


The Adverse and Advantage Effects of Wearing a Facemask in Thai Children: A Survey During the COVID-19 Pandemic

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Abstract

Background: There is little information on facemask use during the COVID-19 pandemic in the pediatric population. This became the main purpose of the present study to investigate demographic data of facemask wearing in children, types, and length of facemask, as well as the benefits, drawbacks, and negative consequences of facemask wearing in this population. **Methods:** A cross-sectional study was conducted using a structured questionnaire sent via Google Forms. Caregivers for consecutive convenience were asked in the survey (parents of children under the age of 18). **Results:** A total number of 706 children were enrolled. There were 320 boys (45.33%), and 386 girls (54.67%). The children's ages range between 4 months and 18 years, with a median age of 9 years. A surgical mask (549, 77.76%) was the most frequent type of facemask in the study population, followed by a cloth mask (86, 12.18%). Facemasks have been shown to be beneficial in the pediatric population. When compared to a former time when facemasks were not used routinely, there were considerably fewer respiratory infections, reduced diarrhea symptoms, and a drop in hospital admissions. In 317 cases (44.9%), children were shown to have negative consequences from wearing facemasks. The most prevalent adverse effect observed in the study population was non-cutaneous (respiratory discomfort/breathing difficulty) which were found in 240 cases (33.99%). Double masking method (surgical + surgical) and wearing a facemask oversize revealed a higher risk in the presence of facemask adverse effects, whereas wearing a proper size facemask reduces the risk of adverse effects from facemask use in children (Adjusted OR [95% CI] = 0.55 [0.38-0.78], *P*.0003). **Conclusions:** Wearing a proper-size facemask reduces the risk of adverse effects from facemask use in children. The future suggestion of an appropriate facemask size for a certain age will aid in the avoidance of facemask adverse effects in the pediatric population.

Keywords

adverse effect, children, COVID-19, facemask

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Background

Since the COVID-19 pandemic in late 2019, wearing a facemask is one of several preventative strategies, including social distancing, hand hygiene,¹ and other protective equipment against the transmission of COVID-19 viruses. Wearing a public facemask has been stated to be a new typical behavior in several nations throughout the world, including Thailand.

Long-term facemask use resulted in a variety of facemask consequences during the COVID-19 outbreak. The adverse effects of facemask wearing were primarily identified in health care personnel, who had a lengthy contact time with

the facemask; nevertheless, the general adult population was also harmed since facemask wearing was made a national policy. In children, there was scant evidence of using facemasks.^{2,3} There was no standard guideline, and decisions concerning mask use in children should be based on what is best for the child. The use of facemasks in children may have

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both advantages and downsides. The possible benefits clearly include a lower chance of COVID-19 in the child as well as a lower risk of other respiratory infections. However, it is crucial to remember that children may experience disadvantages when wearing a facemask. Children with cognitive or respiratory impairments, developmental disorders, disabilities, or other specific health conditions who experience difficulties wearing a mask or have health conditions that interfere with mask-wearing should not be required to wear a mask.^{4,5} Another important problem concerning facemask use in children is conjecture and concern about the effects of mask-wearing on emotional communication, particularly during a child's developmental milestone.^{2,6} According to the World Health Organization (WHO), facemasks should not be worn by children under the age of 5 since they may not be able to do so adequately without assistance or supervision.⁵ However, in reality, Thai children of all ages, including infants appear to wear facemasks in public indoor and outdoor areas. Despite the fact that numerous studies have shown many aspects of facemask usage influence on the general adult population,⁷⁻¹⁰ there is relatively little information on children. This became the main purpose of the present study to investigate demographic data of facemask wearing in children, types, and length of facemask, as well as the benefits, drawbacks, and negative consequences of facemask wearing in this population.

The findings may help to guide future facemask use among the pediatric population in terms of proper facemask use and potential risk factors for associated facemask adverse reactions.

Materials and Methods

This was a cross-sectional study undertaken at Khon Kaen University's Faculty of Medicine in Thailand between September 1, 2021, and April 30, 2022. All caregivers (parents) with children under the age of 18 were eligible. The study sought for consecutive convenience caregivers from the Faculty of Medicine at Khon Kaen University.

The data was collected using a structured questionnaire using Google form, with the main goal of finding the benefits and drawbacks of facemask use in children. The demographic background information provided in the questionnaire included age, sex of both caregivers and the dependent kid, overall condition of the child, and underlying illnesses. A structured questionnaire was also used to address the potential risk factors of adverse responses on the skin covered by the facemask, such as the type of facemask, average duration of facemask wearing per day, and underlying skin issues prior to the facemask wearing policy.

The study was approved by the institutional review board (IRB) of the Khon Kaen University, Human Research Ethics Committee (#HE641399). The study was funded by

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Statistical Analysis

At the end of the study, the collected data were analyzed using STATA software version 10 (StataCorp LP). Descriptive statistical methods, means, standard deviations (SDs), medians, and frequencies were used to analyze the demographic data. Univariate and multivariate logistic regression analyses were performed to test the associations between the proposed factors and adverse reactions from facemask wearing. Values of $P < .05$ were considered to indicate statistical significance. Incomplete surveys and missing data were handled as imputed data, and final calculations took into account all recorded data.

Results

A total of 706 caregivers (parents) were enrolled. The parents' average age was 37.67 (SD 9.93). The majority of the parents (587 cases, 83.14%) did not work in the healthcare field. There were 320 boys (45.33%), and 386 girls (54.67%) in the study population. The ages of the children ranged from 4 months to 18 years, with a median age of 9 years. The age was classified into 5 age group; infants (<1 year), 55 cases (7.79%); toddlers (1-<3 years), 103 cases (14.59%); preschool age (3-5 years), 61 cases (8.64%); school age (6-12 years), 291 cases (41.22%); and adolescent (12-18 years), 196 cases (27.76%). Table 1 displays the demographic data of the study population.

The most common type of facemask in the study population was a surgical mask (549 cases, 77.76%), followed by a cloth mask (86 cases, 12.18%). Wearing a single layer of facemask (surgical, cloth, and N95) was the most prevalent (647, 91.64%), while double masking, (surgical + surgical; 48 cases, 6.8%, and surgical + cloth; 11 cases, 1.56%) were less common. The majority of the population wore a child-sized facemask; 332 cases (47.03%). Two hundred forty-one cases (34.14%) utilize an adult facemask, while 133 cases (18.84%) use an adult facemask that has been physically tugged in side-edges.

The majority of the children in the study population wore facemasks for an average of 2 to 4 h per day, (341 cases, 48.30%), followed by less than 1 h per day (198 cases, 28.05%). In 111 instances (15.72%), the average duration of facemask wearing was 4 to 6 h per day, with 56 cases (7.93%) reporting more than 6 h per day.

The following factors played a role in the choice to not wear a facemask in children: breathing difficulty (387 cases), feeling hot and humid (309 cases), uncooperative child (156 cases), and facemask itching (111 cases). Only 10 cases in the pediatric population were concerned about the safety of using a facemask. Figure 1 depicts the reasons

Table 1. Demographic Data of the Caregivers (Parents) and the Study Population.

Variables	Number	Percentage
<i>Participants (parents)</i>		
Age (years)		
Mean \pm SD		37.67 \pm 9.93
Median (min, max)		38 (24, 66)
Occupation		
Healthcare worker (HCW)	119	16.86
Non-health care worker	587	83.14
Level of education		
High school	362	51.27
Vocational certificate/Bachelor's degree	269	38.10
Master's degree/Doctoral degree	75	10.62
Average income/month (Thai Baht)		
Less than 15 000	219	31.02
15 000-30 000	312	44.19
30 000-50 000	86	12.18
50 000-100 000	71	10.06
More than 100 000	18	2.55
<i>Target population (children)</i>		
Gender		
Boy	320	45.33
Girl	386	54.67
Age		
Mean \pm SD		8.60 \pm 5.46
Median (min, max)		9.00 (0, 18.92)
Infant (<1 year)	55	7.79
Toddler (1-<3 years)	103	14.59
Preschool age (3-5 years)	61	8.64
School-age (6-<12 years)	291	41.22
Adolescent (12-18 years)	196	27.76
Types of facemasks		
Surgical mask	549	77.76
Cloth mask	86	12.18
Surgical + cloth-filtered mask	23	3.26
N95	48	6.80
Facemask wearing method		
Single layer (surgical mask)	514	72.80
Single layer (cloth mask)	82	11.61
Single layer (N95)	51	7.22
Double layers (surgical + surgical)	48	6.80
Double layers (cloth + surgical)	11	1.56
Size of facemask		
Adult facemask (fit to the child's face)	241	34.14
Adult facemask (doesn't fit the child's face)	133	18.84
Children facemask	332	47.03
Timing of facemask wearing		
Public indoor area	44	6.23
Public outdoor area	623	88.24
Public indoor and outdoor area	39	5.52
The average duration of facemask wearing/day		
<1 h	198	28.05
2-4 h	341	48.30
4-6 h	111	15.72
>6 h	56	7.93

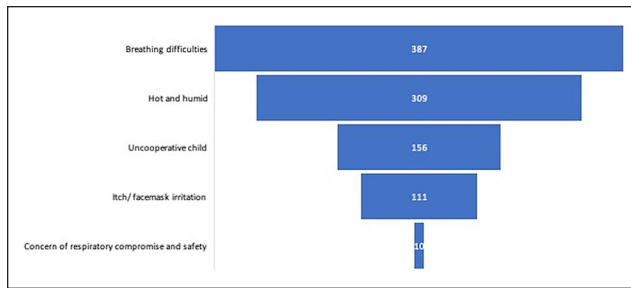


Figure 1. The reasons why the study population's caregivers did not choose to put facemasks on their children.

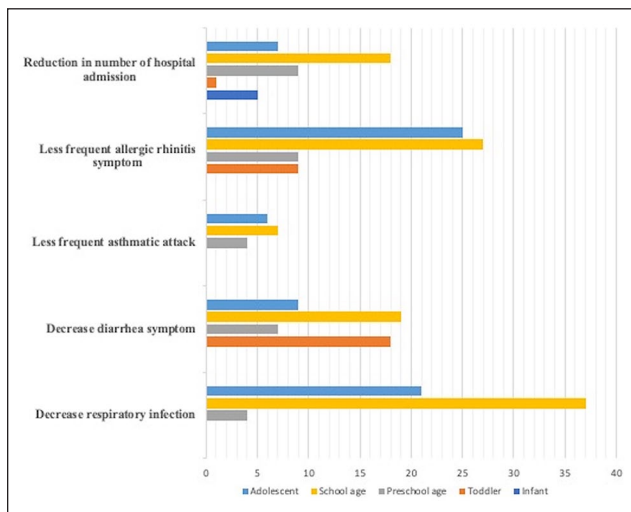


Figure 2. The advantages of wearing a facemask during COVID-19 pandemic in the study population when compared to a former time when facemasks were not used routinely.

why the study population's caregivers did not choose to put facemasks on their children.

Figure 2 depicts the advantages of wearing a facemask in the study population. When compared to a former time when facemasks were not used routinely, there were considerably fewer respiratory infections (42 cases, 5.95%), a lower incidence of diarrhea (7 cases, 0.99%), a decrease in allergic symptoms (102 cases, 14.45%), and a reduced number of hospital admissions during the study period (27 cases, 3.82%).

In 317 cases (44.9%), children were shown to have negative consequences from wearing facemasks. The authors grouped the adverse effects of wearing a facemask into 2 categories: (1) cutaneous adverse effects (itch symptoms, rash, pressure effects, and acne), and (2) non-cutaneous adverse effects (breathing difficulty). The most prevalent adverse effect observed in the study population was non-cutaneous (respiratory discomfort/breathing difficulty) which was found in 240 cases (33.99%). Table 2 depicts the

adverse effect of facemask use in the study population by different age groups. The presence of itchy symptoms, rashes on the face, and acne were the cutaneous adverse effects of facemask use that were shown to be significantly higher in the adolescent group, $P < .05$, Table 2.

Multiple logistic regression was used to examine the risk factors for facemask adverse reactions. Adolescents (12-18 years) showed a higher rate of adverse reactions to facemasks than other age groups (Crude OR [95% CI]=1.72 [0.94-3.15], $P = .0003$). From bivariate analysis, double masking method (surgical + surgical) and wearing facemask oversize revealed a higher risk in the presence of facemask adverse effect, crude OR (95% CI)=2.38 (1.28-4.41), $P = .04$, and crude OR (95% CI)=1.08 (0.71-1.65) $P = .0002$, Table 3.

Significant risk variables identified in bivariate analysis were examined further in multivariate regression. The results showed that wearing a proper-size facemask in children reduced the risk of adverse effects from facemasks in the study population, adjusted OR (95% CI)=0.55 (0.38-0.78, $P = .0003$), Table 4.

Discussion

During the COVID-19 pandemic, the customary suggestion of wearing a facemask at a specified age, particularly in children, is still controversial. The majority of recommendations focus on young children using facemasks that should be worn under supervision. The American Academy of Pediatrics (AAP) recommends that children under the age of 2 should not wear any type of mask because their airways are still so restricted that they can struggle to breathe.^{11,12} While the WHO recommends against using facemasks in children aged 5 and younger because they may not be able to appropriately wear a mask without aid or supervision.⁵ However, in reality, Thai children of all ages, including infants appear to wear facemasks in public indoor and outdoor areas. The present study also revealed that more than a quarter (219 cases, 31.01%) of the study population who have used facemasks on a regular basis were under the age of 5. This finding indicated that the awareness of the negative impacts of wearing a facemask among children was underestimated. As a result, physicians and healthcare providers should continue to educate and make public announcements regarding the proper use of facemasks, particularly in young children who require constant monitoring.

Having children wear facemasks may have both advantages and disadvantages. The possible benefits clearly include a lower chance of COVID-19 in the child as well as a lower risk of disease transmission.¹³⁻¹⁵ The present study also demonstrated that wearing a facemask in children had some benefits when compared to a former time when facemasks were not used routinely in terms of reducing several communicable infectious diseases, such as a reduction in

Table 2. Facemask Adverse Effect Among Different Age Groups.

Variables	(n=706)	Age group					P-value
		Infant <1 year (n=55)	Toddler 1-<3 years (n=103)	Preschool 3-<5 years (n=61)	School 5-12 years (n=291)	Adolescent 12-18 years (n=196)	
<i>Cutaneous adverse effect</i>							
Itch symptom							.002
Absent	643 (91.08)	44 (80.00)	94 (91.26)	59 (96.72)	274 (94.16)	172 (87.76)	
Present	63 (8.92)	11 (20.00)	9 (8.74)	2 (3.28)	17 (5.84)	24 (12.24)	
Rash on the face							<.001
Absent	657 (93.06)	53 (96.36)	103 (100)	60 (98.36)	277 (95.19)	164 (83.67)	
Present	49 (6.94)	2 (3.64)	0 (0)	1 (1.64)	14 (4.81)	32 (16.33)	
Rash behind the ears							.486
Absent	701 (99.29)	55 (100)	103 (100)	61 (100)	289 (99.31)	193 (98.47)	
Present	5 (0.71)	0 (0)	0 (0)	0 (0)	2 (0.69)	3 (1.53)	
Pressure effect							.513
Absent	642 (90.93)	49 (89.09)	94 (91.26)	54 (88.52)	261 (89.69)	184 (93.88)	
Present	64 (9.07)	6 (10.91)	9 (8.74)	7 (11.48)	30 (10.31)	12 (6.12)	
Acne							<.001
Absent	591 (83.71)	49 (89.09)	97 (94.17)	61 (100)	268 (92.10)	116 (59.18)	
Present	115 (16.29)	6 (10.91)	6 (5.83)	0 (0)	23 (7.90)	80 (40.82)	
<i>Non-cutaneous adverse effect</i>							
Respiratory discomfort/breathing difficulty							<.001
Absent	466 (66.01)	45 (81.82)	86 (83.50)	39 (63.93)	181 (62.20)	115 (58.67)	
Present	240 (33.99)	10 (18.18)	17 (16.50)	22 (36.07)	110 (37.80)	81 (41.33)	

respiratory infection, a lower incidence of diarrhea, and a reduced number of hospital admissions during the study period. However, these revealing benefits were based on caregiver perceptions and did not include references to the participants' data sources. Furthermore, various COVID-19 preventive strategies such as hand hygiene, social distancing, and homeschooling can be ascribed to this impact. As a result, during this pandemic, the potential advantages and downsides of wearing facemasks in children should be considered.

Wearing facemasks may have an impact on children's social interactions.¹⁶ While substantial research has documented to demonstrate how children understand emotions from facial expressions and how this capability affects children's social and academic competence. A recent study found that, while children may encounter certain difficulties as a result of people wearing masks, they are still capable of making accurate inferences about emotions, even when parts of the faces were covered. In combination with other contextual clues, masks are unlikely to dramatically impair children's social interactions in their everyday lives.⁶

In the study population, 317 children had overall adverse effects from wearing a facemask (44.9%). The present study divided facemask-related adverse effects into 2 categories: (1) cutaneous adverse effects (itch symptoms, rash, pressure effects, and acne), and (2) non-cutaneous adverse

effects (breathing difficulties). The most common adverse effect among children was breathing difficulties (240 cases, 33.99%), which contrasts with the most common facemask adverse effect in adults, which was a cutaneous adverse reaction.^{9,10}

The use of a facemask was associated with an increase in adverse cutaneous effects. In the adult Thai population, the timing of more than 8 h per day enhanced the risk of unpleasant cutaneous adverse reactions.⁹ The present study discovered that the average duration of facemask wear in children was 2 to 4 h per day, which was much less than that of adults. As a result, it appears that cutaneous adverse reactions are less common in this study. The authors conducted a sub-analysis and observed that adolescents were more likely than younger age groups to experience cutaneous adverse reactions from facemasks, OR (95% CI)=1.72 (0.94-3.15), $P=.0003$. This result might be related to a similar cause of prolonged usage of facemasks during the day since the average length of facemask used in adolescents was greater each day compared to younger age groups.

Double masking resulted in significant improvements in overall fitted filtration efficiency (FFE).¹⁷ Despite having a greater protective barrier against COVID-19 infection, the present study found that it increases the risk of facemask adverse reactions by 2.38 times compared to the other technique of facemask wearing, 95% CI=1.28 to 4.41, $P=.04$

Table 3. Bivariate Analysis of Risk Variables for Facemask Adverse Reactions in the Study Population.

Variables	Adverse effect		Crude odds ratio	95% CI	P-value*
	Present(n= 317)	Absent(n= 389)			
The average duration of facemask wearing (h/day)					.08
<1	81 (25.55)	117 (30.08)	1.00		
2-4	149 (47.00)	192 (49.36)	1.12	0.79-1.60	
4-6	62 (19.56)	49 (12.60)	1.83	1.14-2.92	
>6	25 (7.89)	31 (7.97)	1.16	0.64-2.12	
Types of facemask					.81
Surgical mask	250 (78.86)	299 (76.86)	1.00		
Cloth mask	39 (12.30)	47 (12.08)	0.99	0.63-1.57	
Surgical + cloth mask	9 (2.84)	14 (3.60)	0.77	0.33-1.81	
N95	19 (5.99)	29 (7.46)	0.78	0.43-1.43	
Method of facemask wearing					.04
Single layer (surgical mask)	223 (70.35)	291 (74.81)	1.00		
Single layer (cloth mask)	35 (11.04)	47 (12.08)	0.97	0.61-1.55	
Single layer (N95)	25 (7.89)	26 (6.68)	1.25	0.71-2.23	
Double layers (surgical + surgical)	31 (9.78)	17 (4.37)	2.38	1.28-4.41	
Double layers (surgical + cloth)	3 (0.95)	8 (2.06)	0.49	0.13-1.87	
Size of facemask					.0002
Fit adult facemask	124 (39.12)	117 (30.08)	1.00		
Oversize (adult facemask + manual tug-in)	71 (22.40)	62 (15.94)	1.08	0.71-1.65	
Fit children mask	122 (38.49)	210 (53.98)	0.55	0.39-0.77	
Age group					.0003
<1 year	24 (7.57)	31 (7.97)	1.00		
1-<3 years	32 (10.09)	71 (18.25)	0.58	0.30-1.15	
3-<5 years	26 (8.20)	35 (9.00)	0.96	0.46-2.00	
5-12 years	123 (38.80)	168 (43.19)	0.95	0.53-1.69	
>12-18 years	112 (35.33)	84 (21.59)	1.72	0.94-3.15	

*P-value from partial likelihood ratio test.

Table 4. Multivariate Analysis of Risk Variables for Facemask Adverse Reactions in the Study Population.

Variables	Adjusted odds ratio	95% CI	P-value*
The average duration of facemask wearing (h/day)			.1115
<1	1.00		
2-4	0.98	0.68-1.41	
4-6	1.57	0.97-2.54	
>6	0.78	0.42-1.47	
Size of facemask			.0003
Fit adult facemask	1.00		
Oversize (adult facemask + tuck inside-edges)	1.13	0.74-1.74	
Fit children mask	0.55	0.38-0.78	

*P-value from partial likelihood ratio test.

(Table 3). As a result, optimal facemask usage among children should be addressed in order to reduce the risk of adverse consequences from facemask use in this population.

It is apparent that having one universal facemask for all patients would be practically difficult, and there is no most effective mask size for the entire population.¹⁸ This issue

also occurred, particularly among the pediatric population who primarily used standard adult size, which is oversize for children. Wearing an oversized mask can result in leakage, which primarily occurs near the chin due to the oversized mask sagging below the chin. Tucking in the side edges can reduce leakage area, but it can also result in wider gaps.¹⁸

Before the proper children's facemask size was widely available on the market, children frequently used manual tucking in of the mask's side edges. Aside from reducing one's effectiveness to protect against respiratory infections due to leakage, a large facemask might cause cutaneous unpleasant reactions due to friction and skin irritation. Therefore, choosing the proper size of facemask may reduce this possible unpleasant adverse reaction. The present study also discovered and found evidence supporting that wearing an appropriate size of a facemask in children reduced the risk of adverse reactions from wearing a facemask, adjusted OR=0.55, 95% CI=0.38 to 0.78, $P < .0003$. As a result, when there is an indication to wear a facemask in children, selecting an appropriate size of facemask will reduce the risk of facemask adverse reactions in the pediatric population.

Limitation

The study's limitations include low participation rates among those contacts, as well as the fact that it was performed in Thailand, where attitudes toward mask-wearing differ significantly from those in western societies.

Conclusion

Non-cutaneous adverse reactions, particularly breathing difficulties, were revealed to be the most prevalent adverse result of facemask usage in the pediatric population. Wearing an appropriate size facemask reduces the risk of adverse effects from facemask use in children (adjusted OR [95% CI]=0.55 [0.38-0.78], $P .0003$). As a result, when it is indicated to wear a facemask, especially during the ongoing COVID-19 pandemic, selecting a proper size of facemask will reduce the incidence of facemask adverse effects in the pediatric population.

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