



Note

Antibiotic literacy among Japanese medical students[☆]

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ABSTRACT

Antimicrobial resistance (AMR) is an urgent global issue. After the AMR action plan was introduced in 2016, a study on antibiotic literacy (i.e., awareness, knowledge, and attitude relating to antimicrobial use) among clinicians and lay people was conducted in Japan. However, no studies have hitherto targeted medical students who are expected to have a high level of antibiotic literacy. The present study was conducted between September 2019 and February 2020, enrolling undergraduate students at Okayama University Medical School. We collected data using a paper-based questionnaire form with 11 questions about antibiotic literacy. The response rate was 93.8% (661/705 students). Overall, 92.6% of the students knew that antibiotics inhibit the growth of bacteria. Student reporting that antibiotics could treat the common cold accounted for 77.0% (Year 1), 50.9% (Year 2), 48.2% (Year 3), 49.1% (Year 4), 23.8% (Year 5), and 26.2% (Year 6). Only 43 (6.5%) had heard about the AMR action plan. The study data suggested that medical students' level of literacy on antimicrobial use should be further enhanced to address AMR and promote antimicrobial stewardship.

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Antimicrobial resistance (AMR) has become an emerging public health concern worldwide. Following the Global Action Plan on Antimicrobial Resistance [1], an AMR action plan was launched in Japan in 2016 [2], aiming to reduce the overall use of antimicrobials by 33% over the 2013–2020 period. To this end, wise antimicrobial use should be highly recommended in every medical situation. Although education plays an essential part in antimicrobial stewardship [3], the contents of proper antimicrobial use has not been well incorporated into the curricula of medical universities. We hypothesize that Japanese medical students might have been

provided fewer opportunities of learning about antimicrobial use than those required in clinical settings. Therefore, most of them graduate from the medical schools without the “antibiotic literacy.”

To date, several surveys on the antimicrobial awareness have been conducted in Japan, focusing on pediatricians [4,5] and physicians [6,7], but not targeting medical students. In this study, we aimed to investigate the current status of antibiotic literacy among Japanese medical students.

We carried out this study with undergraduate students of Okayama University Medical School between September 2019 and February 2020. Medical students in our university take lectures on bacteriology, virology, and infectious diseases during 3rd grade year. We used a paper-based self-administered questionnaire consisting of 11 questions related to antibiotic literacy. Rates were calculated on the basis of the numbers of responses as denominators. The study protocol was accepted by Institutional Review Board of Okayama University Hospital (No. 1906-039). Informed consent was obtained from all of the students.

The response rate was 93.8% (661/705 medical students). Table 1 shows that almost all students (659, 99.7%) reported knowing the term “antibiotics”. Regarding the benefits of antibiotics, 92.6% of

Abbreviations: AMR, antimicrobial resistance.

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Table 1
Frequencies and rates of students, by answer option and year of medical education.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
Number of students	114	117	122	126	109	117	705
Number (rate) of responses	113 (99.1)	114 (97.4)	110 (90.2)	116 (92.1)	105 (96.3)	103 (88.0)	661 (93.8)
Do you know the term “antibiotics?” [YES]	113 (100)	114 (100)	109 (99.1)	116 (100)	104 (99.0)	103 (100)	659 (99.7)
What are the benefits of antibiotics? ^{a,b}							
1) antipyretic 2) pain relief 3) antitussive 4) inhibit bacterial growth	102 (91.1)	102 (93.6)	105 (96.3)	108 (95.6)	102 (97.1)	93 (94.9)	612 (92.6)
When visiting a doctor for the common cold, do you expect him or her to prescribe antibiotics? [YES]	25 (22.3)	20 (17.5)	18 (16.8)	25 (21.6)	12 (11.7)	16 (15.5)	116 (17.5)
Have you ever thought of using unprescribed antibiotics? [YES]	33 (29.7)	33 (28.9)	42 (38.5)	55 (47.4)	40 (38.1)	49 (47.6)	252 (38.1)
Do you take up all the antibiotics prescribed at clinics? [YES]	56 (50.5)	67 (59.3)	67 (61.5)	69 (61.1)	73 (70.2)	55 (53.4)	387 (58.5)
How do you deal with left-over antibiotics? ^a							
1) Keeping them for use when needed	36 (35.6)	34 (34.9)	36 (37.9)	42 (41.2)	23 (25.8)	38 (40.4)	209 (31.6)
2) Taking them when falling ill	16 (15.8)	19 (19.0)	20 (21.1)	23 (22.5)	21 (23.6)	21 (22.3)	120 (20.3)
3) Giving them to others	0	0	0	0	0	1	1 (0.2)
4) Throwing them away	42 (37.8)	42 (42.0)	35 (36.8)	31 (30.4)	37 (41.6)	30 (31.9)	217 (36.7)
Have you ever taken antibiotics given by your family members or acquaintances? [YES]	38 (33.9)	41 (36.0)	39 (35.5)	41 (35.3)	40 (38.1)	36 (35.0)	235 (35.6)
Do you know about the “AMR action plan?” [YES]	1 (0.9)	5 (4.4)	14 (12.8)	6 (5.2)	4 (3.8)	13 (12.7)	43 (6.5)

Rates (%) are denoted in the parentheses.

^a Multiple-choice question.

^b For this question, only the numbers of students who selected option 4 are presented in this table.

the students were aware that antibiotics help inhibiting bacterial growth. Additionally, 30.0% of all medical students answered that antibiotics were effective in treating diseases caused by viruses (64.6%, 45.6%, 27.3%, 19.8%, 11.4%, and 7.8% of students from Year 1 to Year 6, respectively). In particular, 46.4% of all students misunderstood that antibiotics could be used as an option of treatment for the common cold (77.0%, 50.9%, 48.2%, 49.1%, 23.8%, and 26.2% of students from Year 1 to Year 6). Students who thought that influenza could be treated with antibiotics accounted for 26.5% (60.2%, 32.5%, 25.5%, 17.2%, 11.4%, and 9.7% of students from Year 1 to Year 6) (Fig. 1).

Approximately 20% of the medical students expected physicians to prescribe antibiotics to them to treat the common cold. Nearly 40% of them responded that they had thought of taking

unprescribed antibiotics. Around 60% of all students reported taking up all the antibiotics they were prescribed. Regarding how to deal with the left-over antibiotics, 31.6% of the students said they kept those medications because they might need them later, while 36.7% chose to throw them away. One-fifth of the students used antibiotics when falling ill, and nearly one-third used these medications given to them by their family members or acquaintances. Nearly no one gave the remaining antibiotics to other people. Forty-three students (6.5%) had heard about the “AMR action plan”, which was launched and promoted by the Japanese government in 2016 (Table 1).

Although this study was conducted in only one setting (Okayama University), it may be the first attempt to uncover Japanese medical students' antibiotic literacy. Antibiotics are the drugs possibly most

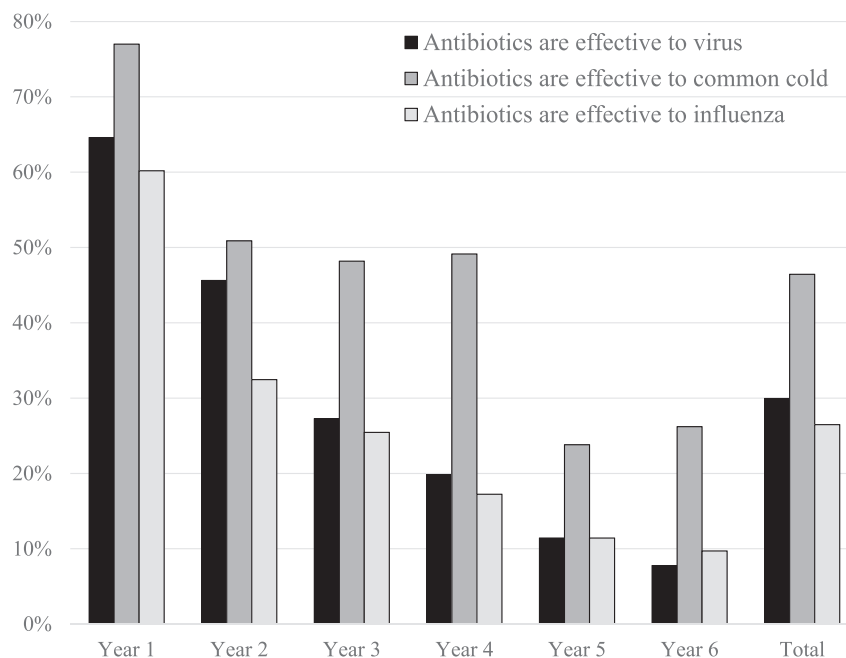


Fig. 1. Rates of medical students misunderstanding that antibiotics could treat viral diseases, by year of medical education.

commonly prescribed by young doctors without sufficient instructions from senior doctors or specialists. The attitude of professionalism is mostly developed in the very beginning of training, and thus, professional education in antimicrobial prescribing should involve not only postgraduates but undergraduates [8]. In fact, the Japanese Ministry of Education, Culture, Sports, Science and Technology stresses an importance of appropriate use of antimicrobials in the Medical Education Model Core Curriculum [9]. According to a cross-sectional, web-based survey with European final-year medical students, more than half of the respondents expressed the need for more opportunities of education in antibiotic use [10]. The Global Action Plan underlined the values of education and training [1], and the faculty members should further provide such a learning opportunity with a clear attainment target.

Our study findings show that more than 90% of medical students knew that antimicrobials can inhibit bacterial growth. However, relatively high rates of students answered that the antibiotics could be used to treat viral diseases, such as the common cold and influenza. Notably, almost half of all students and a quarter of final-year students were found to have a false understanding that the antibiotics helped treat the common cold. In Japan, the overuse of antibiotics for acute respiratory infections remains in every clinical situation [11,12], indicating the importance of undergraduate education in antibiotic literacy. The AMR action plan was little known by medical students (6.5%), though it has been carried out for more than 3 years [2]. A previous study showed that 44% of physicians had never heard of this plan [7]. These findings also suggest that university educators should further familiarize them with the national policy on AMR countermeasures.

There have existed several approaches to enhancing medical students' antibiotic literacy, one of which is providing more learning opportunities for students and integrating more contents related to antibiotic use into the university curriculum. A recent survey showed that medical schools in the United Kingdom allocated a median of 17.8 class hours to antimicrobial stewardship-related contents [13]. Despite the unavailability of related data in the entire Japan, those of this study suggest that Japanese medical students lack opportunities to learn about antimicrobial use. Additionally, teaching methods should be devised to them effectively. A prospective controlled intervention study demonstrated that e-learning and internet-based learning contribute to improving medical students' long-term antimicrobial prescribing behavior [14]. Even though students' antibiotic literacy is improved, it is worth noting that the gaps between knowledge and antibiotic prescribing still exist in clinical settings [15]. Therefore, a continuous education scheme for under- and post-graduates is absolutely imperative. The poor understanding among 1st grade students may reflect common knowledge and basic attitude of high-school graduates. In this era of AMR, a basic education that enhances the antibiotic literacy in teenagers is warranted as well.

The strength of our study lies in the high response rate of respondents, ranging from 88.0% to 99.1%. However, the study has several limitations that need to be addressed. First, the study was conducted on medical students at only one university. Second, the cross-sectional nature of the study would lead to information bias. Finally, we used a self-administered questionnaire to collect data, and therefore, undergraduate students' self-reports might affect the accuracy of the collected data.

In summary, medical students at Okayama University Medical School appeared to have inadequate antibiotic literacy, and therefore, they should be provided with additional education in antimicrobial stewardship during the undergraduate period. We suggest that a further comprehensive survey with a larger sample size is required to assess medical students' awareness, preparedness, and attitude toward antimicrobial stewardship.

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Declaration of Competing Interest

None to report.

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