Vaccine Passport Use and Travel Health Status Among Turkish Travelers at an International Airport

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Abstract

Introduction: Even though Istanbul is one of the centers of the world’s fastest-growing tourism and travel sector, there are limited statistics on the knowledge, attitudes, and practices (KAP) of travelers from this region regarding travel-related infectious diseases. This study aimed to determine the passengers’ KAP about contagious diseases and contribute to developing new solutions for the problems people face while traveling abroad.

Methods: A questionnaire was administered to 182 Turkish travelers planning on traveling abroad and applied to the Istanbul Travel Health Center and the Istanbul Airport Health Control Center between January and March 2019.

Results: The proportion of carrying a vaccination certificate was statistically higher in those who received healthcare services at international terminals (P = 0.002), especially those who had yellow fever (P < 0.001) and meningococcal vaccine (P = 0.011). More than half of the vaccinated passengers did not carry their vaccination certificates, while around half (53.8%) were traveling to Africa. When compared to travelers flying to Europe, vaccination checks were 6.7 times (95% CI: 2.5-17.9) higher in passengers traveling to Africa, 6.1 times (95% CI: 1.5-24.3) higher in passengers traveling to Asia, and 14.8 times (95% CI: 1.3-164.3) higher in passengers traveling to South America. In addition, the vaccination certificate carrying proportion was significantly higher in those with a travel duration of 15 days or more (P = 0.028), those who received health services at international terminals (P = 0.002), and those vaccinated (P < 0.001).

Conclusion: Improved knowledge of travel-related infectious diseases and increased adoption of pre-travel health advice and vaccines are urgently needed among Turkish travelers.

Keywords: Travel, Travelers’ Health, Travelers’ Behavior, Risk Factors, Vaccinations

Introduction

With globalization, population growth, increase in economic relations, development of technology, and expanded transportation facilities, relations between countries and societies have improved, leading to a higher number of business and leisure travelers. Air transport is the most preferred type of travel because of the shortened travel durations.1,2 In 2019, 2.28 billion people in the world traveled abroad.3 In the same year, 59% of the total number of passengers traveled with airlines.4

Travelers play an essential role in spreading contagious diseases with travel patterns and behaviors. Traveling is also a crucial risk factor in the resurgence of infectious diseases, particularly vaccine-preventable ailments, such as yellow fever, hepatitis A, typhoid fever, polio, and measles. It is also a significant risk factor for the recurrence of well-controlled infectious diseases in the travelers’ country of residence.5 Understanding the travelers’ attitudes and behaviors towards various contagious diseases can provide policies to protect the passengers, their contacts, and communities.6

The spread of transmissible diseases is a global threat and therefore constitutes a priority on the International Public
We therefore conducted a descriptive cross-sectional survey at the Istanbul Atatürk Airport Health Inspection Center, which is affiliated with the Turkish Travel Health Directorate, to evaluate the knowledge, attitudes, and practices (KAP) of Turkish people traveling internationally.

This study aimed to evaluate the health status of passengers traveling abroad at their pre-travel vaccination checks concerning carrying a vaccination certificate, the frequency of utilizing technological innovations to improve their travel health experiences, and their KAP on transmissible diseases.

Methods
Research Design and Setting
This research was designed and conducted as a prospective analytical cross-sectional study. A survey was conducted with 182 Turkish passengers who applied to the Istanbul Airport Health Inspection Center affiliated to the Travel Health Directorate during the three-month interval between January and March 2019 and intended to travel abroad. An informed consent form was signed by the participants prior to the interview. Travelers with cognitive dysfunction or psychosis, those under 18, pregnant, puerperal, and breastfeeding women were excluded. To conduct the survey, the validity of the questionnaire was assessed, utilizing face, content, and construct validity methods. Internal consistency was calculated to determine the reliability of the questionnaire. All items were perceived as relevant and comprehensible by participants. Content validity was confirmed by a panel of experts. As measured by Cronbach’s alpha coefficient, the internal consistency exceeded the minimum reliability standard. The reporting process of the study was performed according to the rules in the STROBE guideline.

Population and Sampling
A total of 214 passengers applied to the center during the research period. All applicants were offered to participate in the study; no randomization was performed. The data were obtained via face-to-face interviews by the doctors in charge using the data collection form. Interviews with the participants were conducted in the outpatient clinics of the travel health center. Of the travelers, 21 refused to participate, and 11 were excluded because their questionnaires were deemed invalid. Thus, the final sample constituted 182 (85%) participants (Figure 1).

Variables
The data were obtained by face-to-face interviews employing the study questionnaire. The dependent variables in the study were having a vaccination check concerning their previous travels and carrying the vaccination certificate during the trip. The independent variables were variables related to

![Figure 1. Research Flowchart.](image-url)
sociodemographic characteristics (age, sex, marital status, educational level, income status, and habits), travel-related variables, region of travel, duration of the journey, the purpose of the trip, having health problems in previous travels, and having searched the internet about diseases or drugs.

**Bias Prevention**

The participants were briefly informed about the research before the survey, and they were asked not to write their identity information on the questionnaires to ensure correct information declaration. Data collection from all participants was carried out by the same research team. After the collected data were entered into the computer, debugging was performed to check for errors.

**Statistical Methods**

In descriptive statistics, continuous data were presented as median, minimum, and maximum values, while categorical data were given as numbers and percentages.

In the statistical comparison of the data, the conformity to the normal distribution for continuous variables was evaluated by the Kolmogorov-Smirnov test. In the case of two groups, the Mann-Whitney U test was employed to compare continuous data between independent groups. The chi-square test was utilized for statistical comparisons of categorical data. Multivariate logistic regression analysis was performed using the Enter method with variables significant in the univariate analysis and related to causality. The odds ratio and 95% confidence interval were calculated for the independent variables. Finally, the model's fit was evaluated with the Hosmer-Lemeshow goodness of fit test.

A *P* value of less than 0.05 at the 95% confidence interval was accepted as significant. The SPSS v 21.0 program (IBM Inc., Chicago, IL, USA) was used for statistical analysis.

**Results**

**Participants**

In this study, the data of 182 passengers were analyzed. The median age of the participants was 27 (18-73), 126 (69.2%) were male, and 160 (87.9%) were university graduates. Participant characteristics are shown in Table 1.

**Result Data**

Of the participants, 78 (42.9%) were traveling for vacation, 98 (53.8%) stated that their destination was Africa, and 103 (56.6%) would stay in the visited country for 14 days or less. Of the 107 (58.8%) people who had previously been vaccinated for international travel, the most frequent vaccination was yellow fever (n = 89, 48.9%), which is the mandatory vaccine. Distributions of the participants’ travel-related information are displayed in Table 1. The participants’ median number of countries visited was 7 (1-83).

Among the participants, married ones and smokers had significantly more vaccination checks (*P* = 0.047 and *P* = 0.001, respectively), but no significant difference was found between having a vaccination check and the education or income of the individuals (Table 1).

**Table 1.** Distribution of the Sociodemographic Characteristics and Travel-Related Information of the Participants

| Characteristic                              | Yes | No |
|--------------------------------------------|-----|----|
| Gender                                     | Male | 126 | 69.2|
|                                           | Female| 56  | 30.8|
| Marital status                             | Single | 126 | 69.2|
|                                           | Married | 56  | 30.8|
| Educational attainment                      | Primary/secondary school | 12  | 6.6|
|                                           | High school | 10  | 5.5|
|                                           | University | 160 | 87.9|
| Income                                     | 1-3 minimum wages | 74  | 40.7|
|                                           | 4-6 minimum wages | 61  | 33.5|
|                                           | 7-9 minimum wages | 25  | 13.7|
|                                           | 10 minimum wages and more | 22  | 12.1|
| Tobacco smoking                            | Yes | 64  | 35.2|
|                                           | No  | 118 | 64.8|
| Chronic diseases                           | Present | 17  | 9.3|
|                                           | Absent | 165 | 90.7|
| Continuous medication use                   | Yes | 21  | 11.5|
|                                           | No  | 161 | 88.5|
| Smartphone usage                           | Yes | 179 | 98.4|
|                                           | No  | 3   | 1.6|
| Use of e-nabiz (online health portal)      | Yes | 63  | 34.6|
|                                           | No  | 119 | 65.4|
|                                           | Africa | 98  | 53.8|
|                                           | Europe | 53  | 29.1|
|                                           | Asia  | 17  | 9.3|
|                                           | South America | 8  | 4.4|
|                                           | North America | 3  | 1.6|
|                                           | Australia | 3  | 1.6|
| Travel duration                            | 1-7 days | 55  | 30.2|
|                                           | 8-14 days | 48  | 26.4|
|                                           | 15-30 days | 21 | 11.5|
|                                           | 31 days and more | 58  | 31.9|
| Travel purpose                             | Business | 97 | 53.3|
|                                           | Education | 7  | 3.8|
| Status of receiving health services at international terminals (Inspection/ Pharmacy, etc) | Yes | 21  | 11.5|
|                                           | No  | 161 | 88.5|
| Vaccination control status by applying to the travel health center during travels abroad | Yes | 107 | 58.8|
|                                           | No  | 75  | 41.2|
| Previous vaccination status for overseas travel | Not vaccinated | 75  | 41.2|
|                                           | Vaccinated | 107 | 58.8|
In our study, 22% of travelers had vaccinations checked. On the other hand, those vaccinated before had 6.9 times (95% CI: 3.1-15.4) more vaccination checks. On the other hand had a statistically higher proportion of possessing a vaccination certificate. Meanwhile, the rate of carrying a vaccination certificate was significantly higher in those who received health services at international terminals before (P = 0.002), those who had vaccination controls (P < 0.001), and those who had vaccinations (especially those who had yellow fever (P < 0.001) and meningococcal vaccines (P = 0.011)). However, a significant difference was found between the place of travel and carrying a vaccination certificate (P < 0.001) (Table 3).

Those with a travel duration of 15 days or more (P = 0.028) had a statistically higher proportion of possessing a vaccination certificate. In addition, it has been reported that informatics-based applications in public health management increase service quality, traceability, awareness, self-management skills, and knowledge, while reducing hospital visits, workload, labor loss, cost, data loss, unsuccessful treatment rates, and incomplete treatment proportions. To this end, many medical applications have been made available to individuals on various platforms.21

Patients with chronic diseases show significant deficiencies in rational drug use. Of the travelers in Turkey, 9.3% have a chronic illness.22 Mobile applications can be used as a solution for tracking travelers with chronic diseases (e.g., blood sugar, blood pressure, and medication intake). The advancements in technological devices can be an opportunity to develop preventive and remedial projects through these devices.

In the studies of LaRocque et al and Van Herck et al., the proportion of seeking health information among travelers was below 50%.23,24 We found that more than half of all participants (58.8%) sought health information before traveling. Another airport survey reported that only 26% of Asian travelers sought pre-trip health advice, compared to 63% of Western travelers,24 whereas one study mentioned that only 23.9% of South Korean travelers to India (high risk for many infectious diseases) obtained pre-trip health advice.25,26

We realized that trips to more temperate regions such as South America and Africa were associated with higher travel health center referrals and vaccination checks. Yellow fever (which was epidemic, especially in Turkey's south and southeast regions in the 2000s) still poses a high risk in South America and Africa. On the other hand, the WHO Strategic Advisory Group of Experts on Immunization (SAGE) declared that the yellow fever vaccine protects most people for at least 35 years, and possibly for a lifetime, and with a few exceptions, no booster dose is required. These may have a role in the specified relationship.27,28 In parallel with this, we determined that the most frequently administered vaccine before travel was yellow fever (48.9%). The most commonly reported vaccines were hepatitis A, hepatitis B, tetanus, and typhoid in other traveler surveys.13,14,15,29,30 Studies have estimated that between 30%-50% of travelers have become sick or injured during their travel, suggesting it is urgent to raise awareness about travel health.31 In our study, 22% of the participants declared previously having an illness while traveling.

#### Table 3

| Vaccines given (n = 107) | No. | % |
|------------------------|-----|---|
| Yellow fever           | 89  | 48.9 |
| Tetanus diphtheria     | 18  | 9.9 |
| Typhoid                | 15  | 8.2 |
| Meningococcus          | 8   | 4.4 |
| HAV                    | 9   | 4.9 |

**Discussion**

In this study, the data of 182 passengers with a median age of 27 (18-73) were evaluated; 126 participants (69.2%) were men, and 160 (87.9%) were university graduates. The majority of participants were young, male, and with a relatively high level of education. Of this population, 53.3% traveled abroad for business and 42.9% for vacation. Of the participants, 79.7% declared that they searched the internet for diseases and drugs before traveling, and 58.8% applied to the travel health center and had a vaccination check.

Seeking health-related information before travel can prepare travelers for health risks at their destination. Various studies have indicated that there is a relationship between taking advice, rational risk perception, and engaging in preventive behaviors.17,18 Considering the medical information pollution on the internet and that almost all travelers use smartphones, it would be beneficial to establish a platform with a mobile application such as the e-nabiz (English: e-pulse) and/or add the necessary information to this platform to provide accurate and reliable information to passengers.

Of the participants included in our study, 34.6% had used the e-nabiz mobile application (https://enabiz.gov.tr/). This platform was developed by the Ministry of Health of the Republic of Turkey in 2015, and it is one of the popular mobile personal health record systems. As of June 2021, the total number of downloads of the app was over 10 million. Studies show that individuals' opinions about the e-nabiz system are generally positive39 and the awareness level of health care recipients and health workers for this system is above average.26 In addition, it has been reported that informatics-based applications in public health management increase service quality, traceability, awareness, self-management skills, and knowledge, while reducing hospital visits, workload, labor loss, cost, data loss, unsuccessful treatment rates, and incomplete treatment proportions. To this end, many medical applications have been made available to individuals on various platforms.21

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Table 2. Factors Associated With Applying to a Travel Health Center and Getting a Vaccination Check When Traveling Abroad

| Factor                                             | Had Vaccination Check | Had No Vaccination Check | \( p^* \) |
|----------------------------------------------------|-----------------------|--------------------------|---------|
| Age, median (min-max)                              | 27 (18-62)            | 27 (18-73)               | 0.989** |
| Gender                                             |                       |                          |         |
| Male                                               | 76 (60.3)             | 50 (39.7)                | 0.53    |
| Female                                             | 31 (55.4)             | 25 (44.6)                |         |
| Marital status                                     |                       |                          |         |
| Single                                             | 68 (54.0)             | 58 (46.0)                | 0.047   |
| Married                                            | 39 (69.6)             | 17 (30.4)                |         |
| Educational attainment                             |                       |                          |         |
| Primary/secondary school                           | 8 (66.7)              | 4 (33.3)                 |         |
| High school                                        | 8 (80.0)              | 2 (20.0)                 | 0.3     |
| University                                         | 91 (56.9)             | 69 (43.1)                |         |
| Income                                             |                       |                          |         |
| 1-3 minimum wages                                  | 44 (59.5)             | 30 (40.5)                |         |
| 4-6 minimum wages                                  | 34 (55.7)             | 27 (44.3)                | 0.477   |
| 7-9 minimum wages                                  | 13 (52.0)             | 12 (48.0)                |         |
| 10 minimum wages and more                          | 16 (72.7)             | 6 (27.3)                 |         |
| Tobacco smoking                                    |                       |                          |         |
| Yes                                                | 48 (75.0)             | 16 (25.0)                | 0.001   |
| No                                                 | 59 (50.0)             | 59 (50.0)                |         |
| Chronic diseases                                   |                       |                          |         |
| Present                                            | 11 (64.7)             | 6 (35.3)                 | 0.603   |
| Absent                                             | 96 (58.2)             | 69 (41.8)                |         |
| Continuous medication use                          |                       |                          |         |
| Yes                                                | 14 (66.7)             | 7 (33.3)                 | 0.436   |
| No                                                 | 93 (57.8)             | 68 (42.2)                |         |
| Travel site                                        |                       |                          | <0.001  |
| Africa                                             | 76 (77.6)             | 22 (22.4)                |         |
| Europe                                             | 9 (17.0)              | 44 (83.0)                |         |
| Asia                                               | 11 (64.7)             | 6 (35.3)                 |         |
| South America                                      | 7 (87.5)              | 1 (12.5)                 |         |
| North America                                      | 1 (33.3)              | 2 (66.7)                 |         |
| Australia                                          | 3 (100.0)             | 0 (0.0)                  |         |
| Travel duration                                    |                       |                          | 0.091   |
| 14 days or less                                    | 55 (53.4)             | 48 (46.6)                |         |
| 15 days or more                                    | 52 (65.8)             | 27 (34.2)                |         |
| Travel purpose                                     |                       |                          | 0.48    |
| Holiday                                            | 42 (53.8)             | 36 (46.2)                |         |
| Work                                               | 61 (62.9)             | 36 (37.1)                |         |
| Education                                          | 4 (57.1)              | 3 (42.9)                 |         |
| Status of receiving health services at international terminals (Medical inspection/Pharmacy, etc) | | | | |
| Yes                                                | 17 (81.0)             | 4 (19.0)                 | 0.028   |
| No                                                 | 90 (55.9)             | 71 (44.1)                |         |
| Previous vaccination status for overseas travel    |                       |                          | <0.001  |
| Not vaccinated                                     | 19 (25.3)             | 56 (74.7)                |         |
| Vaccinated                                         | 88 (82.2)             | 19 (17.8)                |         |
| Yellow fever                                       |                       |                          | <0.001  |
| Not vaccinated                                     | 30 (32.3)             | 63 (67.7)                |         |
| Vaccinated                                         | 77 (86.5)             | 12 (13.5)                |         |
| Meningococcus                                      |                       |                          | 0.827   |
| Not vaccinated                                     | 102 (58.6)            | 72 (41.4)                |         |
| Vaccinated                                         | 5 (62.5)              | 3 (37.5)                 |         |
| HAV                                                |                       |                          | 0.06    |
| Not vaccinated                                     | 99 (57.2)             | 74 (42.8)                |         |
| Vaccinated                                         | 8 (88.9)              | 1 (11.1)                 |         |
| Tetanus and diphtheria                             |                       |                          | 0.085   |
| Not vaccinated                                     | 93 (56.7)             | 71 (43.3)                |         |
| Vaccinated                                         | 14 (77.8)             | 4 (22.2)                 |         |
| Crimean Congo Hemorrhagic fever                    |                       |                          | 0.656   |
| Not vaccinated                                     | 104 (59.1)            | 72 (40.9)                |         |
| Vaccinated                                         | 3 (50.0)              | 3 (50.0)                 |         |
After the COVID-19 pandemic, editorial letters and personal views on vaccination passports have increased.11-13 Our study is the first to question travel vaccination certificates. Only 44% of the travelers who participated in our study carried their vaccination certificates. The importance of a vaccination certificate or passport is better understood if we consider the mortality, morbidity, and prevalence of infectious diseases. Having these data available through digital applications such as the e-nabiz can provide significant convenience.

Kain et al32 suggested that the main reason for not seeking or complying with pre-travel health advice was the low perception of infection risk during travel. However, two surveys in South America found that participants lacked travel medicine knowledge.33,34 Similarly, based on the fact that those who received health services at international terminals ($P=0.002$) and those who were already vaccinated applied more frequently to travel health centers than those who did not receive such services ($P<0.001$); we think that the main reason is the inadequacy of information about travel health of the passengers.

### Limitations

Compared to similar studies in the literature, the small sample size of this research can be regarded as a limitation. While the short questionnaire design was suitable for maximizing the response rate in high-volume airport surveys, it limited the amount of detail obtained (e.g., time of vaccination). Regional or seasonal differences could also be evaluated if the study had been expanded to include other airports in Turkey and covered longer or seasonally different periods.

### Conclusion

Turkish travelers should be informed more about travel health and communicable diseases, and this responsibility falls primarily on travel health centers. Therefore, there is a need for developing mobile applications for travel health. With such applications, carrying a vaccination passport will become more accessible and widespread. In addition, considering the prevalence of smartphones, we think that the use of digital health applications such as e-nabiz may be beneficial in reaching wider populations concerning travel health.
Table 4. Factors Associated With Carrying an International Vaccination or Prophylaxis Certificate

| Factor                                      | Carries a Vaccination Certificate (n = 80) | Does not Carry a Vaccination Certificate (n = 102) | p*  |
|---------------------------------------------|-------------------------------------------|----------------------------------------------------|-----|
| Age, median (min-max)                       | 28 (18-62)                                | 27 (18-73)                                         | 0.703** |
| Gender                                      |                                           |                                                   |     |
| Male                                        | 59                                         | 67                                                 | 0.242 |
| Female                                      | 21                                         | 35                                                 |     |
| Marital Status                              |                                           |                                                   |     |
| Single                                      | 54                                         | 72                                                 | 0.654 |
| Married                                     | 26                                         | 30                                                 |     |
| Educational attainment                      |                                           |                                                   |     |
| Primary/secondary school                    | 5                                          | 7                                                  | 0.915 |
| High school                                 | 5                                          | 5                                                  |     |
| University                                  | 70                                         | 90                                                 |     |
| Income                                      |                                           |                                                   |     |
| 1-3 minimum wages                           | 28                                         | 46                                                 | 0.342 |
| 4-6 minimum wages                           | 27                                         | 34                                                 |     |
| 7-9 minimum wages                           | 12                                         | 13                                                 |     |
| 10 minimum wages and more                   | 13                                         | 9                                                  |     |
| Tobacco smoking                             |                                           |                                                   |     |
| Yes                                         | 33                                         | 31                                                 | 0.128 |
| No                                          | 47                                         | 71                                                 |     |
| Chronic diseases                            |                                           |                                                   |     |
| Present                                     | 8                                          | 9                                                  | 0.787 |
| Absent                                      | 72                                         | 93                                                 |     |
| Continuous medication use                   |                                           |                                                   |     |
| Yes                                         | 11                                         | 10                                                 | 0.408 |
| No                                          | 69                                         | 92                                                 |     |
| Travel site                                 |                                           |                                                   |     |
| Europe                                      | 10                                         | 43                                                 | <0.001 |
| Asia                                        | 5                                          | 12                                                 |     |
| Africa                                      | 56                                         | 42                                                 |     |
| South America                               | 5                                          | 3                                                  |     |
| North America                               | 1                                          | 2                                                  |     |
| Australia                                   | 3                                          | 0                                                  |     |
| Travel duration                             |                                           |                                                   |     |
| 14 days and below                           | 38                                         | 65                                                 | 0.028 |
| 15 days and above                           | 42                                         | 37                                                 |     |
| Travel purpose                              |                                           |                                                   |     |
| Vacation                                    | 31                                         | 47                                                 | 0.525 |
| Business                                    | 45                                         | 52                                                 |     |
| Education                                   | 4                                          | 3                                                  |     |
| Status of receiving health services at international terminals (Inspection / Pharmacy, etc) |                                           |                                                   |     |
| Yes                                         | 16                                         | 5                                                  | 0.002 |
| No                                          | 64                                         | 97                                                 |     |
| Do you get a vaccination check by applying to the travel health center during your travels abroad? |                                           |                                                   |     |
| Yes                                         | 72                                         | 35                                                 | <0.001 |
| No                                          | 8                                          | 67                                                 |     |
| Previous vaccination status for overseas travel |                                           |                                                   |     |
| Not vaccinated                              | 5                                          | 70                                                 | <0.001 |
| Vaccinated                                  | 75                                         | 32                                                 |     |
| Yellow fever                                |                                           |                                                   |     |
| Not vaccinated                              | 11                                         | 82                                                 | <0.001 |
| Vaccinated                                  | 69                                         | 20                                                 |     |
| Meningococcus                               |                                           |                                                   |     |
| Vaccinated                                  | 77                                         | 96                                                 | 0.51 |
| Vaccinated                                  | 3                                          | 6                                                  |     |
| HAV                                         |                                           |                                                   |     |
| Not vaccinated                              | 77                                         | 96                                                 | 0.51 |
| Vaccinated                                  | 3                                          | 6                                                  |     |
| Tetanus and diphtheria                      |                                           |                                                   |     |
| Vaccinated                                  | 77                                         | 96                                                 | 0.594 |
| Crimean Congo hemorrhagic fever             |                                           |                                                   |     |
| Not vaccinated                              | 78                                         | 98                                                 | 0.648 |
| Vaccinated                                  | 2                                          | 4                                                  |     |
| Typhoid                                     |                                           |                                                   |     |
| Not vaccinated                              | 70                                         | 97                                                 | 0.064 |
| Vaccinated                                  | 10                                         | 5                                                  |     |
Table 4. Continued

| Disease and drug search on the internet | Does not Carry a Vaccination Certificate (n=102) | Carries a Vaccination Certificate (n=80) | p* |
|----------------------------------------|-----------------------------------------------|----------------------------------------|----|
| Yes                                    | 83                                           | 62                                    | 0.519 |
| Yes                                    | 58.5%                                        | 42.8%                                  |    |
| No                                     | 83                                           | 62                                    |    |
| No                                     | 58.5%                                        | 42.8%                                  |    |

*Chi-square test result.
**Mann Whitney U test result.

Research Highlights

What Is Already Known?
- The spread of transmittable diseases is a global threat. Travelers play an essential role in the international spread of contagious diseases with travel patterns and behaviors.
- The “International Certificate of Vaccination or Prophylaxis” was put into effect in 2007 by the World Health Organization.

What Does This Study Add?
- A mobile application should be developed that can be used as a vaccination passport and a health wallet for international travel.

Author’ Contributions
Concept and design: MK, OK, CA, FKA and SO. Carried out the studies: IY, EM, AR, AS, EMC, EC, AD, MST and NY. Statistical analysis: MK, HEO and MMO. Writing original draft preparation: MK, EBB and SHBP. Writing review and editing: SO and MAK. Supervision: MAK.

Conflict of Interest Disclosures
The authors have no conflict of interest in this study.

Ethical Approval
Ethical approval for the study was obtained from the Istanbul University Istanbul Faculty of Medicine Clinical Research Ethics Committee (Number: 2018/1068).

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