Hepatitis B vaccination status and associated factors among university students in Ghana: A cross-sectional survey

Akwasi Adjei Gyimah1*, Prince Peprah2, Williams Agyemang-Duah3, Eric Frimpong2, Ariel Kwegyir Tsiboe4 and Mercy Aboagye Darkwa2

The World Health Organization (WHO) promotes Hepatitis B vaccination as the most-effective way of controlling HBV infection. However, knowledge regarding general university students’ population vaccination status remains limited in Ghana. Using data from a survey involving 2712 students from three universities, this study aimed to examine Hepatitis B vaccination status and associated factors among university students in Ghana. Results showed that less than half of the participants (38.2%) have been vaccinated and (57.3%) were yet to complete full vaccination (taken the full three doses of the vaccine). Non-compulsory nature of Hepatitis B vaccination (22.7%), lack of awareness of the vaccination (22.7%), high cost of the vaccination (18.1%), no interest/motivation in the vaccination (16.5%) and availability issues (13.8%) were the common reasons cited for non-vaccination. In a multivariate logistic regression analysis, participants who were aged 26 years or above had higher odds of taking Hepatitis B vaccination (AOR: 2.084; CI: 1.530–2.838, p = .001). Also, non-Akans (AOR: 0.746; CI: 0.601–0.902, p = .002), urban residents (AOR: .695; CI: .578–.835, p = .001) and no social support receivers (AOR: .812; CI: .701–1.223, p = .005) had lesser odds of taking Hepatitis B vaccination. This study highlights the urgent need for continued health education on HBV infection and strategies that ensure that students are fully vaccinated. The findings suggest

ABOUT THE AUTHOR
Akwasi Adjei Gyimah holds BSc and MPhil in Disability, Rehabilitation and Development from Kwame Nkrumah University of Science and Technology. His research interests include disability studies, public health, social policy, ageing, sustainable development and inclusive education. The authors of this paper form a team of upward researchers who jointly articulate the knowledge and attitude of people in relation to health in Ghana. In this paper, the authors present the prevalence and factors associated with hepatitis B vaccination among university students in Ghana.

PUBLIC INTEREST STATEMENT
One of the most highly infectious diseases in the sub-Saharan region is Hepatitis B. The disease affects both young and older people. The purpose of the paper was to examine if university students have the promptness to go for vaccination. This was necessary as there is no enough evidence pertaining to how university students go for Hepatitis B vaccination. A cross-sectional survey was employed to examine Hepatitis B vaccination status and associated demographic and socio-economic factors among university students in Ghana. The study provides evidence to demonstrate that that less than half of the respondents have been vaccinated. Of those who were not vaccinated, the most dominant reasons for non-vaccination include non-compulsory nature of hepatitis B vaccination, lack of awareness of the vaccination and the high cost of the vaccination.
that any interventions design to enhance uptake of Hepatitis B vaccination among students should be sensitive to socio-demographic characteristics especially age, ethnicity, residential status as well as social support.

Subjects: Health & Society; Health Conditions; Public Health Policy and Practice

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1. Introduction
Hepatitis B is a highly infectious blood borne pathogen and is transmitted by percutaneous or mucosal exposure to infected blood, semen or other bodily fluids (WHO, 2015; WHO, 2017). Despite the availability of a vaccine, the disease remains a major concern for the public health professional in the world (WHO, 2017). Statistics indicate that one-third of the world population that is approximately more than 350 million people are carriers (Meireles et al., 2015). Countries in the Global South particularly, sub-Saharan Africa and Southeast Asia account for about 10–20% of chronic Hepatitis B Virus (HBV), which is the highest in the world (Lemoine et al., 2015). Estimates show that, yearly, approximately 500,000–1.2 million lose their lives due to chronic hepatitis, cirrhosis and hepatocellular carcinoma all, associated with HBV (Biradar et al., 2015).

One of the most endemic countries in Africa is Nigeria, where about 18 million people been infected with HBV (Jombo et al., 2005; Sirisena et al., 2002). A study by Bwogi et al. (2009) also highlighted, among the people of Uganda, more than 8% of the populace are infected with the virus. In South Africa, Tsebe et al. (2001) expressed that, Hepatitis B is seen to be the main cause of liver-related diseases and more than 70% of the people of South African are being exposed to the infection. In addition, in Ghana, Ofori-Asenso and Agyeman (2016) opined that the prevalence of HBV as detected by HBsAg seropositivity is 12.3%. Another research conducted in Ghana also estimated the prevalence around 12.92% (Schweitzer et al., 2015).

Some studies indicated that students who work within the healthcare delivery system are more susceptible to be infected with HBV. That is two to four times than the general population (Osei et al., 2017; Prüss-Üstün et al., 2005; WHO, 2017). In Uganda, a study conducted among medical students in Makerere University found that approximately 11% of the medical students have been infected with Hepatitis B (Pido & Kagimu, 2005). In Ethiopia, Mesfin and Kibret (2013) reported that there is low level of knowledge about Hepatitis B among university students because few of their study participants knew about horizontal infection of Hepatitis B. In addition, Mansour-Ghanaei et al. (2013) emphasized the knowledge levels of the medical students are partial towards HBV infection. A study by Osei et al. (2019) among Ghanaian students on knowledge, testing and vaccination history among undergraduate public health students in Ghana indicated that pertaining to the knowledge, the students had moderate knowledge, but for testing and vaccination, there was low response rate.

Various studies have been conducted on the knowledge of students on HBV (Adekanle et al., 2015; Ibrahim & Idris, 2014; Kue & Thorburn, 2013; Magdy & Nuha, 2013). These studies have been focused on the medical students neglecting the views of non-medical students which could hinder efforts in promoting Hepatitis B vaccination among Ghanaian university students. Considering this gap, the purpose of the study is to examine the prevalence and factors associated with Hepatitis B vaccination among university students in Ghana.

2. Methods and data

2.1. Data and sample
We conducted a cross-sectional survey to examine Hepatitis B vaccination status and associated demographic and socio-economic factors among university students in Ghana. The institutions included the Kwame Nkrumah University of Science and Technology (KNUST), Accra Technical
University and Koforidua Technical University in Kumasi, Accra and Koforidua, respectively. A representative sample of 2712 students across all levels (100–400) and programme of study were included in the study.

A simple random sampling technique was employed to select the students for the study (Teddlie & Yu, 2007). Structured questionnaire consisting of two sections was provided to the participants during their normal lecture time. Section one of the questionnaire comprised socio-demographic characteristics of the participants such as age (years), gender, level of study, place of residence, monthly pocket money, religion and relationship status. Section two comprised questions such as have you done the Hepatitis B vaccination? If yes, where did you do the vaccination? If you have been vaccinated, is it a full/partial vaccination? And reasons for non-vaccination. The administration of the questionnaire lasted 20 minutes on the average.

The participants were briefed on the purpose of the study before data collection started. Written consent was obtained from the respondents before the administration of the questionnaire. They were assured of strict confidentiality of the data they provided.

2.2. Measures
The outcome variable was Hepatitis B vaccination which was measured as a dichotomous variable indicating “yes = 1” or “no = 0” responses. The independent variables and their measurements were age (years) (1 = 18 or below; 2 = 19–25 and 26 or above), gender (1 = male; 2 = female), level of study (1 = 100; 2 = 200; 3 = 300; 4 = 400), place of residence (1 = Rural; 2 = Urban), monthly pocket money (GHS) (1 = less than 300 cedis; 2 = 300 or more), membership of an association (1 = Yes; No = 0), religion (1 = Christian; 2 = non-Christian), ethnicity (1 = Akan; non-Akan) and are you in a Relationship (1 = Yes; No = 0).

2.3. Analytical framework
The data were keyed in the Statistical Package for Social Sciences (SPSS) software (version 21.0) for analytical purpose. The sample characteristics of the participants were described using percentages and frequencies. Chi-square tests were performed to determine the difference between the predictor and the outcome variables. Based on the variables that were significant in the Chi-square analysis, multivariate logistic regression were used to estimate the odds of Hepatitis B vaccination. The robustness of the multivariate logistic regression has been measured and the results are as follows. One, given the set of the data, the outcome (p > 0.05) of the Hosmer and Lemeshow test of homogeneity (see Table 3) demonstrates that the model is a good fit to the data. Two, the Omnibus Tests of Model Coefficients show a significant difference between the based model (without explanatory variables) and the current model with explanatory variables (p < 0.05). The proportion of correct classification is 61.8%. All tests were considered significant at a p value of 0.05 or less.

3. Results

3.1. Socio-demographic characteristics of the study participants
The majority (68.6%) of the respondents were aged between 19 and 25 years, 53.2% were females, 28.8% were in level 100 and 73.9% resided in the urban areas. The majority (62.8%) of the respondents received a monthly pocket income of less than GHS300. Approximately, 93% of the respondents were Christians, 28.3% had not received any form of social supports in the past 6 months and 51.4% were in a romantic relationship. In a Chi-square test to establish association between socio-demographic variables and Hepatitis B vaccination, we found that there was a statistically significant association between age (p = .001), place of residence (p = .001), ethnicity (p = .002) and social support (p = .001) in relation to Hepatitis B vaccination (see Table 1).
Table 1. A Chi-square tests of Independence on socio-demographic characteristics of the study participants and Hepatitis B vaccination

|                               | Hepatitis B vaccination |       |       |       |       |
|-------------------------------|-------------------------|-------|-------|-------|-------|
|                               | Yes (n = 1037) | %      | No (n = 1675) | %      | Total (n = 2712) | %      | p-value |
| Age (years)                   |                     |       |                     |       |                     |       |         |
| 18 or below                   | 293                  | 28.3% | 295                  | 17.6% | 588                  | 21.7% | .001    |
| 19–25                         | 660                  | 63.6% | 1200                 | 71.6% | 1860                 | 68.6% |         |
| 26 or above                   | 84                   | 8.1%  | 180                  | 10.7% | 264                  | 9.7%  |         |
| Gender                        |                     |       |                     |       |                     |       | .318    |
| Male                          | 473                  | 45.6% | 797                  | 47.6% | 1270                 | 46.8% |         |
| Female                        | 564                  | 54.4% | 878                  | 52.4% | 1442                 | 53.2% |         |
| Level of study                |                     |       |                     |       |                     |       | .206    |
| 100                           | 276                  | 26.6% | 504                  | 30.1% | 780                  | 28.8% |         |
| 200                           | 353                  | 34.0% | 523                  | 31.2% | 876                  | 32.3% |         |
| 300                           | 180                  | 17.4% | 276                  | 16.5% | 456                  | 16.8% |         |
| 400                           | 228                  | 22.0% | 372                  | 22.2% | 600                  | 22.1% |         |
| Place of residence            |                     |       |                     |       |                     |       | .001    |
| Rural                         | 228                  | 22.0% | 480                  | 28.7% | 708                  | 26.1% |         |
| Urban                         | 809                  | 78.0% | 1195                 | 71.3% | 2004                 | 73.9% |         |
| Monthly pocket money          |                     |       |                     |       |                     |       | .065    |
| less than 300 cedis           | 629                  | 60.7% | 1075                 | 64.2% | 1704                 | 62.8% |         |
| 300 or more                   | 408                  | 39.3% | 600                  | 35.8% | 1008                 | 37.2% |         |
| Religion                      |                     |       |                     |       |                     |       | .161    |
| Christian                     | 977                  | 94.2% | 1555                 | 92.8% | 2532                 | 93.4% |         |
| Non-Christian                 | 60                   | 5.8%  | 120                  | 7.2%  | 180                  | 6.6%  |         |
| Ethnicity                     |                     |       |                     |       |                     |       | .002    |
| Akan                          | 785                  | 75.7% | 1351                 | 80.7% | 2136                 | 78.8% |         |
| Non-Akan                      | 252                  | 24.3% | 324                  | 19.3% | 576                  | 21.2% |         |
| Social support in the past 6 months |           |       |                     |       |                     |       | .001    |
| Yes                           | 336                  | 32.4% | 432                  | 25.8% | 768                  | 28.3% |         |
| No                            | 701                  | 67.6% | 1243                 | 74.2% | 1944                 | 71.7% |         |
| Are you in a relationship     |                     |       |                     |       |                     |       | .249    |
| Yes                           | 548                  | 52.8% | 847                  | 50.6% | 1395                 | 51.4% |         |
| No                            | 489                  | 47.2% | 828                  | 49.4% | 1317                 | 48.6% |         |

* p < 0.05.
3.2. Prevalence of Hepatitis B vaccination among the participants
The study revealed that 38.2% of the respondents had done Hepatitis B vaccination, 44.3% did the vaccination in school and 57.3% of the respondents had partially vaccinated. The reasons for non-vaccination among the participants included non-compulsory nature of Hepatitis B vaccination (22.7%), lack of awareness of the vaccination (22.7%), high cost of the vaccination (18.1%), lack of interest in the vaccination (16.5%), among others (see Table 2).

3.3. Socio-demographic factors explaining Hepatitis B vaccination
The study revealed that participants aged 26 years or above were more likely to undertake Hepatitis B vaccination compared with those who were 18 years or below (AOR: 2.084; CI: 1.530–2.838, p = .001). The study revealed that participants residing in urban areas (AOR: 6.95; CI: 5.78–8.35, p = .001), non-Akan participants (AOR: 7.46; CI: 6.17–9.02, p = .002) and those who have not received any form of social supports in the past 6 months (AOR: .812; CI: .701–1.223, p = .005) were significantly less likely to undertake Hepatitis B vaccination compared with their respective counterparts.

4. Discussion
The current study, to the best of the authors’ knowledge, is the first study among university students in Ghana to obtain data on Hepatitis B vaccination status and associated factors. The main findings of the study were that less than half of the respondents have been vaccinated (38.2%). Of those who were not vaccinated (61.8%), the most dominant reasons for non-vaccination included non-compulsory nature of Hepatitis B vaccination, lack of awareness of the vaccination and the high cost of the vaccination. In a multivariate regression analysis, students’ age, residential status, ethnicity and social support were associated with Hepatitis B vaccination. Our findings generally mirror evidence by previous studies involving students’ vaccination attitude (Al-Hazmi, 2015; Aniaku et al., 2019; Biradar et al., 2015; Ochu & Beynon, 2017; Osei et al., 2019; Shrivastava et al., 2018; Wbabara et al., 2019).

Our results that only 38.2% of the respondents were vaccinated whereas 42.7% have been fully vaccinated point to a low Hepatitis B vaccination status among university students, but higher than 30.5% reported among students studying health-related courses (Al-Hazmi, 2015). This calls for massive public health education and orientation and sensitization programme among university students in Ghana. A study conducted among medical and health science students established that 4.7% of the

| Table 2. Prevalence of Hepatitis B vaccination among the participants |
|---------------------------------------------------------------|
| **Variable** | **Response** | **Count** | **%** |
|----------------|-------------|-----------|------|
| Have you done the Hepatitis B vaccination? | Yes | 1037 | 38.2% |
| | No | 1675 | 61.8% |
| If Yes, where did you do the vaccination? | School | 468 | 44.3% |
| | Healthcare facility | 372 | 35.2% |
| | Home | 96 | 9.1% |
| | Church | 60 | 5.7% |
| | Other | 60 | 5.7% |
| If you have been vaccinated, is it a fully/partially vaccination? | Fully | 443 | 42.7% |
| | Partially | 594 | 57.3% |
| Reasons for non-vaccination | No interest | 276 | 16.5% |
| | No motivation | 104 | 6.2% |
| | Not aware | 381 | 22.7% |
| | High cost | 303 | 18.1% |
| | Availability issues | 231 | 13.8% |
| | Not compulsory | 380 | 22.7% |
study participants completed all three doses of their vaccination schedule (Osei et al., 2019). This means students who have not been vaccinated face risk of contracting the disease in future. It is, therefore, crucial that students who have never received Hepatitis B vaccination or have not completed the full vaccination are encouraged and supported to receive three doses of the vaccination (Al-Hazmi, 2015).

In this study, reasons for non-vaccination included non-compulsory nature of Hepatitis B vaccination, lack of awareness of the vaccination, high cost of the vaccination, and no interest in the vaccination and availability issues of where to find the vaccine. These findings agree with previous studies where availability (Atiba et al., 2014; Biset Ayalew & Adugna Horsa, 2017), high cost of the vaccines and lack of money (Afihene et al., 2015; Osei et al., 2019; Wibabara et al., 2019), lack of interest or motivation (Biradar et al., 2015; Ibrahim & Idris, 2014; Mesfin & Kibret, 2013; Shrivastava et al., 2018) and lack of awareness (Aniaku et al., 2019; Mesfin & Kibret, 2013; Shrivastava et al., 2018) were the most cited reasons for Hepatitis B non-vaccination. These findings show that awareness, motivation/interest and money are necessary to increase Hepatitis B vaccination coverage. In addition, for a country like Ghana, which is classified as a high burden for Hepatitis B to win the battle against the infection, it is important to consider making vaccination compulsory and free of charge for

### Table 3. Multivariate Logistic analysis on socio-demographic factors associated with Hepatitis B vaccination

| 95% C.I. for AOR | AOR | Lower | Upper | p value |
|------------------|-----|-------|-------|---------|
| Age (years)      |     |       |       |         |
| 18 or below (Ref Group) | 1.00 |       |       |         |
| 19–25            | 1.766 | 1.461 | 2.135 | .001    |
| 26 or above      | 2.084 | 1.530 | 2.838 | .001    |
| Place of Residence |    |       |       |         |
| Rural            | 1.00 |       |       |         |
| Urban            | .695 | .578  | .835  | .001    |
| Ethnicity        |     |       |       |         |
| Akan             | 1.00 |       |       |         |
| Non-Akan         | .746 | .617  | .902  | .002    |
| Social support   |     |       |       |         |
| Yes              | 1.00 |       |       |         |
| No               | .812 | .701  | 1.223 | .005    |
| Model goodness-of fit and model robustness | | | |
| Omnibus Tests of Model Coefficients (Chi-square, p value) | 76.421 (0.000) |
| Hosmer & Lemeshow Test of Homogeneity (Chi-square, p value) | 109.171 (0.053) |
| Proportion of correct classification (%) | 61.8 |

Italic values indicate significance of p value (p < 0.05)
CI = Confidence Interval; AOR = Adjusted Odd Ratio
* p < 0.05.
everyone to have access to it irrespective of social class (Osei et al., 2019). Particularly for students, various students’ representative council can organize free Hepatitis B testing and vaccination for all students preferably during their first year of enrolment.

This study shows that there are some associations in sociodemographic variables and Hepatitis B vaccination. The findings that those aged 26 years or above had higher odds to have Hepatitis B vaccination compared with those who were 18 years or below whereas non-Akans, urban settlers and no social support receivers had lesser odds of receiving hepatitis B vaccination are important. This finding differs from previous studies (Aniaku et al., 2019; Osei et al., 2019; Wibabara et al., 2019) where there was a significant association between programme of study, year of study, mode of study, gender and students’ sponsorship.

5. Conclusion

Our findings suggest that any interventions design to enhance uptake of Hepatitis B vaccination among students should be sensitive to sociodemographic characteristics especially age, ethnicity, residential status as well as social support. For instance, the presence of social support would provide students with sufficient pocket money to meet the students’ needs including healthcare needs like vaccination. In spite of the significance and novelty of this study, some limitations must be highlighted to put the interpretations of the findings into appropriate perspective. First, the cross-sectional design adopted does not permit causal associations to be established among variables. Again, all the variables were retrospective through self-reporting and could not be verified by records thus, recall biases and reporting are almost inevitable. However, self-reporting may be the best and certainly most convenient method to capture respondents’ subjective interpretation of the social support they received (Gyasi, 2018).

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Author details

Akwasi, Adjei Gyimah1
E-mail: akwasiigyma@gmail.com
ORCID ID: http://orcid.org/0000-0001-8942-3445
Prince Peprah2
E-mail: princepeprah15@gmail.com
ORCID ID: http://orcid.org/0000-0002-3816-2713
Williams Agyemang-Duah3
E-mail: agyemangduahwilliams@yahoo.com
ORCID ID: http://orcid.org/0000-0001-8658-004X
Eric Frimpong4
E-mail: frimpongeriq05@gmail.com
Ariel Kwegyir Tsiboe5
E-mail: tsiboeariel@yahoo.com
ORCID ID: http://orcid.org/0000-0002-6753-4395
Mercy Abooagye Darkwa6
E-mail: phyboaagye@gmail.com
1 Department of Sociology and Gerontology, Miami University, USA.
2 Social Policy Research Centre / Centre for Primary Health Care and Equity, UNSW, Sydney, Australia.
3 Department of Geography and Planning, Queen’s University, Kingston, Ontario, Canada K7L 3N6.
4 Centre for Research on Ageing, University of Southampton, Southampton, UK.

Abbreviations

Hepatitis B Virus – HBV
Hepatitis B surface antigen – HBsAg
Kwame Nkrumah University of Science & Technology – KNUST

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