI especially Adults. We designed this study to evaluate the impact of this vaccination programs, the accessibility of vaccines and the scope of this program in selected communities in the central region of Ghana.

Methods: We screened and evaluated 1021 respondents from five Ghanaian indigenous communities in the central region namely Nkanfoa, Mankessim, Abura, Yamoransa and Gomoa Pinanko. They were screened for HBV and evaluated for status of Anti-HBV vaccination and on knowledge on the existence of such vaccine.

Results: Majority of the respondents were between the ages of 52 years and 68 years representing 28.2% of the study population. Sixty-three (63) screened respondents tested positive to HBV infection. We recorded 6.2% HBV prevalence for the study. 11.9% had history of previous Anti-HBV vaccination whereas 33 (3.2%) had knowledge on the existence of Anti-HBV vaccines. The age class ≤17 years had all benefitted from the EPI hence were previously vaccinated. Interestingly, they all had no knowledge of such vaccines in existence. However, 4 respondents of this beneficiaries tested positive to HBV.

Conclusion: HBV is still endemic in Ghana. Despite the inception of EPI, there is still more work to be done to finally eradicate HBV from the country. EPI should be extended to benefit adults who missed the opportunity to be vaccinated from year 2002. A state of emergency should be issued on HBV and public education intensified. Easy accessibility and affordability of Anti-HBV vaccines are key in eradicating HBV from Ghana.

Keywords: Epidemiology; HBV; Anti HBV vaccine; Global health; Central region; Ghana

Introduction

Hepatitis generally results from inflammation of the liver due to varied aetiologies. However, viral hepatitis results from inflammation of the liver, caused by a viral infection [1]. Review identified almost all of such infections to five viruses, namely hepatitis A virus (HAV), hepatitis B virus (HBV), hepatitis C virus (HCV), hepatitis D virus (HDV), and hepatitis E virus (HEV) [2]. Viral Hepatitis, an infectious form of hepatitis is a major global health concern and poses severe global threats. Annually, nearly 1.4

million fatalities from viral hepatitis closely related liver cirrhosis and hepatocellular carcinomas (HCC) are recorded [3,2]. In 2015, The World Health Organization (WHO) estimated that globally, 1 in 3 people have been infected by either HBV or HCV [4] responsible for about 90% of these fatalities, whilst the remaining 10% of fatalities are caused by other hepatitis viruses [5]. In 2016, World Health Organization adopted a strategy for the elimination of viral hepatitis by 2030. This aim is to achieve a 90% reduction in new

cases of chronic hepatitis B and C and 65% in mortality by 2030 [6]. Sub-Saharan Africa carries a significant portion of the global burden of viral hepatitis.

Systematic reviews indicates about 257 million people currently living with HBV worldwide [7]. In a further review by [8], a prevalence of >8% was established in parts of sub-Saharan Africa such as West Africa of which Ghana is not exempted. An intermediate prevalence (2–7.99%) is present in some regions of the eastern Mediterranean, Central Asia, Southeast Asia, parts of South America and in some European countries. A low prevalence is present (<2%) in some parts of North America in some European countries and in Australia [8]. Several reports identifies significant rates of HBV infections in Ghana which cuts across blood donors >10% [9,10], pregnant women 13.1%, rural communities 13.3% and urban communities 12.2%. Regional prevalence established the Brong Ahafo as the region with the highest rate (13.7%), the Ashanti, Greater Accra, Eastern, Northern and Central regions as 13.1, 10.6, 13.6, 13.1 and 11.5% respectively [11].

Though Anti-HBV vaccines existed and was available since 1982, as the single most important Hepatitis B prevention measure [12], Ghana started active mass immunization program on HBV in infants in 2002 with single-combined Expanded Program Immunisation (EPI) vaccine; pentavalent vaccine (DTPw-HepB/Hib; Panacea Biotech Ltd, India) [13]. Following 2002, several adults were vaccinated across the nation with the World Health Organization's approved and recommended vaccine Hepavax-Gene (Berna Biotech Korea Corporation, a Crucell Company), 10 ml pediatric dose vial/ 5 ml adult dose vial [14].

For decades, these vaccination programs for adults have being adopted and taken over by health service providers in Ghana. It is common to get vaccinated as an adult in Ghana but at a fee ranging from USD 75 –USD 150 per dose. This permits only the affluent in society to access this prevention measure hence hindering the Sustainable Development Goal 3 on promoting good health and wellbeing. We designed this study to evaluate the impact of this vaccination programs, the accessibility of vaccines and the scope of this program in selected communities in the central region of Ghana.

Methods

Study Design

This community-based cross-sectional study was incorporated into an on-going medical screening program by a Ghanaian-owned rural community-focused mobile laboratory company, Dream Laboratory Consult Limited. This generated the hepatitis "B" morbidity data between 2016 and 2018. This follows decades of introduction of AntiHBV vaccination in Ghana.

Study site and population

The study was conducted in the Central region of Ghana from 2016-2018. The Central region houses a population of 2,563,228 (8.5 %) of Ghana's 30,280,811 population, on an area of 9,826 km² (4.1% of Ghana's total land area of 238,533 km²) [15]. The Nkanfoa,

Abura, Mankessim, Yamoransa and Gomoa Pinanko communities were recruited for this study.

Data collection

Data were collected from participants in an on-going medical screening exercise by Dream Laboratory Consult Limited in the Central region. 1021 participants were recruited for this study. Variables collected were age, sex, hepatitis "B" status, Anti-HBV vaccination status and knowledge on Anti-HBV vaccines and vaccination.

Laboratory investigation

Point of care rapid diagnostic tests on hepatitis "B" were performed. Advanced Quality TM one step hepatitis "B" surface antigen (HBsAg) Test strip for whole blood, a rapid one step immunochromatographic assay for detection of HBsAg produced InTec Products, Inc. (Xiamen).

Data analysis

Study data were collated and entered into Excel (Microsoft Office 2013) and analyzed with IBM SPSS version 20. Descriptive statistics on measured parameters were performed. Statistical reports were presented in tables.

Ethical Issues

Informed consent was sought from the participants for this study. Written permission was sought from Dream Laboratory Consult Limited, Ghana on the preparation of this manuscript and the decision to publish. The data records were also captured without traceable identities of the cases.

Results

Age Group (years)	Sex		
	Males	Females	Total
	N (%)	N (%)	N (%)
≤17	42(37.2)	71(62.8)	113(11.1)
18-34	68(33.1)	138(66.9)	206(20.2)
35-51	77(28.1)	197(71.9)	274(26.8)
52-68	87(30.2)	201(69.8)	288(28.2)
≥69	42(30.0)	98(70.0)	140(13.7)
Total	316(30.9)	705(69.1)	1021

Three hundred and sixteen (316) out of the 1021 screened respondents were males whereas 705 were females. Majority of the respondents were between the ages of 52 years and 68 years representing 28.2% of the study population (Table 1). Sixty-three (63) screened respondents tested positive to HBV infection. We recorded 6.2% HBV prevalence for the study. Females established a higher HBV infection rate than males (71.4% and 28.6% respectively) however, age group 35-51 years documented the highest HBV infection rate of 38.1% (Table 2). Among the 1021 respondents, only 122 representing 11.9% had previously received Anti-HBV vaccination whereas only 33 (3.2%) had knowledge on

the existence of Anti-HBV vaccines. The age class ≤ 17 years had all previously received Anti-HBV vaccination (113 respondents) yet they all had no knowledge of such vaccines in existence (Table 3). Four (4) respondents representing 6.3% of this age class tested positive to HBV. The age class ≥ 69 years (140 respondents) all had neither been vaccinated nor heard of the existence of Anti-HBV vaccines. Stratified by communities screened, Yamoransa recorded the highest HBV infection rate of 32 out the 63 infections established (50.8%) however, Mankessim recorded the lowest number of respondents with history of Anti-HBV vaccination of 3 (2.5%). Eighteen (18) respondents representing 54.5% from Gomoa Pinanko demonstrated knowledge on the existence of Anti-HBV vaccine (Table 4).

Table 2: HBV infections

Age Group (years)	HBV infected		
	Males	Females	Total
	N (%)	N (%)	N (%)
≤ 17	1(25.0)	3(75.0)	4(6.3)
18-34	6(31.6)	13(68.4)	19(30.2)
35-51	6(25.0)	18(75.0)	24(38.1)
52-68	4(30.8)	9(69.2)	13(20.6)
≥ 69	1(33.3)	2(66.7)	3(4.8)
Total	18(28.6)	45(71.4)	63(6.2)

Table 3: History and Knowledge on Anti-HBV vaccines Knowledge on the History of Anti-HBV existence of Anti-HBV vaccination vaccines.

Age Group (years)	Vaccinated	Non-Vaccinated	Knowledge	No Knowledge	Total
	N (%)	N (%)	N (%)	N (%)	N
≤ 17	113(100.0)	0(0.0)	0(0.0)	113(100.0)	113
18-34	1(0.5)	205(99.5)	21(10.2)	185(89.8)	206
35-51	5(1.8)	269(98.2)	9(3.3)	265(96.7)	274
52-68	3(1.0)	285(99.0)	3(1.0)	285(99.0)	288
≥ 69	0(0.0)	140(100.0)	0(0.0)	140(100.0)	140
Total	122(11.9)	899(88.1)	33(3.2)	988(96.8)	1021

Table 4: Demographic distribution of HBV infection, respondents' history of Anti-HBV vaccination and knowledge on the existence of Anti-HBV vaccines.

Community	HBV infection	History of Anti-HBV vaccination	Knowledge on the existence of Anti-HBV vaccines
	N (%)	N (%)	N (%)
Yamoransa	32(50.8)	37(30.3)	4(12.1)
Nkanfoa	9(14.3)	71(58.2)	2(6.1)
Gomoa Pinanko	8(12.7)	7(5.7)	18(54.5)
Abura	8(12.7)	4(3.3)	6(18.2)
Mankessim	6(9.5)	3(2.5)	3(9.1)
Total	63	122	33

Discussion

This study evaluated the impact of Anti-HBV vaccination programs, the accessibility to Anti-HBV vaccines and the scope of vaccination programs among selected communities in the Central region of Ghana. After nearly 2 decades of integration of Anti-HBV vaccination program into the national vaccination program, we still reported significant rate of HBV infection. Our study recorded 6.2% prevalence of HBV. This agrees with similar studies across Ghana among different respondents ranging from blood donors >10% [9,10], pregnant women 13.1%, rural communities 13.3% and urban communities 12.2% [11]. Regional prevalence established the Brong Ahafo as the region with the highest rate (13.7%), the Ashanti, Greater Accra, Eastern, Northern and Central regions as 13.1, 10.6, 13.6, 13.1 and 11.5% respectively. We observed that despite a significant rate in HBV in the region established by our study recorded a significant nearly 50% reduction which must be commended. However, further mass education and intervention programs must be designed and not be restricted to infant and children vaccination schedules. Females recorded higher HBV rate than males (71.4%). This gender difference in the infection rate is consistent with a study in Ghana [16]. They attributed these to lower socio-economic status of most females in such environments. However, on a first look it can be estimated that since most of the respondents were females (69.1%), it statistically influenced the increase in their rate (Table 1).

Due to inadequate public education on HBV, only 3.2% of the respondents had knowledge on the existence of Anti-HBV vaccine. Out of 1021 respondents screened, 11.9% (122 respondents) had the opportunity to be previously vaccinated. This was strongly attributed to inadequate public information, education and the high cost of vaccine. In Ghana, free Anti-HBV vaccinations in single-combined Expanded Program on Immunization vaccine; pentavalent vaccine are only accessible by infants and children since 2002 [13]. On the other hand, although, Ghana's Health Insurance Scheme (NHIS) introduced in 2003 aims to improve access to health services by eliminating financial barriers (commonly referred to as pay-as-you-go or pre-paid), however, HBV screening and vaccinations outside the EPI are not covered under the scheme [11]. HBV screening cost ranges from USD 2- USD 4 whereas Anti-HBV vaccination cost ranges from USD 75- USD 150. It is even more expensive to manage or treat HBV patient. The cost of oral treatment for HBV in Ghana ranges from USD 1500- USD 2000 (at GHS 5 conversion) a month or weekly. These have hampered effective control of HBV since 2002 since they favor the younger generation and the affluent class in society. This confirms our findings that all 113 respondents ≤ 17 years were previously vaccinated under the EPI whereas older age class ≥ 69 had no knowledge on the Anti-HBV vaccine and had never been vaccinated. Four (4) (6.3%) of the age class ≤ 17 years tested positive to HBV. Though this age class were evaluated to have been previously vaccinated under the EPI, they could be pre-exposed to HBV where were born to mothers of HBV status, mothers who have immigrated from an HBV endemic country [17]. It is, however, recommended that such infants and

children be given both HBV immune globulin and the Anti-HBV vaccine in the first 12 hours of birth [17].

Yamoransa recorded the highest HBV infection rate of 32 out of the 63 infections established (50.8%). This is a continuously developing community. They have no health facility of their own hence rely on nearby health facilities such as Moree Health Center, Anomabo Health Center and the Brafoyaw Medical Center. This confirms the report by [11]. They recorded a 13.3% HBV prevalence among rural communities against 12.2% in urban communities. Rural or developing communities play an integral role in HBV transmission.

Conclusion

There is a significant burden of HBV infection in the Central region. There are a huge number of adults who are still not vaccinated due different levels of inaccessibility and financial constraints. This can only be eradicated by intensified mass education, free screening programs and free vaccinations despite the EPI program. This will require a conscious effort to achieve results. It is very important for the Government of Ghana, stakeholders and all international partners to prioritize integrating free HBV screening and Anti-HBV vaccination in the national immunization program just like what is done for other viral infections such as yellow fever. Further studies should be extended to all regions to influence health policies in the country.

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Competing Interests

The authors have declared that no competing interest exist.

Author Contributions

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Wrote the paper: Yussif M Dokurugu, Evans Duah

Enrolled/ recruited respondents: Evans Duah, Clement Agoni, Ransford Kumi Oduro, Samuel Essien-Baidoo

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