Research Article

THJPH

Preventive Behaviors and Perceptions Regarding COVID-19 after its Reclassification among Japanese Medical University Students

Yuri Ouchi[1], Ikuharu Morioka[2]

[1]Department of Nursing, Faculty of Wakayama Health Care Sciences, Takarazuka University of Medical and Health Care, Wakayama, Japan

[2] Wakayama Medical University, School of Health and Nursing Science, Wakayama, Japan

Correspondence: Yuri Ouchi, 2252 Nakanoshima, Wakayama-city, Wakayama-pref. 640-8392 Japan, E-mail: y-ouchi@tumh.ac.jp

Received: April 20 2024; Revised: July 30 2024; Accepted: November 15 2024

Abstract

In Japan, COVID-19 was reclassified from Category 2 (equivalent to new influenza) to Category 5 (equivalent to seasonal influenza) under the Infection Disease Control Law in May 2023, after which daily life gradually returned to normal. This study aimed to clarify the changes in preventive behaviours and perceptions of COVID-19 among medical university students after its reclassification.

An anonymous, self-administered questionnaire was distributed to 188 university students. It comprised questions about attributes, infection-preventive behaviours, and perceptions of COVID-19 after its reclassification and one year before. Regarding infection-preventive behaviours, the participants were asked about the frequency of hand washing, alcohol disinfection, indoor and outdoor mask-wearing, temperature measurement, going out, and eating out. Regarding the perception of infection prevention, participants were asked about the importance of each infection-preventive behaviour and the risk of becoming infected with COVID-19.

The frequency of hand washing, alcohol disinfection, use of indoor and outdoor mask-wearing, as well as temperature measurement decreased, while that of going out and eating out increased. Perceptions of the importance of infection-preventive behaviours decreased, as did the risk of becoming infected with the virus. A significant correlation was observed between the declined infection-preventive behaviours and the decreased perception of infection prevention.

Preventive behaviours and perceptions of COVID-19 among medical university students decreased after the reclassification. Since medical university students often come in contact with patients at risk of becoming seriously ill, it is necessary to consider methods for maintaining infection-preventive behaviours and a high perception regarding their importance.

Keywords: Preventive behavior, Perception, Reclassification, Medical student

What was Known

- Medical students are required to engage in infection-preventive behaviors daily.
- Medical students need to be highly aware of the necessity and importance of prevention.
- Due to the COVID-19 pandemic, many people took precautions to prevent infection.

What's New and Next

- Medical students' infection-preventive behaviors have faded after COVID-19 reclassification.
- Methods for maintaining infection-preventive behaviors among medical students are necessary.

Introduction

In Japan, COVID-19 was reclassified from a Category 2 disease (equivalent to new influenza) to Category 5 (equivalent to seasonal influenza) under the Infection Disease Control Law, on 8 May 2023[1], and daily life gradually returned to normal. This reclassification reflects the improved COVID-19 situation, and the relaxed behavioural restrictions, such as wearing masks, refraining from going outside the prefecture as well as from eating out, has brought a certain sense of security to people. However, new concerns have emerged.

Medical students undergoing training in medical and nursing care facilities are at risk of becoming sources of infection themselves. The reclassification of COVID-19 may create false perceptions, such as equating COVID-19 with a common seasonal infectious disease, which may lead to negligence or complacency in infection-preventive behaviours, thus possibly causing the spread of infection during training. An earlier study using healthcare workers showed that hand hygiene adherence was higher during periods of high influenza activity than at other times of the year[2]. This suggests that even healthcare workers may be less compliant with infection prevention practices during periods of low infection activity. As to the COVID-19

infection, an earlier study on social distancing among German university students showed that adherence to social distancing lowered after one year than during the period of infection spread[3].

However, how infection-preventive behaviours and perceptions, other than social distancing have changed among medical university students remains unclear. For those in charge of practical training at medical universities, understanding these changes after reclassification will clarify what should be emphasised and re-learned before practical training. Further, this will help us understand the infection-preventive behaviours of young people in Japan.

This study aimed to clarify the changes in preventive behaviours and perceptions of COVID-19 among medical university students after its reclassification.

Materials and Methods

1. Participants

The target of this cross-sectional study was 297 first- and second-year students from a medical university in Wakayama Prefecture, Japan. The incidence rate of COVID-19 infections in this area was peaked in January 2023, similar to the national average, and although the incidence rate was lower than the national average from April to July, it remained stable. The participants were limited to eliminate the influence of differences in behavioural restrictions due to COVID-19 measures among universities. We excluded third-year students onwards, since they are in continuous training in hospitals and often take infection prevention measures based on hospitals' instructions, regardless of their perceptions.

The sample size was calculated using G*power analysis software. Assuming a medium effect size (0.5), alpha error of 0.05, and power of 0.95 for the Wilcoxon's sign rank test, which is the primary used in this study, the required number of participants is 57. Assuming a 50% recovery rate, the number of participants would be 114. Since it is undesirable to intentionally select participants, all students majoring in physical therapy, occupational therapy, and nursing were selected for this survey.

The survey was conducted in July 2023, two months after the reclassification of COVID-19.

2. Data collection

An anonymous self-administered questionnaire survey was conducted after obtaining the ethics committee approval. The questionnaire was explained to the students both verbally and in

writing. Participants completed the questionnaire using a QR code linked to an online Google Forms survey in the classroom during breaks or at home (required time: approximately 5 minutes) and submitted their results. We collected the submitted results on Google Forms one week after the submission deadline.

The original questionnaire used was based on COVID-19 infection prevention measure[4]. To ensure validity, the questionnaire sheets were evaluated by specialists on public health. To ensure the clarity of questions, a pilot test was conducted, and revisions were made based on feedback from respondents.

The questionnaire comprised questions about attributes (gender, grade, and affiliation), infection-preventive behaviours, and perception of COVID-19.

Regarding infection-preventive behaviours, participants were asked about the frequency of washing their hands with running water, excluding meals and defecation, on a daily basis (hand washing), of hand rubs with alcohol on a daily basis (alcohol disinfection), wearing masks indoors (indoor mask-wearing), wearing masks outdoors (outdoor mask-wearing), body temperature measurement on a weekly basis (temperature measurement), going out to dinner on a monthly basis (eating out), and going out of the prefecture on a monthly basis (going out). Regarding the frequencies of indoor and outdoor mask-wearing, participants could choose from four answer items: 1 = *Not at all*, 2 = *Not so much*, 3 = *Somewhat*, and 4 = *Most of the time*.

Nine items were used to assess perceptions of infection prevention: 'Hand washing is important for preventing infection', 'Alcohol disinfection is important for preventing infection', 'Temperature measurements are important for detecting personal ailments', 'Refraining from eating out is important for avoiding the three Cs (closed spaces, crowded places, and close-contact settings)', 'Refraining from going out is important for avoiding the three Cs', 'An indoor mask-wearing is important in helping preventing infections', 'An outdoor mask-wearing is important in helping preventing infections', 'It is risky for me to become infected with COVID-19', and 'It is risky for the people around me if I become infected with COVID-19'. Participants rated their perceptions using the following answer items: 1 = *strongly disagree*, 2 = *disagree*, 3 = *neutral*, 4 = *agree*, and 5 = *strongly agree*.

All items were asked for two points in time: after the reclassification of COVID-19 (2023) and one year before (2022).

3. Statistical Analysis

Median values of the frequency of infection-preventive behaviours and perceptions of their importance were compared between the two time points using the Wilcoxon signed-rank test.

To examine the correlation between changes in the perception of infection prevention and the frequency of infection-preventive behaviours, the participants were divided into two groups. Those whose frequency of infection-preventive behaviours decreased after reclassification were classified into 'decrease', and those whose frequency of infection-preventive behaviours remained unchanged or increased were classified into 'unchanged'. Similarly, by comparing the perceptions of the importance between two time points, the participants were also divided into two groups: 'decrease' and 'unchanged'. A 2 × 2 cross table was created and analysed using an χ-square test.

Data were analysed using SPSS Statistics version 28.

Results

A total of 188 participants consented to participate in the study (response rate: 63.3%); thus the analysis was conducted on 188 questionnaires.

Regarding sex, 80 (42.6%) were male, 103 (54.8%) were female, and 5 (2.7%) did not wish to respond. As to the affiliation, there were 50 first-year and 29 second-year students in the nursing department, 43 first-year and 46 second-year students in the physical therapy department, and 15 first-year and five second-year students in the occupational therapy department. In this study, the students were treated as a single group.

The frequencies of hand washing, alcohol disinfection, and temperature measurements significantly decreased in 2023 (Table 1), while the number of people going out and eating out has significantly increased.

Table 1 Frequency of infection-prevention behaviours in 2022 and 2023

	2022		2023		z	p^a
	Median	IQR	Median	IQR		
Hand washing (/day)	3	2-5	3	2-4	6.58	<0.01
Alcohol Disinfection (/day)	3	2-5	2	1-3	8.77	<0.01
Temperature measurement (/week)	5	1-7	0	0-2.25	9.15	<0.01
Going out (/month)	0	0-1	1	0-2	4.67	<0.01
Eating out (/month)	2	1-4	4	2-6	8.39	<0.01

IQR, Interquartile Range; [a] Wilcoxon signed rank test

Table 2 shows the distribution of the frequencies of indoor and outdoor mask-wearing. Regarding the frequency of the former, choice 4 (*most of the time*) decreased while the others increased in 2023. The distribution of answers regarding the frequency of outdoor mask-wearing showed a similar tendency.

Table 2 Distribution of frequency of indoor and outdoor mask-wearing in 2022 and 2023

		1	2	3	4
		Not at all	Not so much	Somewhat	Most of the time
Indoor mask-wearing	2022	2 (1.1%)	6 (3.2%)	22 (11.7%)	158 (84.0%)
	2023	17 (9.0%)	30 (16.0%)	45 (23.9%)	96 (51.1%)
Outdoor mask-wearing	2022	3 (1.6%)	12 (6.4%)	30 (16.0%)	143 (76.1%)
	2023	25 (13.3%)	53 (28.2%)	44 (23.4%)	66 (35.1%)

Numbers indicate the number of students, and ( ) is the percentage.

Although the median values were the same in both years, significant differences were observed in the frequency of wearing both indoor and outdoor mask-wearing (Table 3).

Table 3 Frequency of indoor and outdoor mask-wearing in 2022 and 2023

	2022		2023		z	p^a
	Median	IQR	Median	IQR		
Frequency of indoor mask-wearing	4	4-4	4	2.25-4	7.20	<0.01
Frequency of outdoor mask-wearing	4	4-4	3	2-4	8.69	<0.01

1 = not at all; 2 = not so much; 3 = somewhat; 4 = most of the time

IQR, interquartile range; [a] Wilcoxon signed rank test

A significant decrease was observed in all perceptions regarding the importance of infection-preventive behaviours following the COVID-19 reclassification compared with the previous year (Table 4).

Table 4 Perceptions of the importance of infection-preventive behaviours in 2022 and 2023

	2022		2023		z	p^a
	Median	IQR	Median	IQR		
Hand washing	5	4-5	5	4-5	3.91	<0.01
Alcohol disinfection	5	4-5	5	4-5	4.71	<0.01
Temperature measurement	5	4-5	4	4-5	4.33	<0.01
Going out	5	4-5	4	3-5	7.45	<0.01
Eating out	5	3-5	4	3-5	4.44	<0.01
Indoor mask-wearing	5	4-5	4	4-5	6.42	<0.01
Outdoor mask-wearing	5	4-5	4	3-5	8.25	<0.01
Risky for me	5	4-5	4	4-5	5.67	<0.01
Risky for others	5	4-5	5	4-5	4.05	<0.01

1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.

IQR, Interquartile Range: [a] Wilcoxon signed rank test

Table 5 shows the correlation between a declined perception regarding the importance of infection-preventive behaviours and a decreased frequency of these behaviours. A decreased perception of temperature measurement and indoor mask-wearing were correlated with all declined frequencies of infection-preventive behaviours other than going out and eating out. Additionally, the declined frequency of alcohol disinfection correlated with decreased perceptions of the importance of infection-preventive behaviours. No correlation was found between a decreased frequency of behaviours associated with leaving the house, such as going out or eating out, and any perception on the importance of infection prevention behaviours.

Table 5 Correlations between infection-prevention behaviours and perception

		Decreased infection-preventive behaviours						
		Hand washing	Alcohol disinfection	Temperature measurement	Going out	Eating out	Indoor mask-wearing	Outdoor mask-wearing
Decreased perception	Hand washing	15.02**	8.63**	2.07	0.01	0.08	2.18	2.52
	Alcohol disinfection	9.56**	11.06**	0.35	0.48	0.59	0.77	1.16
	Temperature measurement	12.41**	6.09*	4.30*	0.07	0.44	6.53*	8.29**
	Going out	1.99	5.21*	1.28	3.69	2.47	0.48	9.69**
	Eating out	0.66	4.14*	0.02	0.84	0.01	1.15	5.09*
	Indoor mask-wearing	5.99*	6.00*	4.48*	0.48	2.65	10.76**	7.92**
	Outdoor mask-wearing	4.71*	7.10**	3.53	0.17	0.67	2.00	27.97**
	Risky to me	7.54**	0.89	1.57	0.00	0.08	0.98	2.61
	Risky to others	2.21	0.02	1.18	0.24	0.01	0.54	1.51

Numbers indicate χ-square value; $^{**}p < 0.01$, $^{*}p < 0.05$

Discussion

1. Frequency of infection-preventive behaviours

Compared to the pandemic period a year prior, the frequency of hand washing, alcohol disinfection, temperature measurement, as well as indoor and outdoor mask-wearing decreased at the time of the survey. By contrast, the frequency of going out and eating out, which had been restricted to avoid the three Cs, increased. These results corresponded to those of the earlier survey in that compliance of adults living in the UK with COVID-19 infection-preventive behaviours, such as washing hands, wearing masks, carrying disinfectants, and maintaining physical distance, was higher during the lockdown period than its relaxation[5].

As to the hand hygiene, a survey of urban adults in India showed that more than half of them washed their hands at least 10 times a day during the COVID-19 pandemic; however, the frequency of hand washing decreased in the post-pandemic period[6]. A study of Chinese health care workers also shows that hand hygiene performance rates were significantly higher during a pandemic and lower during normal times[7].

Hand hygiene compliance was estimated to spike due to COVID-19 but would return to normal levels once it passed[8]. In this survey, the frequency of hand washing decreased after the reclassification of COVID-19, although it was impossible to determine whether it returned to the level before the COVID-19 pandemic.

2. Perception of the importance of infection-preventive behaviours

All perceptions of the importance of infection-preventive behaviours were lower after the reclassification of COVID-19 than one year before.

According to an opinion poll conducted by NHK in 2022, the number of people who answered that they were 'very worried' or 'somewhat worried' about the spread of COVID-19 decreased from 93% in 2020 to 84% in 2022[9]. By age group, the percentage decreased by 13 points, from 88% to 75%, in the 18–20 age group.

In a survey conducted by the Cabinet Office in April 2023, just before COVID-19 was reclassified, 24.4% of the participants said they would go more actively during the long holidays immediately after the revision than in the previous year[10]. By age group, 32.6% of the respondents in their 20s said they would go out more than in the previous year, which was the highest percentage among all age groups. After reclassification, 14.1% of the participants said they would like to reduce hygiene practices, such as hand washing and alcohol disinfection, and 32.1% of the respondents said they would like to reduce the use of masks. These results are consistent with those of this study.

By October 2023, the number of foreign visitors to Japan will have recovered to 2.51 million, nearly pre-pandemic levels[11]. This information indicates that not only Japanese citizens, but also foreign visitors are becoming more willing to go out in response to the abrogation of COVID-19 restrictions. This may be due to the impact of the reclassification of COVID-19 and the reaction to restrictions on movement owing to the prolonged pandemic.

3. Relationship between decreased infection-preventive behaviours and decreased perceptions

In this study, a correlation was found between the decreased perception of the importance of infection-preventive behaviours and their decreased frequency, as well as between the decreased perception of the importance of hand washing and its decreased frequency. A British study showed a correlation between COVID-19 risk perception and preventive behaviours in healthcare workers[13]. A longitudinal study of residents living in a region

with a contiguous experience, such as SARS pandemic also reported that lowered COVID-19 perception was significantly associated with decreased avoidance of social distancing behaviours[12]. Our results are insistent with these results. Our results are corresponding to these facts.

A study of Senegalese adults also showed that perceived risk of COVID-19 was a strong predictor of hand sanitizer use, social distance, staying at home, hand washing and mask use[14]. In a survey of university students including medical students, fear and knowledge of COVID-19 infection were positively correlated with preventive behaviors[15]. One survey of nursing students also found that the higher the level of anxiety, risk perception and health literacy, the better the practice of COVID-19 infection prevention[16]. Our results are consisted with these results.

Decreased perceptions of the importance of temperature measurement and indoor mask-wearing were significantly associated with decreased frequencies of infection-preventive behaviours other than going out and eating out. Hence, for medical university students to continue taking measures to prevent infection, it is desirable to maintain their perception of the importance of temperature measurement, which can help detect early signs of illness (i.e., fever), and to wear masks indoors to prevent droplet infections.

4. Prospects and challenges

A study on COVID-19 risk perception among Chinese university students[17] reported no significant difference in risk perception between medical and non-medical university students. Medical university students have more opportunities to interact with immunocompromised patients than young people of their age. Thus, even if the perception of infection prevention among the non-medical general population weakens due to the reclassification of COVID-19 and the relaxation of behavioural restrictions, medical students must remain aware of potential risks and the role of infection prevention. Medical universities must provide guidance in this direction. It is desirable to raise perceptions of temperature measurements and masks, which are related to various preventive behaviours.

This study had several limitations that should be considered. The affiliation and sex of the participants were combined and analysed as a single group. An earlier study reported that female university students and university students with a high level of knowledge had a high risk perception[18]; the nursing department is considered to have a high proportion of female students,

which might have led to selection bias. The answers were based on the memory of the respondent, which might have led to recall bias.

Despite these limitations, information on changes in infection-preventive behaviours and perceptions in medical university students after the reclassification of COVID-19 is important from a public health perspective for understanding the perspectives and approaches of the younger generation.

Conclusion

Among medical university students, preventive behaviors and perceptions regarding COVID-19 decreased after disease reclassification. As these students often encounter older adults and people who are at risk of becoming seriously ill, they should maintain infection-preventive behaviors and perceptions to prevent infectious diseases, even during normal times, as challenging as it may seem. Future studies are needed to clarify the factors that increase motivation for infection-preventive behaviors, taking gender into consideration.

Ethical Approval Statement

The research representative explained the research purpose and data response procedure to the target students, both verbally and in writing. She explained the purpose and methods of the study, the voluntary aspect of the participation, that academic performance or credit acquisition is not dependent on participation, and that no costs or compensation are offered. The target students decided whether to participate in the study and agreed to participate.

This study was reviewed and approved by the Ethical Review Committee for Human Research, Faculty of Wakayama Health Care Sciences, Takarazuka University of Medical and Health Care, Japan, No. 230530-1 (Received: 30 May 2023).

Author Contributions

YO designed the study and formulated the questionnaire items with guidance from IM. YO conducted the study under the supervision of IM. All authors have read and approved the manuscript prior to its submission for publication.

Acknowledgements

We express our gratitude to the medical university students for their contributions to this study.

We warmly thank for the valuable discussions and suggestions in the International Conference for Public Health, Environmental Health, and Education for Sustainable Development Goals and Lifelong Learning, held in Bangkok, Thailand in September. 2023

Source of Funding

The work presented in this article was self-funded.

Conflicts of Interest

The authors declare no conflicts of interest.

References

1. Ministry of Health, Labour and Welfare, Japan. Novel Coronavirus (COVID-19). Available from:https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/0000164708_00079.html, accessed 27 July, 2024.
2. Rosamaria F, Philipp K, Christian RK, Rolf K, Matthias H, Matthias S, et al. Hand hygiene adherence in relation to influenza season during 6 consecutive years. Am J Infect Control. 2018; 46(11): 1311-14. DOI: 10.1016/j.ajic.2018.04.203
3. Eva L, Matthias FC, Susanne G, Martina R, Falk Batz. Early and later perceptions and reactions to the COVID-19 pandemic in Germany: On predictors of behavioral responses and guideline adherence during the restrictions. Front Psychol. 2021; 12: 769206. DOI: 10.3389/fpsyg.2021.769206
4. Ministry of Health, Labour and Welfare, Japan. For prevention of COVID-19 infection. Available from: https://www.mhlw.go.jp/stf/covid-19/kenkou-iryousoudan.html#h2_1, accessed 27 July, 2024.
5. Dimitra K, Aleksandra H, Emma B, Natalie G, Lion S. Patterns and predictors of adherence to health-protective measures during COVID-19 pandemic in the UK: Cross-sectional and longitudinal findings from the HEBECO study. BMC Public Health. 2022; 22:2347:1-14. DOI: 10.1186/s12889-022-14509-7
6. Srivastava P. A survey on hand hygiene practices learnt from COVID-19 pandemic by urban population in west India. Int J Sci Res. 2022; 11(11): 57-9. DOI: 10.36106/ijsr/9807957
7. Xing Z, Yonghui M, Li K, Yusen L, Juan W, Ning L, et al. The impact of COVID-19 pandemic on hand hygiene compliance of healthcare workers in a tertiary hospital in East China. Front Med. 2023;10: 1-9. DOI: 10.3389/fmed.2023.1160828

8. Makhni S, Umscheid CA., Soo J, Chu V, Bartlett A, Landon E, et al. Hand hygiene compliance rate during the COVID-19 pandemic. JAMA Intern Med. 2021; 181(7): 1006-8. DOI: 10.1001/jamainternmed.2021.1429
9. NHK (Japan Broadcasting Corporation), Japan. NHK Poll: 84% Still "Concerned" 3 Years After New Corona First Confirmed in Japan. Available from: https://www3.nhk.or.jp/news/html/20230115/k10013950241000.html, accessed 27 July, 2024.
10. Cabinet Office, Japan. The 6th Survey on Changes in Attitudes and Behaviors Under the Influence of the New Type of Coronavirus Infection. Available from: https://www5.cao.go.jp/keizai2/wellbeing/covid/pdf/result6_covid.pdf, accessed 27 July, 2024.
11. NHK (Japan Broadcasting Corporation), Japan. Inbound Demand Nationwide Local Tourism Strategies to be Strengthened by The Japan Tourism Agency. Available from: https://www3.nhk.or.jp/news/html/20240105/k10014309421000.html, accessed 27 July, 2024.
12. Kim JH, Kwok KO, Huang Z, Paul KP, Kevin KC, et al. A longitudinal study of COVID-19 preventive behavior fatigue in Hong Kong: a city with previous pandemic experience. BMC Public Health. 2023; 23(618):1-12. DOI: 10.1186/s12889-023-15257-y
13. Schneider CR, Dryhurst S, Kerr J, Freeman ALJ, Recchia G, Spiegelhalter D, et al. COVID-19 risk perception: a longitudinal analysis of its predictors and associations with health protective behaviours in the United Kingdom. J Risk Res. 2021; 24: 294–313. DOI: 10.1080/13669877.2021.1890637
14. Kearney M, Bornstein M, Fall M, Nianogo R, Glik D, Massey P. Cross-sectional study of COVID-19 knowledge, beliefs and prevention behaviors among adults in Senegal. BMJ Open.2022; 12(5): e057914. DOI: 10.1136/bmjopen-2021-057914
15. Fatima M, Habib A, Khan S, Butt MH, Mallhi TH, et al. Knowledge, attitude, practice, behavior and risk perception of COVID-19 pandemic among medical and non-medical university students. Disaster Med Public Health Prep. 2022; 10:17: e101. DOI: 10.1017/dmp.2022.1

16. Park JH, Kim JH, Lee HJ, Kang P. The relationship of anxiety, risk perception, literacy, and compliance of preventive behaviors during COVID-19 pandemic in nursing students. J Kor Appl Sci Tech. 2021; 38(1):48–59. DOI: 10.1192/bjo.2021.954

17. Ding Y, Du X, Li Q, Zhang M, Zhang Q, Tan X, et al. Risk perception of coronavirus disease 2019 (COVID-19) and its related factors among college students in China during quarantine. PLoS ONE. 2020; 15(8): 1-13. DOI: 10.1371/journal.pone.0237626

18. Adachi M, Murakami M, Yoneoka D, Kawashima T, Hashizume M, Sakamoto H, et al. Factors associated with the risk perception of COVID-19 infection and severe illness: A cross-sectional study in Japan. SSM Popul Health. 2022; 18: 101-5. DOI: 10.1016/j.ssmph.2022.101105