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Hepatitis B screening and seroconversion rates for new entry medical students at Newcastle University Medicine (NUMed) Malaysia – A follow up 2 year cohort analysis (2019-2020)

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Abstract

Introduction: This study is an extension of a further 2 year cohort to further support the results regarding HBV vaccination outcomes and subsequent seroconversion status that had been reported previously for the years 2015-1018 in cohorts of new entry medical students.

Methods: Demographics, HBV vaccination status, and HBV surface antibody titers for 119 participants in 2019-2020 intakes were obtained. Seroconversion status and rates were determined, matched to demographics and compared with previous cohorts. **Results:** Overall seroconversion rate for 2019-2020 intakes was similar as previously reported as compared to 2015-2018 intakes. The low seroconversion rate amongst the Chinese and Malay students did not show any difference as compared to the 2015-2018. **Conclusion:** This further two year cohort data showing low seroconversion rate further support the previously reported result. Possible genetic basis for the difference in HBV seroconversion rate among ethnicities.

Keywords: hepatitis B vaccine; seroconversion; medical students

Introduction

Medical students especially during their clinical training are at high risk of biological hazards such as hepatitis B virus (HBV) and other vaccine-preventable infection through occupational exposure [1]. HBV, being a blood borne virus has the highest risk of viral transmission to non-immune healthcare workers as compared to hepatitis C and HIV [2]. Previous studies have reported that 37% of HBV infection among healthcare workers is a result of occupational exposure caused by direct contact with infectious materials such as blood through needle stick injuries or other contaminated body fluids through accidental spillage [1,3]. To mitigate the risk of acquisition, health screening for new entry medical students is recommended prior to their clinical training.

Following the recent publication of our research analysis entitled "Health screening for new entry medical students at Newcastle University Medicine (NUMed) Malaysia – a retrospective 4-year study" 2015-2018 [4] demonstrating a low HBV seroconversion rate (64.6%) among young new entry NUMed medical students (median age: 19) following standard recommended 3-dose vaccination., we have now further extended a further two year cohort 2091-2020 data to further support if the findings from the first study is consistent. In this first study, students of Malay ethnicity also showed a statistically significant non-conversion rate of 51% (P = 0.002) as compared to the Chinese (29.4%) and Indian (28%) ethnicity groups.

Method

This study is a further retrospective cross-sectional analysis of hepatitis B vaccination status and the seroconversion rate of new entry medical students to Newcastle University Medicine (NUMed) Malaysia, a branch campus of University of Newcastle upon Tyne, UK which is located in the Iskandar Puteri district of Johor, Malaysia. The study population consisted of 119 new entry Malaysian medical students from a total of 156 new students enrolled in 2 cohorts of intake (2019-2020). Due to missing data on their occupational health screening report, 37 students were excluded from the study.

Data were collected from participants' occupational health screening reports and recorded in a pre-designed data template on Microsoft Excel. The hepatitis B vaccination status for the participants were identified from their self-reporting questionnaire with evidence of vaccination attached prior to their occupational health assessment. In this study, demographic characteristics such as age, gender and ethnicity were also recorded.

A student was considered to have seroconverted if their HBV surface antibody (anti-HBs) titer was >10 IU/L. The HBV seroconversion status was identified using an enzyme-linked immunoassay (ELISA). Both demographic and vaccination data were then matched to investigate the association between seroconversion rate and demographic characteristics such as ethnicity and gender.

The analysed data was then compared to the previous intakes from 2015-2018 in terms of hepatitis B vaccination status, overall seroconversion rate, seroconversion rate by gender and ethnicity. This analysis has now been published [1]. Comparative statistical analysis with Chi-square test was performed using Prism, where specific statistical investigations will be shown where relevant. The statistical significance threshold was P < 0.05.

Results

A total of 119 new entry medical students from 2 cohorts of intake between 2019-2020 were included in this study. Among

participants, 48 (40.34%) were male and 71 (59.66%) were female. The median age of the students was 19 years. Distribution of ethnicity demonstrated that Chinese (90, 75.63%) was the predominant race among the new entry medical students followed by the Indians (24 patients; 20.17%) and Malays (5 patients; 4.20%). The overall HBV prevalence among the participants was 0% as none of the 119 students were tested positive for hepatitis B surface antigen (HBsAg) and hepatitis B core antibody (anti-HBc). A total of 117 participants (98.32%) were vaccinated against HBV with the recommended standard 3-dose vaccination, while 2 (1.68%) were not vaccinated. Out of all vaccinated participants, only 64 (53.78%) participants seroconverted with anti-HBs titer levels >10 IU/ml, meanwhile 53 (44.54%) did not mount protective anti-HBs level.

There is no significant difference in the seroconversion rate of HBV vaccine between male participants (54.17%) and female participants (53.52%, P = 1.000) However, there is a statistically significant difference in the HBV seroconversion rate between the 3 ethnicity groups, with students of Chinese ethnicity showing the lowest seroconversion rate of 51.11%, followed by those of Indian (58.33%) and Malay ethnicity (60.00%) (P = 0.654) (Table 1)

In comparison with the previous cohorts (2015-2018, 64.64%), the trend of the overall seroconversion rate was similar. Both male (54.17%) and female (53.52%) students from the 2019-2020 intakes also demonstrated a reduction in their seroconversion rate compared to the 2015-2018 intakes (61.98% and 62.48% for males and females respectively). In terms of ethnicity, the students of Indian ethnicity in the 2019-2020 cohort showed an increment in the seroconversion rate by more than 10% but both Malay and Chinese students (60.00% and 51.11% respectively) demonstrated a reduction compared to the previous cohorts (68.25% and 69.63% respectively). (Table 2).

Discussion

Following the recent publication of our first study [4] we have now further analysed two further year cohort of our new entry students (2019-2020) to our MBBS programme to further support our initial findings for the 2015-2018 cohort.

The 2019-2020 data showed a lower response of 53% of students not having achieved seroconversion as compared to the 64 % for the 4 year cohort data results. Students of Chinese and Malay ethnic origin showed 51% and 60% seroconversion rate respectively.

This additional 2 year cohort data (2019 and 2020) further

Table 1. HBV seroconversion status according to demographic characteristics among new entry medical students at NUMed Malaysia 2019-2020.

| | Total | Vaccinated | | | |
|--------------|-------|-----------------------------|-----------------------------|----------------|---------|
| Variable | | Seroconverted (>10 IU/L) | Non-responder (<10 IU/L) | Non-vaccinated | p-value |
| Cohort | | | | | |
| Total cohort | 119 | 64 (53.78%) | 53 (44.54%) | 2 (1.68%) | |
| 2019 | 32 | 16 (50%) | 15 (46.87%) | 1 (3.13%) | |
| 2020 | 87 | 48 (55.17%) | 38 (43.68%) | 1 (1.15%) | 0.720 |
| Gender | | | | | |
| Male | 48 | 26 (54.17%) | 22 (45.83%) | 0 (0%) | |
| Female | 71 | 38 (53.52%) | 31 (43.66%) | 2 (2.82%) | 1.000 |
| Ethnicity | | | | | |
| Chinese | 90 | 46 (51.11%) | 44 (48.89%) | 0 (0%) | |
| Indian | 24 | 14 (58.33%) | 8 (33.33%) | 2 (8.34%) | |
| Malay | 5 | 3 (60.00%) | 2 (40.00%) | 0 (0%) | 0.654 |

Table 2. Comparison of HBV seroconversion rate between new entry medical students of 2015-2018 intakes and 2019-2020 intakes at NUMed Malaysia.

| Parameters | 2015-2018 | 2019-2020 | |
|---------------------------------|------------------|------------------|--|
| Received Hep B vaccination | 98.55% | 98.32% | |
| Overall seroconverted rate | 64.64% | 53.78% | |
| Seroconverted rate by gender | Male – 61.98% | Male – 54.17% | |
| | Female – 64.28% | Female – 53.52% | |
| Seroconverted rate by ethnicity | Chinese – 69.63% | Chinese – 51.11% | |
| | Indian – 47.06% | Indian – 58.33% | |
| | Malay – 68.25% | Malay – 60% | |

supports our observation that there is a low seroconversion rate to standard 3 dose hepatitis B vaccination among young entry medical students and demonstrating a significant difference among students of Malay and Chinese ethnic origin.

This poses an occupational risk to students who are nonresponders, considering that the incidence rate of hepatitis B has since increased more than five-fold from 2.26 per 100,000 in 2008 to 12.65 per 100,000 population in 2015 in Malaysia [24]. A further course or booster dose of vaccination is recommended for students who are non-responders or had not been vaccinated, as per the UK Department of Health and NUMed Occupational Health and Immunisation policy. Post-booster testing of antibody titer should be conducted to ensure seroconversion. Further research is needed to investigate whether there is a genetic basis to explain this difference.

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Ethics

The study protocol was approved by the Newcastle University Ethics Committee (UEC) and Faculty of Medical Sciences (FMS) Research Ethics Committee, Newcastle University. The data collected was kept confidential in a pseudonymised form using reference code numbers and stored in a password-protected institutional drive which will only be accessible to the researchers. Non-responders or non-vaccinated participants will be channeled to an occupational health provider for a further course or booster dose of vaccination and followed by post-booster testing of antibody titer to ensure seroconversion, as advised by UK Department of Health, Newcastle University Admission Policy and NUMed Occupational Health and Immunisation Policy.

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