

Behavior of Face Mask Wearing and Disposal during the Surveillance of Endemic COVID-19: A Study in Middle and High School Students in Thailand

Chulathep Silapanuntakul

Suankularb Wittayalai School, Bangkok, Thailand

DOI: <https://doi.org/10.5281/zenodo.7546799>

Published Date: 18-January-2023

Abstract: Background: The outbreak of COVID-19 disease has now been announced for the surveillance in the endemic period. Wearing the face mask is still the mandate of the student levels in Thailand.

Purpose: The objective of the study was conducted to investigate the behavior of face mask wearing and the disposal during the surveillance of covid-19 in the middle and high school students in Thailand.

Methodology: The study was carried out using a cross sectional online survey among the middle (Grade 7-9) and high school (Grade 10-12) students. A total of 188 students was participated in the study. The behavior of the face mask use and the disposal of the students was analyzed. The behavior of mask use related with the regular mask use, times of use, disposal methods, and opinion on impacts was analyzed by using Chi-square at the significant level of $p < 0.05$.

Findings: The study indicated that all students used the masks. The highest daily mask use of students averaged two (n=94, 50%) when they went to school. The majority of students (n=145,77.1%) were still be using the mask, even though it was during the COVID-19 surveillance period. Mainly, no specific infectious bins for collecting masks were provided at school or at home. The association of the behavior of disposal methods for used masks at school with the student levels was not observed. However, the behavior of disposal methods of used masks at home and the student levels was significantly related ($p = 0.001$). The middle school student (Grade 7-9) showed the better responsibility of sorting and throwing the waste into the infectious waste bin than the high school student (Grade 10-12). In addition, the misunderstanding of no impact of the improper mask waste disposal was still observed among the middle and high school students.

Conclusions: A total of 188 students, middle school students (Grade 7-9) and high school students (Grade 10-12), participated in this research. The result indicated that the students used the mask both at school and at home. The disposal of used masks at school or at home was improper due to the unavailability of used mask bins. The middle school student (Grade 7-9) had a better responsibility of sorting and throwing infectious waste into the infected waste bin than the high school student (Grade 10-12). The misunderstanding of no impact of the improper mask waste disposal was observed among the middle and high school students. The additional knowledge of infectious waste in class and the preparation of specific waste bins at school and at home are essential.

Keywords: COVID-19, Surveillance, Endemic Period, Face Mask Wearing, Mask Disposal, Middle and High School Student.

1. INTRODUCTION

The outbreak of the COVID-19 emerging disease has been widely spread in countries and resulted in illnesses and deaths. The World Health Organization has pronounced the novel Coronavirus (COVID-19) outbreak worldwide pandemic in March 11, 2020 [1]. Since the COVID-19 pandemic started, over 6.7 million people in the world and over 33 thousand

people in Thailand have died from the disease [2]. It has been reported that several severities of outbreak waves have continuously appeared to cause people death across countries. However, at present, the severity of this COVID-19 outbreak has obviously reduced, resulting in the decrease of number of infections, illnesses and deaths from this disease. At this stage, the COVID-19 outbreak is categorized as an endemic. Therefore, Thailand has then announced that COVID-19 is a communicable disease that must be under the surveillance since October 2022 [3].

Despite this announcement, the outbreak of COVID-19 in the country, however, still persists and people are required to follow the preventive measures set by the Ministry of Public Health such as the vaccination, wearing face mask, frequent hand washing, and physical distancing [4]. The use of face mask, mainly made from polypropylene, as the personal protective equipment advised by WHO and Ministry of Public Health [5] is one of the common preventive measures when is in public or in a crowded community or as the requirement of places. At school, wearing face mask is a mandate for Thai students to prevent from disease infection. The extensive use among students can widely be seen not only in Thailand but also in countries [6],[7]. Although, the COVID-19 outbreak is characterized as an endemic, the face mask will certainly be long used for students when in school as a new normal life to prevent themselves from the infection and the spread of disease. After the usage, the vast amount of mask waste will be generated and the proper disposal of used mask is very essential for protecting the deleterious effects on the environment and health implications due to the risk of contamination of used mask.

Therefore, the researcher was interested in investigating the behavior of face mask wearing and disposal during the surveillance of endemic COVID-19 among middle and high school students in Thailand. The outcome of this research is expected to further use as data for the management of used masks in the middle school and high school students of relevant agencies.

2. METHODS

Participants

This study is undertaken as a cross-sectional online survey. An online questionnaire was developed and available through Google form from August 1, 2022 to September 15, 2022. All students, middle school student (Grade 7-9) and high school student (Grade 10-12), from schools in Thailand were invited to participate in this study. The invitation was randomly sent through the social media groups. The study's objective was thoroughly explained to the students in the google form before they voluntarily and freely participated. Those who did not want to participate in the study might make their preference known, and the survey's collected data would not be used to compile the results. Furthermore, no any personal data were collected from the participant. A total of 188 of the 190 students agreed to participate in the study and were subsequently chosen for the data analysis.

Instrument

The questionnaire was developed through the review of literature about the situation of COVID-19 outbreak in Thailand and the practice of mask wearing as one of the preventive measures among students and people. The specific disposal of used masks as recommended by the Department of Health, Ministry of Public Health was also reviewed to construct the questionnaire. The drafted questionnaire was checked by the health expert from the Department of Health and the redundant or complicated question was deleted prior to the final use. The final version of questionnaire consisted of 17 questions, 6 about demographic data, 6 about the behavior of mask wearing of students, 3 about the disposal practice of students, and 2 about opinions of proper disposal practice of students.

3. STATISTICAL ANALYSIS

The data were analyzed using SPSS for windows, version 26. The demographic data, behavior of mask wearing, the disposal practice and opinions of practice was described using the descriptive statistics as a percentage. The relationship of the behavior of mask used or disposal or opinions and student levels was performed using Chi-square. The statistical significance was determined at $p < 0.05$.

Ethical Considerations

This research was an anonymous data collection method to collect the data from the middle school (Grade 7-9) and high school (Grade 10-12) students in Thailand through the use of google form. The invitation was sent to the social media

groups and the cooperation of schools. Information of research objectives and ethical guarantee of confidentiality and anonymity in the data collection were described. Participants were completely free and voluntary and no any personal data were collected from the participant.

4. RESULT

The demographic characteristics of the participants is presented in Table 1. Female participants are the majority in the study (n=119,63.3%) with the age of over 15 years (n=75,39.9%). The family consisted of 3-4 members (n=103,54.8%) and the highest number of student levels was observed in both Grade 9 and Grade 12 (n=46,24.5%, each). Most of the students were in the government school (n=152,80.9%) and lived in the central part (n=150,79.8%).

The study indicated that all students used the masks. The highest daily mask use of students averaged two (n=94, 50%). The main reason to use the face mask of students was the fear of COVID-19 infection (n=156,82.9%). The majority of students wore the face mask at school all the time (n=154,81.9%). Regarding the number of times of face mask use, most of them did not repeatedly use it (n=180, 95.7%). The study found that the majority of students (n=145,77.1%) were still using the mask, even though this was during the COVID-19 surveillance period. The main reason to use the mask, even during the COVID-19 surveillance period, was the fear of COVID-19 infection from the surrounding environment (n=12,66.5%) [Table 2].

Table 1: Demographic characteristics of the middle and high school students (n=188)

Demographic Characteristics	Response
	n (%)
Gender	
Male	69 (36.7)
Female	119 (63.3)
Age	
10-11 year	29 (15.4)
12-13 year	30 (16.0)
14-15 year	54 (28.7)
>15 year	75 (39.9)
Family member	
1-2	7 (3.7)
3-4	103 (54.8)
5-6	50 (26.6)
>6	28 (14.9)
Student levels	
Grade 7	27 (14.4)
Grade 8	14 (7.4)
Grade 9	46 (24.5)
Grade 10	25 (13.3)
Grade 11	30 (16.0)
Grade 12	46 (24.5)
Types of school	
Government	152 (80.9)
Private	36 (19.1)
Living place	
Central	150 (79.8)
North	16 (8.5)
Northeast	2 (1.1)
West	3 (1.6)
East	5 (2.7)
South	12 (6.3)

Table 2: Behavior of mask usage in the middle and high school students (n=188)

Items	Response
	n (%)
Average daily mask usage	
1	46 (24.5)
2	94 (50.0)
3	29 (15.4)
>3	19 (10.1)
Reasons to use the face mask	
Fear of Covid-19 infection	156 (82.9)
Requirement of various places that must be followed	27 (14.4)
Afraid that other people will be disgusted if not wearing it	3 (1.6)
Protect yourself and help protect others	2 (1.1)
When to use the mask	
When at school	154 (81.9)
When at school and at home	32 (17.0)
Number of times of mask use	
No repetition (single usage)	180 (95.7)
Multiple times until useless	8 (4.3)
Continuity of using the mask, even in the COVID-19 surveillance period	
Do not use	3 (1.6)
Use as usual	145 (77.1)
Use if necessary for preventing the COVID-19 virus	40 (21.3)
Reason for using the mask, even in the COVID-19 surveillance period	
Fear of COVID-19 infection because the virus still in the environment.	125 (66.5)
Accustomed to the face mask use.	57 (30.3)
Fear of COVID-19 infection and accustomed to face mask use.	6 (3.2)

The study found that the disposal of used masks at school was mainly discarded at the school waste bin or at the house bin (n=72,38.3%). Regarding the infectious waste bin at school, the study indicated that the specific waste bin was mainly not available (n=72, 38.3%). In addition, the disposal of the used mask at home was mainly carried out by dropping it into the general waste bin without sorting (n=102,54.3%) [Table 3].

The study revealed that the majority of students agreed with the proper disposal of used masks (n=183,97.3%). The main reason of the inappropriate disposal responded by the students was the increasingly capable of spreading the COVID virus into the environment (n=119,63.3%) [Table 4].

Table 3: Behavior of disposing the used masks at school and at home (n=188)

Items	Response
	n (%)
Practice of disposal of used masks at school	
Dispose at the school waste bin	61 (32.5)
Throw it into open area	1 (0.5)
Take back to dispose in the house	54 (28.7)
Dispose at the school waste bin or at the house bin	72 (38.3)
Availability of infectious waste bins at school	
Specific used mask bins are available	56 (29.8)
Only, general waste bins are available	60 (31.9)
No availability of specific used mask bins	72 (38.3)
Practice of disposal of used masks at home	
Separate dispose in the infected waste bin	86 (45.7)
Mix the waste in the general waste bin	102 (54.3)

Table 4: Opinions about the appropriate disposal of used mask at school and at home (n=188)

Items	Response
	n (%)
You agree to the proper disposal of used masks	
Agree	183 (97.3)
Disagree	5 (2.7)
The inappropriate disposal of used masks caused the problems	
Not at all	15 (7.9)
Capable of causing the microplastic problem in the environment	29 (15.5)
Increasingly capable of spreading the COVID virus into the environment	119 (63.3)
Increase in the waste quantity in the environment	25 (13.3)

The study found that the behavior of regular mask usage was not related to student levels ($p = 0.635$). This indicated that the regular mask wearing did not differ between student levels. Moreover, it was found that the behavior of repeated mask usage among student levels was not different ($p = 0.178$). In other words, the repeated wearing of the mask did not differ by student levels [Tables 5 and 6].

Table 5: Relationship between the behavior of regular mask usage and student levels

Student levels	Behavior of regular mask usage		Chi-Square test (Sig.)
	Use at school (n=156)	Use at home and school (n=32)	
Grade 7	14.7%	12.5%	3.309 (0.653*)
Grade 8	7.1%	6.2%	
Grade 9	22.4%	34.4%	
Grade 10	14.1%	9.4%	
Grade 11	17.3%	9.4%	
Grade 12	24.4%	28.1%	

*The significant level is determined at $p < 0.05$.

Table 6: Relationship between repeated mask usage behavior and student levels

Student levels	Behavior of repeated mask usage		Chi-Square test (Sig.)
	Used at school (n=156)	Used at home and school (n=32)	
Grade 7	15.1%	13.5%	7.635 (0.178*)
Grade 8	7.3%	9.6%	
Grade 9	24.5%	23.1%	
Grade 10	12.8%	12.1%	
Grade 11	16.8%	17.1%	
Grade 12	23.5%	24.6%	

*The significant level is determined at $p < 0.05$.

The study found that the behavior of disposal methods for used masks at school was not related to student levels ($p = 0.809$) [Table 7]. However, it was found that the behavior of disposal methods for used masks at home was significantly related to student levels ($p = 0.001$). This revealed that the Grade 7-9 student had a better responsibility of sorting and throwing infectious waste into an infected waste bin [Table 8]. In addition, the opinions on the impact of improper disposal of used masks were not related to the student levels ($p = 0.802$) [Table 9].

Table 7: Relationship between the behavior of disposal methods of used masks at school and student levels

Student levels	Behavior of disposal methods of used masks at school		Chi-Square test (Sig.)
	Threw it into the school waste bin (n=61)	Threw it in the waste bin of the school or the house. (n=72)	
Grade 7	16.4%	15.1%	6.071 (0.809*)
Grade 8	4.9%	6.8%	
Grade 9	24.6%	24.6%	
Grade 10	13.1%	11.0%	
Grade 11	19.7%	11.0%	
Grade 12	21.3%	31.5%	

*The significant level is determined at $p < 0.05$.

Table 8: Relationship between the behavior of disposal methods of used masks at home and student levels

Student levels	Behavior of disposal methods of used masks at home		Chi-Square test (Sig.)
	Not sorted and threw it into the general waste bin (n=86)	Sorted and threw it into the infectious waste bin (n=102)	
Grade 7	8.8%	20.9%	19.878 (0.001*)
Grade 8	3.9%	10.5%	
Grade 9	20.6%	29.1%	
Grade 10	18.6%	7.0%	
Grade 11	22.6%	8.1%	
Grade 12	25.5%	24.4%	

*The significant level is determined at $p < 0.05$.

Table 9: Relationship between opinions on the impact of improper disposal of used masks among middle and secondary school students

Student levels	Impact of improper disposal of used masks				Chi-Square test (Sig.)
	Cause of microplastics problem and pollution (n=29)	Increase of solid waste amount and pollution (n=25)	Increase in the COVID-19 distribution (n=119)	No impact (n=15)	
Middle school (Grade 7-9)	51.7%	44.0%	43.7%	53.3%	0.997 (0.802*)
High school (Grade 10-12)	43.3%	56.0%	56.3%	46.7%	

*The significant level is determined at $p < 0.05$.

5. DISCUSSION

The result in this study revealed that all students (middle and high school students) used the face mask when they went to school, and mainly two masks were used daily. The result confirmed that the face mask wearing practice was clearly due to the fear of COVID-19 infection, the requirement of places that needed to follow, and fear of disgusting by others. Although, the mask wearing in public was not necessary if it is not crowded according to the guidelines of the Ministry of Public Health [5]. However, the face mask wearing is a mandatory measure of the schools for the student to prevent the risk of COVID-19 infection in school [8]. This is because it is believed that the students have more chance to expose the COVID-19 disease easily since they have stayed in class at school quite a long time each day. This mask wearing behavior has, therefore, been a widespread preventive measure in all schools (both Public and Private) in Thailand. The similar practice has been observed in various schools in countries [6],[7]. Although, the mask wearing in some schools are not mandatory

such as in Europe [6]. The mask wearing behavior of the students is believed that this will be long carried out in Thailand even though the COVID-19 outbreak has been now under the surveillance approach. Regarding to the mask wearing practice of students, the large amount of used mask would certainly be produced since most of them used the mask single time every day to prevent from the risk of coronavirus infection. As a result, the huge amount of used waste mask that expected to occur was corresponded to the study of Sangkham[9].

In this finding, the daily production of the used masks would either dispose at the school bin or at the house bin. However, it is interesting to note that the specific infectious bins to collect masks at school or at home was mainly not available, thereby the mixing of wastes in general waste bin for the final disposal. If the used waste mask was not disposed of the proper method, this would undoubtedly cause the risk of viral distribution resulting in subsequent health implications. The improper disposal of used mask will also pose the deleterious impacts to the environment, particularly the microplastic and nano-plastic problem in the aquatic environment and food chain. The study of researchers [10], [11] indicated that the disposal of used face masks resulted in the release of micro-and nano-plastics and many heavy metals into environmental media. In this study, the student levels have mainly agreed with the proper disposal of used masks because they recognized that the inappropriate disposal of used masks would increasingly be capable of spreading the COVID-19 into the environment according to the considering as infectious waste [11]. This is due to the used mask waste may contain the droplets or secretions of the user. However, there are still quite a number of the students that disagreed and did not know the subsequent problems of the improper disposal of waste. The rationale is probably due to the lack of the infectious waste knowledge among them.

In this study, the association of the behavior of disposal methods for used masks at school with the student levels was not observed. This finding indicated that the student at levels realized the waste should be collected in the waste bin both at school and at home for the final disposal. However, the behavior of disposal methods of used masks at home and the student levels were significantly related ($p = 0.05$). The middle school student (Grade 7-9) showed the better responsibility of sorting and throwing the mask waste into the infectious waste bin than the high school student (Grade 10-12). This result is probably due to the stricter habit of lower educational student levels than the higher ones. However, in terms of knowledge, the study of Alves *et al* [12] found that the higher educational student levels understood about COVID-19 better than the lower ones.

Furthermore, regarding to the problems of the improper disposal of used masks, no relationship between opinions on the impact of improper disposal of used masks between student levels was noted. The percentage of no impact of improper disposal of used mask was quite high between the middle school student and high school student, indicating the misunderstanding of infectious waste knowledge among the middle and high school students. In contrast to the study towards knowledge, attitudes, and practices (KAP) in Chinese primary school students by Xue *et al*. [13] who found that relatively higher scores increases as the grade level increases. This misunderstanding of no impact of improper waste disposal was still observed in both middle school student and high school student, suggesting that the knowledge of the infectious waste impact should be added in the class.

6. CONCLUSION

A total of 188 students, middle school students (Grade 7-9) and high school students (Grade 10-12), participated in this research. The result indicated that the students used the mask both at school and at home. The disposal of used masks at school or at home was improper due to the unavailability of used mask bins. The middle school student (Grade 7-9) had a better responsibility of sorting and throwing infectious waste into the infected waste bin than the high school student (Grade 10-12). The misunderstanding of no impact of the improper mask waste disposal was observed among the middle and high school students. The additional knowledge of infectious waste in class and the preparation of specific waste bins at school and at home are essential.

REFERENCES

- [1] World Health Organization [WHO] Coronavirus disease (COVID-19) pandemic. Available at <https://www.who.int/europe/emergencies/situations/covid-19> [Cited on 2023 Jan 8].
- [2] Thailand COVID:33669 Deaths-Worldometer: Available at <https://www.worldometers.info/coronavirus/> [Cited on 2023 Jan 8].
- [3] Ministry of Public Health [MOPH]. Thailand Situation. Available from: <https://ddc.moph.go.th/viralpneumonia/eng/index.php> [Cited on: 2023 Jan 8].

- [4] Ministry of Public Health [MOPH]. Plan for COVID-19 after the dissolution of the Centre for the Administration of the Situation due to the Outbreak of the Communicable Disease Coronavirus 2019 (COVID-19). Available from : <https://ddc.moph.go.th/viralpneumonia/eng/index.php> [Cited on: 2023 Jan 9].
- [5] Ministry of Public Health [MOPH]. Advice for the public to prevent COVID-19 as it enters the post-pandemic phase (post-pandemic). Available from https://ddc.moph.go.th/viralpneumonia/file/int_protection/int_protection_220665.pdf [Cited on: 2023 Jan 9].
- [6] Ministry of Public Health [MOPH]. Guidelines for educational institutions In preventing the spread of COVID-19, Thailand. Available from <http://www.oic.go.th/FILEWEB/CABINFOCENTER17/DRAWER002/GENERAL/DATA0002/00002647.PDF> [Cited on: 2023 Jan 9].
- [7] Mail Online. Article : US is one of only SEVEN countries in the Western world making kids wear masks in schools . Available from <https://www.dailymail.co.uk/health/article-10187437/US-seven-countries-Western-world-recommending-kids-wear-masks-schools.html> [Cited on: 2023 Jan 12].
- [8] Kefalaki, M., Rudolph, J., Tan, S. & Diamantidaki, F. (2021). Face masks in education: The cases of Greece and Singapore. Thesis.,10: 3-42.
- [9] Sangkham, S. (2020). Face mask and medical waste disposal during the novel COVID-19 pandemic in Asia. CSCEE. 2: 100052.
- [10] Fadare, O. O., & Okoffo, E. D. (2020). Covid-19 face masks: A potential source of microplastic fibers in the environment. *Sci. Total Environ.* 737:140279.
- [11] Amuah, E. E. Y., Agyemang, E. P., Dankwa, P., Fei-Baffoe, B., Kazapoe, R. W., & Douti, N. B. (2022). Are used face masks handled as infectious waste? Novel pollution driven by the COVID-19 pandemic. *RCR Advances.* 13 : 200062.
- [12] Alves, R. F., Samorinha, C., & Precioso, J. (2020). Knowledge, attitudes and preventive behaviors toward COVID-19: a study among higher education students in Portugal. *J. Health Res.*, 35: 318-328.
- [13] Xue, Q., Xie, X., Liu, Q., Zhou, Y., Zhu, K., Wu, H., & Song, R. (2021). Knowledge, attitudes, and practices towards COVID-19 among primary school students in Hubei Province, China. *Child Youth Serv Rev.*, 120:105735.