ABSTRACT

We conducted a cross-sectional study using a structured questionnaire in three major Japanese cities from August 03 to 24, 2020 to clarify the current situation of health checkups, including vaccine-preventable diseases (VPDs), among international students at Japanese universities (JUs) and Japanese language schools (JLSs). The total response rate was 36%: 69 JUs (31%) and 137 JLSs (39%). Over 90% of these institutions conducted chest X-ray screening for tuberculosis among their students, whereas only 24.6% of JUs and 15.3% of JLSs performed general blood tests for health screening. Only 14.5% and 2.2% of the JUs and JLSs, respectively, required the submission of vaccination or antibody certificates for admission. The difficulties in requesting vaccination certificates from international students are due to poor legal requirements and concerns about rising costs for schools. From 2017 to 2019, 183 international students, principally from East Asia and Southeast Asia, were infected with VPDs, particularly tuberculosis (99 cases) and varicella (71 cases). Whereas the majority of Japanese educational institutions screen international students for tuberculosis (TB) at admission, only a few institutions request proof of antibody testing relating to other VPDs or of vaccination. These findings will help formulate guidelines for checkups related to vaccination for international students required to protect the educational institutions in Japan from the spread of VPDs. In addition, providing multifaceted social support, including financial compensation for institutions and enhanced international students’ health issues, would be helpful.

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Introduction

The number of international students in Japan had been continuously increasing every year until the temporary restrictions on entry into the country due to the coronavirus (COVID-19) pandemic in 2020. It was breaking a record of approximately 310,000 as of May 2019.1 It was possible owing to the “300,000 International Students Plan” launched by the Japanese government in 2008.2 Of the international students, 93.6% were from Asian countries. China, Vietnam, and Nepal contributed to the major population and accounted for 71.8% of the international students. Japanese universities (JUs) and Japanese language schools (JLSs) are two main educational institutions to accept international students. JLSs provide Japanese language education to non-native Japanese speakers to prepare them to enter the institutions such as universities and professional training colleges, or to work for a Japanese company. The maximum period of enrollment at JLSs is usually two years. JUs are four-year undergraduates. Major populations in JLSs are in their early 20s because they enroll in schools to prepare for higher education after graduating from high school in their home countries.

JUs are under the jurisdiction of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), and they maintain and promote students’ health under the School Health and Safety Act.3,4 It stipulates that an annual health checkup must be conducted by June 30, and tuberculosis (TB) screening by chest X-ray must be included for university attendance in the first year. However, the MEXT does not make specific provisions for antibody tests for vaccine-preventable diseases (VPDs), nor mandate proof of vaccination before admission. Contrarily, JLSs are licensed by the Ministry of Justice, and must follow the “Public Notice Standards for Japanese Language Institutions” guideline to maintain their designation.5 This guideline requires JLSs to conduct a health checkup once a year. However, it does not specify the content
of health checkups, nor stipulate the requirements for vaccine certificates for students.

There have been reports on VPDs among foreigners in Japan. Cluster infections of varicella among foreigners were reported between 2012 and 2016. Rubella outbreaks occurred recently among unvaccinated populations in Japan, and two international students were diagnosed with this disease in 2019, which resulted in cluster infections in their school. Furthermore, there was a report of an outbreak of rubella among foreign trainees undergoing vocational training in 2016. In this case, starting with a Vietnamese trainee, 13 foreign trainees from the same group contracted rubella. Japan has been verified as a country achieving measles elimination; however, several outbreaks caused by travelers from Southeast Asian countries have been reported. In addition, despite a decrease in the number of recently noted TB cases, the incidence of TB is increasing among foreign-born residents in Japan, thereby accounting for 10.7% of the cases in 2019.

The American College Health Association (ACHA) in the United States of America has developed guidelines for immunization recommendations and TB screening for college students. Likewise, the European Union and European Economic Area, North America, and Australia have VPD guideline recommendations for immigrants. TB screening as a health checkup has already been implemented in Japan. However, there are no guidelines for school entry and pre-entry health checkups for VPDs among international students, thus leaving it to the discretion of individual educational institutions.

Literature on international students’ health screening and VPDs is scarce in Japan. In this study, we aimed to clarify the process of health screening for international students in Japanese educational institutions, including JUs and JLSs, with regard to VPDs.

Materials & methods

Study design and participants

We conducted a cross-sectional survey using structured questionnaires for JUs and JLSs from August 03, 2020 to August 24, 2020. We identified the public and private universities in Japan from the website of the MEXT and JLSs designated by the Ministry of Justice, which were eligible to provide student visas (Immigration Services Agency of Japan). We sent the paper-based questionnaires to these 222 JUs and 351 JLSs in Tokyo, Osaka, and Fukuoka, which have large numbers of international students, i.e., 573 institutions. We sent the paper-based questionnaires to the general affairs office or the school’s International center. We did not survey about a specific school year.

Data collection

We conducted a structured questionnaire survey to inquire about the content of the medical checkups at admission, vaccination certificates prior to admission, reasons behind difficulties in requesting vaccine certificates, and recent VPD cases among international students. The questionnaires were developed following discussion with two infectious disease doctors who had been involved in the care of international patients and two nurses of the International Care Center at the National Center for Global Health and Medicine (NCGM), Tokyo, Japan.

Statistical analysis

We performed Fisher’s exact test to compare the JUs and JLSs. Statistical significance was set at P < .05. The primary outcome is understanding the health screening system for international students from “JUs” and “JLSs,” including requirements for VPDs’ screening and certificates. The secondary outcomes included VPD cases across educational institutions from 2017 to 2019. Statistical analysis was performed using the EZR software version 1.53 (Saitama Medical Center, Jichi Medical University, Japan).

Ethics

The NCGM Ethics Review Board approved this study (NCGM-G-003515-00). Informed consent was obtained from all educational institutions for their participation.

Results

The total response rate was 36%: 69 JUs (31%) and 137 JLSs (39%). We identified a significant difference between JUs and JLSs (P < .01) in terms of health checkups, with 84.1% (95% confidence interval [CI] 73.3, 91.8) and 54.0% (95% CI 45.3, 62.6) of the JUs and JLSs conducting regular medical examinations within the first month after admission, respectively (Table 1). Moreover, we identified a significant difference between both groups in conducting regular medical checkups for short-term students for >3 months but <1 year (JUs: 62.8% [95% CI 54.1, 70.9] and JLSs: 37.7% [95% CI 26.3, 50.2], [P < .01]). Over 90% of the JUs and JLSs responded that chest X-rays were included in the health checkups, whereas only 24.6% and 15.3% of the JUs and JLSs, respectively, indicated that they included a general blood test for their health checkups.

Data regarding the requirements for vaccination certificate are summarized in Table 2. Approximately 14.5% (95% CI 7.2, 25.0) and 2.2% (95% CI 0.5, 6.3) of the JUs and JLSs, respectively, required the submission of vaccination or antibody certificates for admission. On the other hand, 58.0% (95% CI 45.5, 69.8) and 85.4% (95% CI 78.4, 90.8) of the JUs and JLSs, respectively, responded that they did not require vaccination or antibody certificates. In response to the question, “Are you considering to oblige students to submit a vaccination certificate in the future?” 53.6% and 38.0% of the JUs and JLSs, respectively, did not have a plan; in contrast, 13.0% and 44.5% of JUs and JLSs, respectively, responded, “We would like to consider certificates” and 29.0% and 10.2% of the JUs and JLSs, respectively, did not answer. We observed a significant difference between the groups in response to the question (P < .01).

We permitted multiple answers for the question, “Why is it difficult to require students to submit vaccination or antibody
Table 1. Regular health checkups for international students across Japanese universities and Japanese language schools.

| Answer items | University (N=69) | Language school (N=137) | P-value |
|--------------|------------------|-------------------------|---------|
|              | n | % | 95% CI | n | % | 95% CI |  |
| Location of educational institutions | | | | | | | |
| Tokyo        | 42 | 60.9 | 48.4-72.4 | 93 | 67.9 | 59.4-75.6 | .558 |
| Osaka        | 18 | 26.1 | 16.3-38.1 | 31 | 22.6 | 15.9-30.6 | |
| Fukuoka      | 9  | 13.0 | 6.1-23.3 | 13  | 9.5  | 5.1-15.7 | |
| Do you have a medical checkup within a month of admission? | | | | | | | .01 |
| yes          | 58 | 84.1 | 73.9-91.8 | 74 | 54.0 | 45.3-62.6 | |
| no           | 9  | 13.0 | 6.1-23.3 | 62 | 45.3 | 36.7-54.0 | |
| not answered | 2  | 2.9  | 0.4-10.1 | 1  | 0.7  | 0.0-4.0 | |
| Do you offer a medical checkup to short-term (3 months to less than 1 year) international students? | | | | | | | .01 |
| yes          | 26 | 37.7 | 26.3-50.2 | 86 | 62.8 | 54.1-70.9 | |
| no           | 29 | 42.0 | 30.2-54.5 | 22 | 16.1 | 10.3-23.3 | |
| none of the above | 8 | 11.6 | 5.1-21.6 | 25 | 18.2 | 12.2-25.7 | |
| not answered | 6  | 8.7  | 3.3-1.8 | 4  | 2.9  | 0.8-7.3 | |
| Does the medical checkup include a chest X-ray? | | | | | | | .098 |
| yes          | 65 | 94.2 | 85.9-98.4 | 127 | 92.7 | 87.0-96.4 | |
| no           | 5  | 0.0  | 0.5-5.2 | 7  | 5.1  | 2.1-10.2 | |
| not answered | 4  | 5.8  | 1.6-14.2 | 3  | 2.2  | 0.5-6.3 | |
| Does the medical checkup include a blood test? | | | | | | | .088 |
| yes          | 17 | 24.6 | 15.1-36.5 | 21 | 15.3 | 9.7-22.5 | |
| no           | 48 | 69.6 | 57.3-80.1 | 112 | 81.8 | 74.3-87.8 | |
| not answered | 4  | 5.8  | 1.6-14.2 | 4  | 2.9  | 0.8-7.3 | |

Abbreviations: CI, confidence interval
Statistical analyses were performed with the EZR software version 1.53

Table 2. Requirement for vaccination certificates in Japanese universities and Japanese language schools.

| Answer items | University (N=69) | Language school (N=137) | P-value |
|--------------|------------------|-------------------------|---------|
|              | n | % | 95% CI | n | % | 95% CI |  |
| Do you require student submission of vaccination or antibody certificate for admission? | | | | | | | .01 |
| yes          | 10 | 14.5 | 7.2-25.0 | 3 | 2.2 | 0.5-6.3 | |
| required only medical class | 1 | 1.4 | 0.7-7.8 | 1 | 0.7 | 0.0-4.0 | |
| required only international students | 1 | 1.4 | 0.7-7.8 | 1 | 0.7 | 0.0-4.0 | |
| not required, but recommended | 5 | 7.2 | 2.4-16.1 | 11 | 8.0 | 4.1-13.9 | |
| no           | 40 | 58.0 | 45.5-69.8 | 117 | 85.4 | 78.4-90.8 | |
| other        | 8  | 11.6 | 5.1-21.6 | 3  | 2.2  | 0.5-6.3 | |
| not answered | 4  | 5.8  | 1.6-14.2 | 1  | 0.7  | 0.0-4.0 | |
| Are you considering to oblige students to submit a vaccination certificate? | | | | | | | .01 |
| We are considering it | 3 | 4.3 | 0.9-12.2 | 10 | 7.3 | 3.6-13.0 | |
| We would like to consider it | 9 | 13.0 | 6.1-23.3 | 61 | 44.5 | 36.0-53.3 | |
| no plan      | 37 | 53.6 | 41.2-65.7 | 52 | 38.0 | 29.8-46.6 | |
| not answered | 20 | 29.0 | 18.7-41.2 | 14 | 10.2 | 5.7-16.6 | |
| Why it is difficult to require students to submit a vaccination or antibody certificate? (Multiple answers were permitted) | | | | | | | |
| 1. The number of candidates may decline | 7 | 10.1 | 4.2-19.8 | 39 | 28.5 | 21.1-36.8 | .01 |
| 2. The expenses may be higher | 16 | 23.2 | 13.9-34.9 | 53 | 38.7 | 30.5-47.4 | .029 |
| 3. It is not required by law | 18 | 26.1 | 16.3-38.1 | 35 | 25.5 | 18.5-33.7 | 1.000 |
| 4. There is no place to keep track of vaccination history | 9 | 13.0 | 6.1-23.3 | 26 | 19.0 | 12.8-26.6 | .330 |
| 5. We do not know where to start | 7 | 10.1 | 4.2-19.8 | 37 | 27.0 | 19.8-35.3 | .01 |
| 6. Answer 1&2 (questionnaires related to school management) | 16 | 23.2 | 13.9-34.9 | 64 | 46.7 | 38.1-55.4 | |

Abbreviations: CI, confidence interval
Statistical analyses were performed with the EZR software version 1.53

JUs not requiring vaccine certification for international students was that it was not required by the law (26.1%). JLSs tended to respond more, saying “We do not know where to start” (JUs, 10.1% and JLSs, 27.0% [P < .01]).

We surveyed previous VPD infections among international students from 2017 to 2019 (Table 3). Most of the JUs (72.5%)...
Table 3. VPDs in Japanese universities and Japanese languages schools from 2017 to 2019.

| Answer items | University (N=69) | Language school (N=137) | P-value |
|---------------|------------------|--------------------------|---------|
|               | n    | %   | 95% CI         | n    | %   | 95% CI         |         |
| Do you recognize students who are absent due to VPDs? |       |     |                |       |     |                |         |
| yes           | 50   | 72.5| 60.4-82.5      | 112  | 81.8| 74.3-87.8      | .346    |
| no            | 16   | 23.2| 13.9-34.9      | 24   | 17.5| 11.6-24.9      |         |
| not answered  | 3    | 4.3 | 0.9-12.2       | 1    | 0.7 | 0-4.0          |         |
| How do you recognize student absence? Report from the student. |       |     |                |       |     |                |         |
| yes           | 47   | 68.1| 55.8-78.8      | 89   | 65.0| 56.4-72.9      | .756    |
| no            | 3    | 4.3 | 0.9-12.2       | 81   | 59.1| 50.4-67.4      | <.01    |
| Have the students been infected with any VPDs? |       |     |                |       |     |                | <.01    |
| yes           | 25   | 36.2| 25.0-48.7      | 58   | 42.3| 33.9-51.1      |         |
| no            | 19   | 27.5| 17.5-39.6      | 68   | 49.6| 41.0-58.3      |         |
| unknown       | 19   | 27.5| 17.5-39.6      | 10   | 7.3 | 3.6-13.0       |         |
| not answered  | 6    | 8.7 | 3.3-18.0       | 1    | 0.7 | 0-4.0          |         |

Abbreviations: VPDs, vaccine preventable diseases; CI, confidence interval. Statistical analyses were performed with the EZR software version 1.53.

Table 4. The number of international students infected with VPDs by the country of origin.

| Country of origin | Number of students | Number of infected cases |
|-------------------|-------------------|--------------------------|
| Vietnam           | 75                | 41.0                     |
| China             | 48                | 26.2                     |
| Sri Lanka         | 18                | 9.8                      |
| Nepal             | 16                | 8.7                      |
| Myanmar           | 11                | 6.0                      |
| Bangladesh        | 5                 | 2.7                      |
| Mongolia          | 3                 | 1.6                      |
| Indonesia         | 3                 | 1.6                      |
| Others            | 4                 | 2.2                      |
| Total             | 183               | 100.0                    |

Abbreviations: VPDs, vaccine preventable diseases.

and JLSs (81.8%) reported that they could keep track of the absence of students owing to VPDs. The students self-reported the methods used to confirm VPDs in 68.1% and 65.0% of the JUs and JLSs, respectively. Regarding past experiences of VPDs among educational institutions, 36.2% and 42.3% of the JUs and JLSs, respectively, had experiences of VPD infections in students.

Table 4 shows the number of international students who had been infected with VPDs over the past 3 years. A total of 183 international students were infected with VPDs. Southeast Asia and East Asia were the major countries of origin. The students from Vietnam had the highest number of VPD cases (n = 75). TB was the most common disease (99 cases), followed by varicella (71 cases). The prevalence of varicella was prominently high in 2019, with a total of 40 cases (Figure 1).

Supplementary Table S1 summarizes the number of educational institutions where international students had VPD cases from 2017 to 2019.

Discussion

This cross-sectional survey of JUs and JLSs on the status of VPDs revealed that chest X-rays were relatively prevalent for TB screening; however, antibody screening or certificate requirement for other VPDs at admission were not conducted enough. The majority of JUs and JLSs conducted medical checkups for students, including X-rays. However, fewer JUs and JLSs performed general blood tests, including antibody testing for VPDs. In addition, only a small proportion of the JUs and JLSs required the submission of vaccination certificates for admission. Nevertheless, approximately half of the JUs and one third of the JLSs responded that they were still not considering the obligation for students to provide a vaccination certificate.

The difference in response to screening for TB and other VPDs among these educational institutions could be explained by the current regulations for the school health screening system in Japan. The high rate of chest radiography among JLSs could be attributed to administrations in major cities, such as Shinjuku, Osaka City, and Fukuoka City, providing or subsidizing TB screening by X-rays to JLSs.18-21

In other countries, some educational institutions require vaccination certificates prior to admission. For example, the ACHA has developed recommendations on vaccination for college and university students prior to admission in the US.12 The recommended vaccines include those against influenza, measles, mumps, rubella, varicella, meningococcus, tetanus, diphtheria, and pertussis to reduce outbreaks among students. COVID-19 vaccination was added by the COVID-
19 pandemic after 2020. Moreover, it recommends hepatitis A/B and human papillomavirus vaccines to provide the opportunity to make sure that students can receive the appropriate vaccines. Previous cross-sectional surveys in the US have demonstrated that several colleges and universities followed the vaccine recommendations by the ACHA or each state. In Canada, several provinces and territories mandate vaccination for local students and international students. In England, the National Health Service advises newly admitted university students to get the MenACWYW vaccine for meningococcal disease and the measles, mumps, and rubella vaccine. In our study, more JLSSs considered the need for vaccine certification prior to admission than JUs; nonetheless they have so far not been adequately formulated preventive measures for VPDs. Recommendations on vaccination from public health authorities may provide an opportunity to develop appropriate preventive measures for VPDs, and thus should be considered in Japan.

Our study highlights differences in the perceptions of prevention measures for VPDs between JUs and JLSSs. More JLSSs were concerned about fewer candidates and increased costs regarding the difficulty in the mandatory submission of the vaccination certificate, compared with JUs. Unlike universities with different areas of expertise, JLSSs only teach Japanese; thus, they are likely to be exposed to competition with other JLSSs. Therefore, JLSSs may have concerns about complicated procedures causing a decrease in the number of applicants. Despite the difficulties in requiring the submission of a vaccination certificate, half of the JLSSs responded positively about the proposal. This may be attributed to the impact of COVID-19 and the experience of VPDs in students. In addition, unlike JUs, JLSSs do not have their own health care centers. Furthermore, the absence of medical personnel may make it difficult for JLSSs to make decisions about medical issues. Japan should develop a legislation for reviewing the content of health checkups and requiring a proof of vaccination, to reduce the risk of VPDs among international students. Additionally, multifaceted support, including financial compensation for JLSSs, which are the major entrances for international students, and enhanced social support for international students’ health issues may contribute to the promotion of measures against VPDs.

We investigated the country of origin of students, along with the VPDs they were most frequently infected with. Among 183 international students infected with VPDs in the past 3 years from 2017 to 2019, Vietnam, China, Sri Lanka, Nepal, and Myanmar were the leading countries (Table 4). They were also ranked in the top eight countries by countries of origin, according to the major student support organizations in Japan. TB was the most common VPD, with more than 30 international students infected each year. This may be attributed to a high prevalence in foreign-born patients and that most international students arrived from countries with high TB rate. TB cases must be reported to a public health center, which will conduct epidemiological investigations on the patient and those who have close contact with the index case. Educational institutions may be better able to identify TB cases because the public health center would contact schools to follow up on students diagnosed with TB.

Varicella was the second most common VPD (71 cases in 3 years). The epidemiology of varicella substantially differs between temperate and tropical regions. In temperate regions, most people are infected with varicella virus before adolescence, whereas the disease onset occurs later in tropical regions. In several parts of Southeast Asia, a large proportion of adults are not vaccinated against varicella, and thus remain susceptible. Foreign students without antibodies against varicella may be susceptible to infection. Japan should recognize differences in infectious disease epidemiology from East and Southeast Asia, which are the major home countries for international students, besides considering the vaccination requirements necessary for protection.

The numbers of measles, rubella, and mumps infection cases were relatively small during the surveillance period. Japan has successfully eradicated endemic measles since 2015; nonetheless, there are reports on local outbreaks caused by pathogens from endemic countries. Recently, Japan endured two outbreaks of rubella in 2012–2013 and 2018–2019. The majority of patients were men, aged 40 years, and ineligible for national routine vaccination. Vaccines for mumps among children are not routine, but voluntary in Japan. In addition, a suboptimal vaccination rate resulted in a high disease burden. Furthermore, there is an issue of vaccine hesitancy influenced by economic status, local culture, traditions, and religion in Asian countries. This may be the cause of low vaccination rates. The immunity status is unclear for the aforementioned infections among international students in Japan, particularly those from leading countries. Therefore, they could be vulnerable to such contagious diseases. Vaccinations for international students against these highly contagious diseases could positively contribute to their health and safety during their stay in Japan.

**Limitations**

This study had several limitations. First, it was based on closed-ended questions. Although questionnaires were constructed with the familiarity of infectious disease specialists and international care center nurses with issues of infectious diseases in foreign people, we did not conduct a pilot study, which might lead to a lack of unrecognized items in the questionnaires. Second, considering the retrospective design, institutions may not keep the records of VPDs or the respondents may be unaware of data retrieval. In addition, several JUs (72.5%) and JLSSs (81.8%) responded that they recognized students who were absent on account of VPDs; nonetheless, most of the health screening methods were self-reported by students. Therefore, we may have underestimated the actual number of VPDs across educational institutions. Third, we conducted the survey principally in educational institutions located across large cities in Japan with numerous international students; however, we could not determine if our findings represented the overall situation in Japan owing to the small sample size. Fourth, when we asked about the blood test in the questionnaires, we intended a general blood test, but we didn’t ask about the specific contents.
Conclusions

In Japan, most educational institutions screen international students for TB at admission, while few require a proof of vaccination or antibody testing for VPDs other than TB. In addition, certain number of students from Southeast Asia and East Asia were infected with VPDs, particularly TB and varicella, possibly owing to the varied epidemiology of infectious diseases between Japan and the home countries of these students. We propose that Japan should establish guidelines and legislations regarding vaccinations for VPDs among international students, in addition to providing multifaceted support provided by schools and the government to protect their health and prevent VPDs among the public.

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Statements of authorship

H. Takahata, H. Nomoto, and N. Iwamoto contributed to the concept, the study design, and data interpretation. H. Takahata and H. Nomoto wrote the manuscript. H. Takahata, K. Onishi, and K. Hayashi conducted the statistical analysis. H. Takahata, H. Nomoto, N. Iwamoto, and N. Hori developed the questionnaires. S. Kutsuna provided the administrative and funding support. E. Kodama and N. Ohmagari supervised the study. All authors have critically revised the manuscript for important intellectual content. All authors meet ICMJE requirements for authorship.

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