

Knowledge, awareness, and vaccination compliance of hepatitis B among medical students in Riyadh's governmental universities

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ABSTRACT

Background: Hepatitis B is a blood-borne infectious liver disease caused by the Hepatitis B Virus (HBV) and it is best prevented by immunization. Due to occupational exposure, medical students have an increased risk of contracting HBV. Therefore, it is essential for all medical students to have good knowledge about HBV and to complete their HBV vaccinations. **Aims:** The aim of this study was to assess and compare HBV knowledge, awareness, and vaccination compliance among pre-clinical medical students in four universities. **Settings and Design:** A cross-sectional study was conducted in September 2018 at the College of Medicine of four governmental universities: King Saud Bin Abdulaziz University for Health Sciences, King Saud University, Princess Noura university, and Imam Mohammed bin Saud Islamic University, in Riyadh, Saudi Arabia. **Methods and Materials:** Two-hundred-sixty-three pre-clinical medical students completed a questionnaire with sections about demographics, HBV awareness, knowledge, and vaccination compliance. **Statistical analysis used:** The data was transferred to Excel and SPSS version 22 was used for statistical analysis. A significance level of $P < 0.05$ was considered statistically significant. **Results:** The overall knowledge about HBV and vaccination compliance were poor. KSU students had the highest vaccination compliance ($n = 52, 54.2\%$) and KSAU-HS the lowest ($n = 19, 23.8\%$). The most-cited reasons for noncompliance were "forgetting about the vaccine" and "busy schedule". **Conclusion:** Overall, most of the participants had poor HBV knowledge and vaccine compliance. Therefore, we recommend the implementation of pre-clinical vaccine checking and the addition of an infectious disease awareness and prevention program.

Keywords: Governmental universities, hepatitis-B, medical students' knowledge, Riyadh, vaccination compliance

Introduction

Hepatitis B is an infectious necro-inflammatory liver disease caused by the Hepatitis B virus (HBV). HBV infection can cause a wide spectrum of liver diseases ranging from acute to chronic hepatitis, which can progress to hepatocellular carcinoma or liver cirrhosis.^[1] HBV infection can be transmitted through

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blood transfusions and body fluids, such as semen, urine, and saliva. Other modes of transmission include mother-to-child transmission, sexual contact, sharing contaminated needles or syringes, and tattooing. According to the World Health Organization (WHO), the prevention of viral hepatitis transmission is possible. By 2030, WHO aims to decrease the viral hepatitis mortality rate by 65% and the number of new cases by 90%. The most effective procedures to prevent HBV transmission are the practice of standard precautions, including hand hygiene, safe disposal of sharp instruments, and wearing personal protective equipment, in addition to awareness, and vaccination.^[2,3]

In the 1980s, Saudi Arabia had an HBsAg prevalence of 8.3%, which made it one of the highest endemic areas in the world at that time. In 1989, a vaccination program for children born after October 1989 was implemented. A year later, another program was implemented that necessitated children's vaccination upon school entry. Several studies conducted after the implementation of the programs illustrated the effectiveness and importance of the hepatitis B vaccinations in prevention.^[4,5]

Health care workers (HCWs) are at a higher risk of getting infected with HBV because they are in direct contact with patients' body fluids and are at higher risk of needle-stick injuries. Being aware of HBV and being vaccinated against it might reduce the risk of infection contraction in HCW populations.^[6] An HBV infection will not only be detrimental to HCW health, but it might also affect patient's health due to the chance of iatrogenic transmission.^[7] Owing to the fact that medical students are future HCWs and are also exposed to clinical practice during their student years, their HBV knowledge and vaccination also plays an important part in decreasing these risks. In addition, these future doctors, in particular if they choose to go the primary healthcare route, will also become a source of information to their patients. As such they should have adequate knowledge about HBV and its vaccine in order to give credible advice and contribute to the promotion of community health.

Several studies have been done on the awareness of hepatitis B infections and vaccination among medical students in specific universities. Internationally, a cross-sectional study was done among clinical medical students of Ebonyi State University, Abakaliki. The study showed that the students had adequate HBV knowledge and awareness but only 29.4% of the 187 medical students were HBV vaccinated. The most common reason for non-vaccination was that it was not readily available.^[8] A study done in Woldia University, Amhara, Ethiopia, showed that 52% of the 200 health science students had good HBV knowledge but only 8% were vaccinated against it. Resource limitation was the most common reason for non-vaccination.^[9] Another study conducted in a tertiary care teaching hospital in Telangana, South India, revealed 84% of the 94 medical students knew about HBV infection but only 24% were vaccinated.^[10] While Locally, one cross-sectional study done at Unaizah College of Medicine, Qassim, found that only 21% of 321 students had good

knowledge about HBV infection and prevention and only 41.4% of the students were vaccinated against HBV.^[11] Another local study was done at King Khalid University Hospital (KKUH), Riyadh. The study revealed that 46.5% of 444 students had a high level of knowledge about HBV and vaccination. For the vaccination compliance, 93.9% took their vaccination when they entered the university. However, only 59.5% received all three doses.^[12]

While there have been some local studies done on the knowledge of HBV infection and vaccination use in medical students, none included multiple medical universities in the sample. Therefore, in this cross-sectional study, we assessed the knowledge and awareness of hepatitis B infection, prevention, and vaccination use among medical students at King Saud bin Abdulaziz University for Health Sciences (KSAU-HS), King Saud University (KSU), Princess Nourah bint Abdulrahman University (PNU), and Imam Muhammad ibn Saud Islamic University (IMIU). The primary objectives of this research were to assess and compare the level of knowledge and awareness of hepatitis B infection among pre-clinical medical students in all four universities, evaluate their state of vaccination, and investigate reasons for non-vaccination.

Subjects and Methods

The study was designed as a questionnaire-based, cross-sectional study conducted in the College of Medicine (COM) of the four governmental universities: King Saud bin Abdulaziz University for Health Sciences (KSAU-HS), King Saud University (KSU), Princess Nourah bint Abdulrahman University (PNU), and Imam Muhammad ibn Saud Islamic University (IMIU), in Riyadh, Saudi Arabia. Permission to include the students in the study was sought from the universities and was granted. Institutional review board (IRB) approval for the research was obtained from King Abdullah International Medical Research Center (KAIMRC) on the 13th of May 2018.

The study participants included last year pre-clinical medical students in the College of Medicine (COM) of the four universities (KSAU-HS, PNU, KSU, and IMIU), in Riyadh in September 2018. It did not include Stream II students of KSAU-HS, holders of bachelor's degrees in scientific fields (science, applied medical sciences, pharmacy) who study for a bachelor's degrees in medicine, or the first-year pre-clinical students of all universities. The estimated number of all last year pre-clinical medical students in the four universities was 826 students, 247 female and male students from KSAU-HS, 97 female students from PNU (a female-only university), 187 female and male students from IMIU, and 300 female and male students from KSU. An online sample size calculator (<http://www.raosoft.com/samplesize.html>) was used, with a margin of error of 5%, a confidence level of 95%, a population size of 826, and an expected prevalence of 50%; the recommended sample size was 263. Sample distribution relative to population size was

79 for KSAU-HS, 96 for KSU, 29 for PNU, and 60 for Imam university. The sampling technique used was non-probability convenience sampling.

A validated questionnaire was taken from a previous similar study conducted by Doctor Ahmad Al-Hazmi.^[13] The consent was sought from the author for the use of the questionnaire, and permission was granted. However, the questionnaire has been edited to best suit the purpose of the study and was re-validated by means of a review from an expert panel and a pilot study. The questionnaire was reviewed by hepatologists, microbiologists, and biostatisticians and then tested through a pilot study. The feedback given from the pilot study was incorporated into the final questionnaire.

The questionnaire comprised four parts. The first section addressed demographic data, such as age, gender, year, university, and grade point average (GPA). The second section focused on vaccination compliance, which we defined as having three doses of the vaccine or a booster shot to be fully immunized depending on the participant's immunity status. This section included questions on the vaccination status of the participant, doses taken, and reasons for the non-compliance with the recommended doses. The third part included multiple-choice questions that measured students' general knowledge about HBV.

Microsoft Excel 2017 was used for data entry, and Statistical Package for Social Sciences program version 22 (SPSS Inc., Chicago, IL) was used for data analysis. Categorical variables obtained from the questionnaire were described as frequencies and percentages, and the Chi-square test was used in describing comparative variables. *P* values < 0.05 were declared as statistically significant.

Results

Table 1 shows the demographic data of the sample, with the number of students according to their gender, GPA, and university. The total number of students was 265, with females as the dominant gender ($n = 145, 54.7\%$), and the total mean age was 20.95 ± 0.99 years. Ninety-six (36.2%) were studying in KSU, 80 (30.2%) in KSAU-HS, 95 (22.3) in IMIU, and 30 (11.3%) in PNU. Most of the students had a GPA above 4.5 ($n = 115, 48.3\%$), 91 (38.2%) had a GPA between 4.01 and 4.5, 29 students had a GPA between 3.51 and 4.00, and three students had a GPA less than 3.5 (1.3%).

The HBV vaccination status of the students is presented in Table 2. About half of them ($n = 156, 59.5\%$) were immunized due to hepatitis B vaccination, 11 students (4.2%) were immunized due to a previous infection, 21 (8%) were not immunized, two students were chronically infected, and 72 (27.5%) did not know about their vaccination status. A total of 27 (10.2%) students received the first dose of HBV vaccine, 34 (12.8%) received the second dose, 95 (35.8%) completed all the three doses, five (1.9%) received booster shots, and 25 (9.4%) did not receive any doses. The most common reasons for non-vaccination were busy

Table 1: Demographic characteristics of the study sample (n-265)

Variables	Frequency (%)
Gender	
Females	145 (54.7)
Males	120 (45.3)
Age (Mean, SD*)	20.95, 0.991
University	
KSAU-HS	80 (30.2)
KSU	96 (36.2)
IMIU	59 (22.3)
PNU	30 (11.3)
GPA	
<3.5	3 (1.3)
3.51-4.00	29 (12.2)
4.01-4.5	91 (38.2)
>4.5	115 (48.3)

*Standard deviation

Table 2: HBV status and vaccination compliance

Variables	Frequency (%)
HBV Status	
Immune due to a previous infection	11 (4.2)
Immune due to hepatitis B vaccination	156 (59.5)
Susceptible "not immune"	21 (8.0)
Chronically infected	2 (0.8)
Don't know	72 (27.5)
Number of HBV Vaccine Doses	
1 Dose	27 (10.2)
2 Doses	34 (12.8)
3 Doses (All doses)	95 (35.8)
More than 3 doses	5 (1.9)
None	25 (9.4)
Unknown	79 (29.8)
Reasons for not taking full-doses (n=125)*	
HBV vaccine is ineffective	2 (1.6)
Difficulty in accessing the vaccination site	14 (11.2)
Don't know where to be vaccinated	19 (15.2)
Worries about side effects	9 (7.2)
Busy Schedule	38 (30.4)
Forgetting about the vaccine	38 (30.4)
Other	26 (23.2)

*Each subject was able to choose more than one answer.

schedules and forgetting about the vaccine, and both reasons were equal in frequency ($n = 38, 30.4\%$).

Table 3 shows the vaccination compliance among different universities. The vaccination compliance of the students had a significant relationship with their universities ($p < 0.001$). Among 265 students, 100 students were immunized with all vaccination doses. KSU students had higher vaccination compliance, with approximately half of the students completing all three doses (54.2%), followed by PNU ($n = 11, 36.7\%$), IMIU ($n = 18, 30.5\%$), and KSAU-HS ($n = 19, 23.8\%$) respectively.

Students' correct answers on knowledge about HBV distributed across universities are shown in Table 4. Less than 50% of the students knew the HBV incubation period ($n = 46, 17.4\%$), HBV site of replication ($n = 12, 4.5\%$), HBsAg persistence

duration in chronically infected patients (n = 63, 23.8%), the highly infectious or contagious patients (n = 88, 33.2%), whether or not HBV is infectious outside the body (n = 86, 33.9%), whether or not HBV is more transmissible than HIV (n = 104, 40%), and that HBV is resistant to alcohol (n = 50, 19.7%). One-hundred-twenty-six (48.6%) understood that infected mothers pass the virus perinatally to 70–90% of their offspring, whereas only 85 (33.2%) knew that chronic infection would develop in almost all children infected perinatally. One-hundred-sixty-five students (61.8%) knew that they are at higher risk of contracting and spreading HBV (n = 165, 61.8%), and 204 students (78.5%) understood that health care providers should receive the HBV vaccine. Furthermore, 146 (56.6%) believed that high-risk populations should be screened. A significant relationship was found between students' knowledge and their universities.

Discussion

The overall compliance with the HBV vaccine among all the universities was low. This finding was similar to a study done in India, which showed that most of the students had low compliance with the immunization.^[14] However, among the universities, KSU had the highest vaccination compliance (54.2%), and it was reported from the students that batch leaders were responsible for following up with the students to ensure that they have completed all doses before they progress into the clinical phase. On the other hand, KSAU-HS had the

lowest compliance (23.8%), and that might be attributed to the lack of a follow-up system. It is important to mention that there were immunization status check-ups for the titers before and after receiving the first dose, but not to follow up with the students until they complete all the doses. Among all the non-compliance reasons, the most documented ones were busy schedules and forgetting about the vaccine. This is different to some other studies that showed the most common reasons for non-compliance is lack of resources.^[8,9] This suggests that student factors might affect the vaccination compliance.

Adequate knowledge about HBV and its modes of transmission among medical students is highly recommended due to their susceptibility to contracting the infection. The overall knowledge about HBV across the four universities was also poor. Based on the questionnaire responses, (33.9%) of the students knew that HBV is infectious outside the body, and (40.0%) knew that it is more infectious than HIV. These findings were similar to that of a study done at Aljouf University, where the majority of the students did not know that HBV survives outside the body, and if it is more infectious than HIV.^[13] Whereas in another study done in a medical college in Tirunelveli, (93.5%) of the students knew that HBV is more infectious than HIV and had a good HBV knowledge overall.^[15] Despite the lack of HBV knowledge among students in this study, (61.8%) agreed that medical students had a higher risk of contracting HBV, and (78.5%) agreed that healthcare professionals should receive the HBV vaccine. A similar result was observed in a study done in a Syrian private university and in a study done in Qassim University, in which students had poor knowledge about HBV but believed that medical students had a higher risk of infection contraction.^[11,16] It also revealed that male students had a higher level of knowledge about HBV transmission when compared to female students. These findings are not in line with a study conducted at King Khalid University Hospital (KKUH) in Riyadh, Saudi Arabia, in which females had a higher level of knowledge than males.^[12] Similarly, another study was done across Saudi Arabia to assess HBV knowledge among dental students and revealed that female

Table 3: Vaccination compliance among different universities

University	Non-compliant n, (%)	Compliant n, (%)	P
KSAU-HS	61 (76.2)	19 (23.8)	<0.01*
KSU	44 (45.8)	52 (54.2)	
IMIU	41 (69.5)	18 (30.5)	
PNU	19 (63.3)	11 (36.7)	
Total	165 (62.3)	100 (37.7)	

*Chi-square was used

Table 4: General Knowledge of students regarding HBV

Hepatitis B Knowledge questions	Correct answers n, (%)	Universities				P
		KSAU-HS n=80	KSU n=96	IMIU n=59	PNU n=30	
Incubation period of HBV	46 (17.4)	11 (13.8)	14 (14.6)	18 (30.5)	3 (10.0)	0.02*
Site of replication of HBV	12 (4.5)	4 (5.0)	3 (3.1)	2 (3.4)	3 (10.0)	0.43
Chronic infection persistence duration	63 (23.8)	10 (12.5)	27 (28.1)	26 (44.1)	0 (0.0)	<0.001*
Highly infectious/contagious patients	88 (33.2)	17 (21.3)	32 (33.3)	34 (57.6)	5 (16.7)	<0.001*
Medical students are at higher risk of contracting/spreading HBV	162 (61.8)	49 (62.0)	72 (76.6)	21 (35.6)	20 (66.7)	<0.001*
HBV is almost 100 times more transmissible than HIV	104 (40.0)	27 (34.2)	41 (43.6)	25 (43.9)	11 (36.7)	0.55
HBV is not infectious outside the body	86 (33.9)	33 (42.9)	26 (28.9)	12 (21.1)	15 (50.0)	0.01*
HBV is resistant to alcohol and some detergents	50 (19.7)	10 (12.7)	18 (19.8)	12 (21.4)	10 (35.7)	0.07
Infected mothers pass the virus perinatally to 70-90% of their offspring	126 (48.6)	34 (43.0)	44 (46.8)	35 (61.4)	13 (44.8)	0.17
Chronic infection will develop in almost all children infected perinatally	85 (33.2)	24 (30.4)	31 (34.1)	21 (37.5)	9 (30.0)	0.82
High-risk populations should not be screened for HBV infection	146 (56.6)	52 (66.7)	48 (51.1)	33 (57.9)	13 (44.8)	0.11
Healthcare professionals should receive HBV vaccine	204 (78.5)	67 (84.8)	77 (81.9)	42 (73.7)	18 (60.0)	0.03*

*Chi square or Fishers exact test as applicable. *Column percentages are reported

students had slightly better knowledge than male students.^[17] Furthermore, this study showed that IMIU students had better knowledge about HBV modes of transmission when compared to other universities, which could be attributed to the early introduction of virology curriculum to the pre-clinical medical students from whom the data was collected.

The study showed various levels of HBV knowledge and vaccination compliance among the students of Riyadh's governmental universities. This might be attributed to the differences in teaching methods and curricula delivered to the pre-clinical medical students in those universities. In all the universities, there were foundation sciences courses which included some materials on the common infectious diseases accounting for ten credit hours, but there were slight differences in curricula among the universities. In KSU, they had three credit hours of pathology in the pre-clinical phase, whereas KSAU-HS curriculum had four credit hours on principles of diseases in the second preparatory year.^[18-20] In IMIU, students had a course of infectious diseases and their prevention early in the first preparatory year, then a total of 11 credit hours of pathology in the subsequent years.^[21] Lastly, in PNU, there is only the foundation sciences course with no additional courses of pathology or infectious diseases in the pre-clinical phase.^[22]

Based on the results of this study, we recommend emphasizing to the students the importance of HBV vaccine compliance by the addition of educational programs about infectious diseases and their prevention to make them aware of the consequences of HBV infection, and thus increases their vaccination compliance. Additionally, implementing immunization status checks, similar to the concept done in KSU, for students before they proceed into the clinical years might improve vaccination compliance.

This study had some limitations. First, the sample was collected through convenience sampling, and thus might not accurately represent the population. Second, the study utilized a self-report questionnaire that depended on the student's ability to recall, which might have introduced a response bias.

Conclusion

In conclusion, pre-clinical medical students in Riyadh's governmental universities had poor knowledge about HBV, its transmission, and vaccination, with IMIU having the highest general and transmission knowledge about HBV and this disparity between the universities is possibly due to the differing curriculum hours given to pathology courses. Additionally, vaccination compliance was poor, with KSU having the highest compliance rate, which is perhaps to their immunization follow-up system. To increase vaccination compliance, we recommend the addition of educational programs about infectious disease and prevention and the implementation of immunization status checks for students before they progress into the clinical years.

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Declaration of patient consent

Before the survey could be answered, each study participant had to fill an informed consent form where the study's purpose was elucidated, and it was stated that their contribution to the study would be anonymous and voluntary. It was distributed to them along with questionnaire; thus, the consent was taken from all participants.

Key Messages

- Medical students are at a high risk of contracting HBV infection due to occupational exposure.
- Most medical students had poor knowledge about HBV.
- Overall, all students had poor vaccine compliance with KSU having the highest (54.2%)

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Conflicts of interest

There are no conflicts of interest.

References

1. Manne V, Gochanour E, Kowdley KV. Current perspectives into the evaluation and management of hepatitis B: A review. *Hepatobiliary Surg Nutr* 2019;8:361-9.
2. Cho EJ, Kim SE, Suk KT, An J, Jeong SW, Chung WJ, *et al.* Current status and strategies for hepatitis B control in Korea. *Clin Mol Hepatol* 2017;23:196-204.
3. Schillie S, Vellozzi C, Reingold A, Harris A, Haber P, Ward JW, *et al.* Prevention of hepatitis B virus infection in the United States: Recommendations of the advisory committee on immunization practices. *MMWR Recomm Rep* 2018;67:1-31.
4. Abdo AA, Sanai FM. Viral hepatitis in Saudi Arabia: An unfinished story. *Saudi Med J* 2015;36:785-6.
5. Mahmood S, Shah KU, Khan TM. Immune persistence after infant hepatitis-B vaccination: A systematic review and meta-analysis. *Sci Rep* 2018;8.
6. Lewis JD, Enfield KB, Sifri CD. Hepatitis B in healthcare workers: Transmission events and guidance for management. *World J Hepatol* 2015;7:488-97.
7. Stepień M, Zakrzewska K, Rosińska M. Significant proportion of acute hepatitis B in Poland in 2010-2014 attributed to hospital transmission: Combining surveillance and public registries data. *BMC Infect Dis* 2018;18:164.
8. Eze NC, Egba EC, Ogbanna JE, Nwamini SN, Nweke PU. Knowledge, attitude and uptake of hepatitis B vaccine among clinical medical students of a tertiary institution in

- Southeast Nigeria. *Asian J Immunol* 2020;4:31-6.
9. Gebremeskel T, Beshah T, Tesfaye M, Beletew B, Mengesha A, Getie A. Assessment of knowledge and practice on hepatitis B infection prevention and associated factors among health science students in Woldia University, Northeast Ethiopia. *Adv Prev Med* 2020;2020:1-6. doi: 10.1155/2020/9421964.
 10. Kandi V, Katoch A, Miniskar H, Jaripiti S, RV SS, Burugu HR, *et al.* Adequate knowledge and low vaccination rates of hepatitis B virus infection among students, medical, and paramedical persons in a tertiary care teaching hospital. *Cureus* 2020;12:e9121.
 11. Al Wutayd O, AlRehaili A, AlSafrani K, Abalkhail A, AlEidi SM. Current knowledge, attitudes, and practice of medical students regarding the risk of hepatitis B virus infection and control measures at Qassim university. *Open Access Maced J Med Sci* 2019;7:435-9.
 12. Ghomraoui FA, Alfaqeeh FA, Algadheeb AS, Al-alsheikh AS, Al-Hamoudi WK, Alswat KA. Medical students' awareness of and compliance with the hepatitis B vaccine in a tertiary care academic hospital: An epidemiological study. *J Infect Public Health* 2016;9:60-5.
 13. Al-Hazmi A. Knowledge, attitudes, and practice of medical students regarding occupational risks of hepatitis B virus in College of Medicine, Aljouf University. *Ann Med Health Sci Res* 2015;9:60-5.
 14. Rathi A, Kumar V, Majhi J, Jain S, Lal P, Singh S. Assessment of knowledge, attitude, and practices toward prevention of hepatitis B infection among medical students in a high-risk setting of a newly established medical institution. *J Lab Physicians* 2018;10:374-9.
 15. Velvzhi G, Senthil K, Sucilathangam G, Revathy C. Knowledge and attitude of medical students towards hepatitis B infection. *Int J Curr Microbiol Appl Sci* 2016;5:570-6.
 16. Maina AN, Bii LC. Factors affecting HBV vaccination in a medical training college in Kenya: A mixed methods study. *BMC Public Health* 2020;20:48.
 17. Saquib S, Ibrahim W, Othman A, Assiri M, Al-Shari H, Al-Qarni A. Exploring the knowledge, attitude and practice regarding hepatitis b infection among dental students in saudi arabia: A cross-sectional study. *Open Access Maced J Med Sci* 2019;7:805-9.
 18. King Saud University. Academic Plan College of Medicine [Internet]. Available from: <https://medicine.ksu.edu.sa/en/node/2224>. [Last cited on 2020 Apr 13].
 19. King Saud bin Abdulaziz University for Health Sciences. University Pre-Professional Program Study Plan for Medicine Track [Internet]. Available from: <https://coshp.ksau-hs.edu.sa/PDFs/StudyPlans/COM.pdf>. [Last cited on 2020 Apr 13].
 20. King Saud bin Abdulaziz University for Health Sciences. Phas II [Internet]. Available from: <https://conf.ksau-hs.edu.sa/academics/medical-program/phase-ii?server=4>. [Last cited on 2020 Apr 13].
 21. Imam Muhammad ibn Saud Islamic University. Study program [Internet]. 2018. Available from: <https://units.imamu.edu.sa/colleges/Medicine/studyprograms/Pages/default.aspx>. [Last cited on 2020 Sep 26].
 22. Princess Nourah Bint Abdulrahman University. Study plan for College of Medicine [Internet]. Available from: [https://www.pnu.edu.sa/ar/Deanship/Registration/Documents/9102019/plans College of Medicine1437.PDF](https://www.pnu.edu.sa/ar/Deanship/Registration/Documents/9102019/plans%20College%20of%20Medicine1437.PDF). [Last cited on 2020 Apr 13].