



Enhancement of Hand Hygiene and Face Mask Use during COVID-19 Pandemic among K-12 Schools' Teachers

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ABSTRACT

Background: Teachers can play role models in following COVID-19 preventive measures and can act as supervisors ensuring students application of these measures. The practice of hand hygiene and mask use should be correct to achieve the desired effect. **Objective:** To assess the effect of health education intervention on Knowledge, Attitudes, Practices (KAP) of K-12 schools' teachers as regards hand hygiene and mask use. **Methods:** Interventional study was conducted from March 2021 to July 2021 on 98 teachers from K-12 schools in Zagazig city, Sharkia Governorate, Egypt. Participants were given health education intervention including practical training and eliminating barriers to hand hygiene and mask use. The effect of intervention was assessed through KAP questionnaire and observation checklist. **Results:** Following intervention, the percent of participants who achieved satisfactory knowledge, positive attitude, satisfactory self-reported and observed practices related to hand hygiene had increased from 33.7%, 34.7%, 29.6% and 32.6% to 67.4%, 84.7%, 72.4 and 76.5% respectively and that related to face mask use had increased from 29.6%, 46.9%, 37.7% and 28.6% to 78.6%, 85.7%, 72.5% and 69.4% respectively, most barriers to hand hygiene and face mask use had significantly decreased. Despite positive correlation between post intervention knowledge, attitudes and practices related to hand hygiene and mask use, there were insignificant associations between them and all participants characteristics except association of satisfactory observed practices with gender, marital state, and social class. **Conclusion:** Health education intervention was effective in improving knowledge, attitudes and practices related to hand hygiene and mask use among K-12 schools' teachers.

INTRODUCTION

Since SARS-CoV-2 (COVID-19) has been declared as a global pandemic by the World Health Organization (WHO) on 11 March 2020,¹ the education of an estimated 1.54 billion children worldwide has been affected.² Schools closure has negative impacts not only on learning outcomes but also on children's health and wellbeing.³ So, schools reopening is critical which necessitates orientation training of all school staff and students about the prevention and control measures of COVID-19 infection.⁴ This orientation training makes them aware of their specific role in prevention and

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control of COVID-19 and counters rumors and misleading information.⁵

A key lesson learned during the pandemic, is the important role of teachers in ensuring that learning process continues as well as the special importance of face-to-face communication in learning of children and adolescents from kindergarten to grade 12 (K-12) schools which necessitates schools reopening.⁶ As teachers, knowing the facts about COVID-19 infection will not only protect themselves but also their students. If teachers adhere to COVID-19 prevention and control measures, they will decrease the sources of infection in indoor school environment so they will protect their students. Protection of students will lead in its turn

to protection of their families as studies proved that children and adolescents act as silent sources of infection that can transmit COVID-19 infection to others while they are commonly asymptomatic or have mild, non-specific symptoms.⁷ Furthermore, the teachers can play role models in following the preventive measures and can act as supervisors ensuring students understanding and application of these measures.⁶

Health organizations worldwide recommend hand hygiene and face mask use as the simplest, cheapest and most effective interventions for protecting oneself and preventing the spread of respiratory infections including COVID-19 provided that the practice of these healthy behaviors should be correct to achieve the desired effect and to avoid being causes of increased rate of infection through giving a false sense of security.^{8,9,10} Previous researches revealed that proper hand hygiene is not as widespread as desired in technique and frequency worldwide.¹¹ while to date, public knowledge on the practice and technique of using face mask remains inconclusive.¹² So, the research question of this study was whether the health education intervention would be effective in improving Knowledge, Attitude, Practice (KAP) of K-12 schools' teachers as regards hand hygiene and face mask use so they could spread these healthy behaviors as social norms in their schools and subsequently to whole community. The research hypothesis was health education intervention would improve (KAP) of K-12 schools' teachers as regards hand hygiene and face mask use. The study objective was to assess the effect of health education intervention on KAP of K-12 schools' teachers as regards hand hygiene and face mask use.

METHOD

An intervention (one group pretest-posttest) study was conducted at K-12 schools in Zagazig city, K-12 schools' teachers were the target group for this study. Inclusion criteria included school teachers working in the chosen schools, available during the study period, and willing to take part in the study were incorporated.

The sample size was calculated by Epi info version 6 software program, using the following data: the percent of teachers with satisfactory knowledge about face mask use was increased from 32% before health education to 65% after health education according to pilot study, two-sided

confidence level of 95% and power of 80%, so the calculated sample size was 82 teachers. Taking into consideration 20% drop out, the sample was increased to 98 teachers. The sample was chosen by multistage random sampling technique. First stage; There are two educational districts (East and West) in Zagazig city, one of them was chosen randomly. Second stage; One school from each level (primary including kindergarten, preparatory and secondary) was selected randomly from the chosen district. Third stage; nearly equal number of teachers (33 from primary school, 33 from preparatory school and 32 from secondary school) was selected by simple random sampling technique using the teachers' attendance records and simple random tables.

Data collection tools: They were developed by the researchers as per the research objectives, previously validated relevant study tools, and Centers for Disease Control and Prevention (CDC) guidelines published during COVID-19 pandemic.¹³⁻¹⁴ The tools were tested for content validity by agreement of four experts in the fields of Community Medicine. The experts' responses were represented in four points rating score ranging from 4 to 1; 4=strongly relevant, 3= relevant, 2= little relevant, and 1= not relevant. In view of experts' conclusion, the validity of these tools was calculated and found to be 93% for the questionnaire and 98%for the observation checklist.

First tool: Knowledge, Attitude and Practice (KAP) Questionnaire: A self-administered questionnaire developed in Arabic language and divided into seven sections. *Section A:* Socio-demographic characteristics: It included age, sex, residence, marital state, social class which was calculated according to Fahmy Socioeconomic Level Questionnaire¹⁵, previous COVID-19 infection, and presence of chronic diseases. *Section B:* knowledge about hand hygiene: It comprised of 10 items covering methods and value of hand hygiene. Responses to these items were on a true/false basis, with an additional 'I don't know' option. Score "one" was given for each correct answer and score "zero" for incorrect answer or 'I don't know' option. The total knowledge score ranged from 0 to 10, with consideration of reaching more than 60% from total score as a satisfactory knowledge of hand hygiene. *Section C:* Attitude towards hand hygiene: It comprised of three items reflecting the

opinions of the participants about hand hygiene effectiveness, importance, and simplicity of its practice. Responses to these items were on a five-point Likert scale (Strongly disagree =1, Disagree=2, Neutral=3, Agree=4, strongly agree=5). The total attitude score ranged from 1 to 15, with consideration of reaching more than 60% from total score as a positive attitude towards hand hygiene. *Section D: Self-reported hand hygiene practice:* It included 18 items; 10 about key times to wash hands, four about additional times to wash hands during COVID-19 pandemic, and four about how to wash hand. Responses to these items were on a five-point Likert scale (Never=0, Rare=1, Sometimes=2, Often=3, Always=4). The total score ranged from 0 to 72, with consideration of reaching more than 60% from total score as a satisfactory self-reported hand hygiene practice. Additional item about reasons of skipping hand hygiene was added to this section in the form of multiple-choice question with the ability of the participants to choose more than one answer and to use the option "other" to allow them to express other non-mentioned reasons if they liked. *Section E: knowledge about face mask:* It comprised 10 items covering value, types, and when to use each type of face mask. Responses to these items were on a true/false basis, with an additional 'I don't know' option. Score "one" was given for each correct answer and score "zero" for incorrect answer or 'I don't know' option. The total knowledge score ranged from 0 to 10, with consideration of reaching more than 60% from total score as a satisfactory knowledge about face mask. *Section F: Attitude towards face mask use:* It included three items reflecting the opinions of the participants about face mask effectiveness, importance, and preference of its use. The responses were measured on a five-point Likert scale (Strongly disagree =1, Disagree=2, Neutral=3, Agree=4, strongly agree=5). The total attitude score ranged from 1 to 15, with consideration of reaching more than 60% from total score as positive attitude. *Section G: Self-reported face mask use practice:* It included 30 items; three about when to use face mask, six about how to select face mask, two about how to wear a face mask, seven about how not to wear a mask, three about how to take off a mask, four about how to clean, two about how to dry, and three about how to store. Responses to these items were on a five-point Likert scale (Never=0, Rare=1,

Sometimes=2, Often=3, Always=4). The total score ranged from 0 to 120, with consideration of reaching more than 60% from total score as a satisfactory self-reported face mask use practice. Additional item about reasons of skipping face mask use was added to this section in the form of multiple-choice question with the ability of the participants to choose more than one answer and to use the option "other" to allow them to express other non-mentioned reasons if they liked.

Second tool "Observational checklist": It was formed of two sections; one for assessing hand hygiene practice (11 items) and the other for assessing face mask use practice (11 items). The researchers assessed each item as achieved or not through direct observation. Score "one" was given for each achieved item and score "zero" for unachieved one. The total score for each section ranged from 0 to 11 and the observed practice was considered satisfactory if the participants achieved 100% of total score.

Phases of the research: The study included four phases. (1) *Pilot study:* It was conducted on 10 teachers who were excluded from the final analysis to test reliability of questionnaire and the applicability of intervention. Accordingly, unclear items of questionnaire were clarified through simplifying the language and shortening sentences. The Cronbach's alpha coefficient was calculated for each section: knowledge (0.74), attitude (0.63), and practice (0.82) of the questionnaire, indicating an acceptable internal consistency. (2) *Pre-intervention (assessment) phase:* It took one month where baseline knowledge, attitudes and practices regarding hand hygiene and face mask use during COVID-19 pandemic were assessed using the KAP questionnaire and the observational checklist. Data were collected through a face-to-face interview with the teachers then analyzed and used to guide designing the intervention. (3) *Intervention phase (training program):* It took one month, one day for each group. Its objective was to cover the gaps in the teachers' knowledge, attitudes and practices about hand hygiene and face mask use. The participants were divided into small groups. There were 11 participants in all groups except one group included 10 participants only. The training was conducted by the researchers through face-to-face communication in teachers' workplace at the school library. Each group attended two sessions per day;

Table (1): Teachers' knowledge, attitude, self-reported and observed practices regarding hand hygiene and face mask use before and after the intervention

Items	Before intervention		After intervention		McNemar test p value
	No=98	%	No=98	%	
Hand hygiene					
Knowledge:					
Satisfactory	33	33.7	66	67.4	<0.001*
Unsatisfactory	65	66.3	32	32.6	
Attitude:					
Positive	34	34.7	83	84.7	<0.001*
Negative	64	65.3	15	15.3	
Self-reported practice:					
Satisfactory	29	29.6	71	72.4	<0.001*
Unsatisfactory	69	70.4	27	17.3	
Observed practice:					
Satisfactory	32	32.6	75	76.5	<0.001*
Unsatisfactory	66	67.4	23	23.5	
Face Mask use					
Knowledge:					
Satisfactory	29	29.6	77	78.6	<0.001*
Unsatisfactory	69	70.4	21	21.4	
Attitude:					
Positive	46	46.9	84	85.7	<0.001*
Negative	52	53.1	14	14.3	
Self-reported practice:					
Satisfactory	37	37.7	71	72.5	<0.001*
Unsatisfactory	61	62.3	27	27.5	
Observed practice:					
Satisfactory	28	28.6	68	69.4	<0.001*
Unsatisfactory	70	71.4	30	30.6	

*Significant ($p < 0.05$)

each session took 45-60 minutes; the first one was theoretical and the second one was practical. The theoretical session covered the hand hygiene value, times, and methods. Additionally, face mask value, types, when to use, how to select, how to wear and how not to wear, how to take off, how to clean, how to dry, and how to store. In the practical session, the researchers demonstrate firstly the steps of how to wear and take off mask correctly and how to wash hand properly then asked each participant to repeat these steps with providing feedback on the participants performance. The training methods included viewing videos, practicing role plays, open discussion and answering questions. The content of training program was distributed after the end of the sessions in the form of printed colored handouts to facilitate the process of remembering when needed with distributing posters for hand hygiene and face

mask use everywhere in school. (4) *Post intervention (evaluation) phase:* It was conducted three months after the training program. It emphasized on estimating the effect of the training program through reassessing teachers' knowledge, attitudes and practices of hand hygiene and face mask use by the same data collection tools.

Statistical analysis: The collected data were analyzed by using SPSS (Statistical Package for the Social Sciences) program version 19.0 and the appropriate statistical tests including McNamar, Chi-square, Fisher exact and correlation co-efficient tests were performed. Excel program was used to draw graphs.

RESULTS

Regarding the sociodemographic characteristics of our participants, nearly half of them were males (57.1%) with mean age 44.7 ± 8.1 years, most of

Table (2): Correlation matrix between knowledge, attitude, and practice of school teachers regarding hand hygiene before and after the intervention

Items	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Knowledge about hand hygiene before intervention								
r		0.26	0.34	0.34	0.36	0.16	0.3	0.18
P	1	0.00*	0.00*	0.02*	0.00*	0.01*	0.7	0.24
(2) Attitude towards hand hygiene before intervention								
r	0.26		0.55	0.28	0.25	0.32	0.14	0.10
P	0.00*	1	0.00*	0.07	0.01*	0.00*	0.15	0.51
(3) Self-reported hand hygiene practice before intervention								
r	0.34	0.55		0.49	0.14	0.18	0.69	0.47
P	0.00*	0.00*	1	0.00*	0.13	0.07	0.00*	0.00*
(4) Observed hand hygiene practice before intervention								
r	0.34	0.28	0.49		0.35	0.10	0.63	0.53
P	0.02*	0.07	0.00*	1	0.02*	0.51	0.00*	0.00*
(5) Knowledge about hand hygiene after intervention								
r	0.36	0.25	0.14	0.35		0.27	0.27	0.29
P	0.00*	0.01*	0.13	0.02*	1	0.00*	0.00*	0.05
(6) Attitude towards hand hygiene after intervention								
r	0.16	0.32	0.18	0.10	0.27		0.09	0.26
P	0.01*	0.00*	0.07	0.51	0.00*	1	0.4	0.01*
(7) Self-reported hand hygiene practice after intervention								
r	0.3	0.14	0.69	0.63	0.27	0.09		0.5
P	0.7	0.15	0.00*	0.00*	0.00*	0.4	1	0.00*
(8) Observed hand hygiene practice after intervention								
r	0.18	0.10	0.47	0.53	0.29	0.26	0.5	
P	0.24	0.51	0.00*	0.00*	0.05	0.01*	0.00*	1

*Correlation is significant at the 0.05 level (2-tailed)

them were urban residents (79.6%) and married (72.5%) and nearly half of them were of middle social class (46.9%). Only (23.5%) had previous COVID-19 infection and (38.8%) had chronic diseases.

Table (1) shows that after the intervention, the percent of participants with satisfactory knowledge, positive attitude, and satisfactory self-reported practice related to hand hygiene had increased from 33.7%, 34.7% and 29.6% to 67.4%, 84.7%, and 72.4 respectively and that related to face mask use had increased from 29.6%, 46.9% and 37.7% to 78.6%, 85.7% and 72.5% respectively with statistically significant differences. Regarding the percent of participants with satisfactory observed practice related to hand hygiene, it had increased

from 32.6% to 76.5% while that related to face mask use had increased from 28.6% to 69.4% with statistically significant differences.

Figure (1) shows the main reasons of skipping hand hygiene. Before intervention, they were arranged as follow; costly antiseptics (86.7%), no need (82.6%), exhausting ideal practice (77.5%), no time (70.4%), inaccessible hand washing facilities (66.3%), forgetfulness (62.2%), unattractive/unclean hand washing facilities (53.2%) and skin irritation by hand hygiene agents (21.4%). After intervention, all reasons of skipping hand hygiene had significantly decreased except inaccessible, unattractive/unclean hand washing facilities and skin irritation by hand hygiene agents.

Table (3): Correlation matrix between knowledge, attitude and practice of school teachers regarding face mask use before and after the intervention

Items	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Knowledge about mask use before intervention								
r		0.04	0.19	0.193	0.43	0.08	0.36	0.36
P	1	0.7	0.06	0.03*	0.00*	0.41	0.00*	0.00*
(2) Attitude towards mask use before intervention								
r	0.04		0.52	0.31	0.60	0.69	0.54	0.43
P	0.7	1	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
(3) Self-reported mask use practice before intervention								
r	0.19	0.52		0.43	0.37	0.14	0.53	0.52
P	0.06	0.00*	1	0.00*	0.00*	0.16	0.00*	0.00*
(4) Observed mask use practice before intervention								
r	0.193	0.31	0.43		0.14	0.18	0.69	0.55
P	0.03*	0.00*	0.00*	1	0.13	0.07	0.00*	0.00*
(5) Knowledge about mask use after intervention								
r	0.43	0.60	0.37	0.14		0.47	0.36	0.58
P	0.00*	0.00*	0.00*	0.13	1	0.00*	0.00*	0.00*
(6) Attitude towards mask use after intervention								
r	0.08	0.69	0.14	0.18	0.47		0.54	0.43
P	0.41	0.00*	0.16	0.07	0.00*	1	0.00*	0.00*
(7) Self-reported mask use practice after intervention								
r	0.36	0.54	0.53	0.69	0.36	0.54		0.34
P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	1	0.00*
(8) Observed mask use practice after intervention								
r								
P	0.36	0.43	0.52	0.55	0.58	0.43	0.34	
	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	1

*Correlation is significant at the 0.05 level (2-tailed)

Figure (2) shows the main reasons of skipping face mask use. Before intervention, they were arranged as follow; expensive medical masks (92.9%), uncomfortable in hot and humid environment (88.7%), leads to difficult communication (83.6%), the unpleasant appearance of face masks (80.6%), forgetfulness (70.4%), feel of embarrassments it might cause people to criticize me about being in public while ill (62.2%), leads to headache and/or breathing difficulties (50%), uncomfortable with presence of glasses (44.3%), leads to facial skin lesions (15%) and makes me look unattractive (10%). After intervention, only the following reasons of skipping face mask use had significantly decreased; expensive medical masks, forgetfulness, feel embarrassed and uncomfortable with presence of glasses.

Table (2) shows a statistically significant positive correlation between knowledge, attitude, self-reported practice and observed practice related to hand hygiene before and after the intervention. Table (3) shows a statistically significant positive correlation between knowledge, attitude, self-

reported practice, and observed practice related to face mask use before and after the intervention.

Table (4) shows statistically insignificant associations between all participants characteristics and post intervention knowledge, attitude, self-reported and observed practices related to hand hygiene except gender and marital state where satisfactory observed practice was more among females and married participants. Table (5) shows statistically insignificant associations between all participants characteristics and post intervention knowledge, attitude, self-reported and observed practices related to face mask use except social class where satisfactory observed practice was more among participants of middle social class.

DISCUSSION

Our study showed that the health education intervention was effective in improving the knowledge, attitudes and practices related to hand hygiene and face mask use. This could be attributed to dependence of our study on identifying the barriers to these healthy practices and finding

Table (4): Relation between post intervention knowledge, attitude, practices related to hand hygiene and participants characteristics

Post intervention	Knowledge		Attitude		Self-reported practice		Observed Practice	
	Satisfactory N=66 (%)	Unsatisfactory N=32 (%)	Positive N=83 (%)	Negative N=15 (%)	Satisfactory N =71 (%)	Unsatisfactory N =27 (%)	Satisfactory N=75 (%)	Unsatisfactory N=23 (%)
Gender:								
Male (No=56)	40 (71.4)	16 (28.6)	46 (82.1)	10 (17.9)	37 (66.1)	19 (33.9)	36 (64.3)	20 (35.7)
Female (No=42)	26 (61.9)	16 (38.1)	37 (88.1)	5 (11.9)	34 (80.9)	8 (19.1)	39 (92.9)	3 (7.1)
χ^2 (P value)	0.99 (0.31)		0.65 (0.41)		2.6 (0.1)		10.9(0.00) *	
Residence:								
Urban (No=78)	51 (65.4)	27 (34.6)	71 (91.0)	7 (9.0)	54 (69.2)	24 (30.8)	63 (80.8)	15 (19.2)
Rural (No=20)	15 (75.0)	5 (15.0)	12 (60.0)	8 (40.0)	17 (85.0)	3 (15.0)	12 (60.0)	8 (40.0)
χ^2 (P value)	0.66(0.41)		(0.18) **		1.9 (0.15)		(0.07) **	
Marital status:								
Married (No=71)	45 (63.4)	26 (36.6)	61 (85.9)	10 (14.1)	53 (74.6)	18 (25.4)	50 (70.4)	21 (29.6)
Unmarried (No=27)	21 (77.8)	6 (22.2)	22 (81.5)	5 (18.5)	18 (66.7)	9 (33.3)	25 (92.6)	2 (7.4)
χ^2 (P value)	1.8 (0.17)		(0.54) **		0.62 (0.42)		5.3 (0.02) *	
Social class:								
Low (No=19)	16 (84.2)	3 (15.8)	18 (94.7)	1 (5.3)	17(89.5)	2 (10.5)	17 (89.5)	2 (10.5)
Middle (No= 46)	29 (63.1)	17 (36.9)	36 (78.3)	10 (21.7)	29 (63.0)	17 (37.0)	36 (78.3)	10 (21.7)
High (No=33)	21 (63.6)	12 (36.4)	29 (87.8)	4 (24.2)	25 (75.8)	8 (24.2)	22 (66.7)	11 (33.3)
χ^2 (P value)	3.0 (0.21)		3.2 (0.2)		4.9 (0.08)		3.6 (0.16)	
Previous COVID-19 infection:								
Yes (No=23)	12 (52.7)	11 (47.3)	18 (78.3)	5 (21.7)	14 (60.9)	9 (39.1)	18 (78.3)	5 (21.7)
No (No=75)	54 (72.0)	21 (28.0)	65 (86.7)	10 (13.3)	57 (76.0)	18 (24.0)	57 (76.0)	18 (24.0)
χ^2 (P value)	3.1 (0.07)		(0.33) **		2.0(0.15)		0.05 (0.82)	
Chronic disease:								
Present (No=38)	24 (63.2)	14 (36.8)	33 (86.8)	5 (13.2)	27 (71.1)	11 (28.9)	32 (84.2)	6 (15.8)
Absent (No=60)	42 (70.0)	18 (30.0)	50 (83.3)	10 (16.7)	44 (73.3)	16 (26.7)	43 (71.7)	17 (28.3)
χ^2 (P value)	0.49 (0.48)		0.22 (0.63)		0.06 (0.80)		2.0 (0.15)	
Age (Mean \pm SD)	44.1 \pm 9.5	45.1 \pm 7.4	45.6 \pm 9.2	44.3 \pm 7.6	43.7 \pm 6.3	44.2 \pm 7.6	45.0 \pm 9.1	46.0 \pm 7.7
T test (P value)	0.52(0.6)		0.74(0.5)		0.3(0.7)		0.22(0.8)	

*Significant (p< 0.05) **Fisher exact test was calculated

solution to them. Besides, its practical content that addressed the correct way to wash hands, and wear and discard masks.

Our study shows that the knowledge, attitude, and practice related to hand hygiene were unsatisfactory before the health education intervention and became satisfactory after intervention. The pre-intervention result comes in contrast with a study done in Saudi Arabia in year of 2021 which found high level of good knowledge, positive attitude, and good practice regarding hand hygiene among the participants. This difference could be attributed to repeated exposure of Saudi Arabia to waves of infectious respiratory system diseases such as SARS (severe acute respiratory syndrome) and MRSA (Middle East respiratory syndrome) and H1N1 influenza related to entry of many Muslim nationalities during the Hajj and Umrah seasons or Prophet's Mosque visiting, which forces Saudi health authorities to conduct widespread- multi-language health education campaigns from time to time to raise public awareness about preventive measures including hand hygiene.¹⁶ The post intervention result comes

in agreement with a study conducted in Korea in year of 2019 which reported that individuals who had received education on correct hand washing within the previous year had higher scores in both self-reported hand-washing methods and frequency than did those who did not have such experiences.¹⁷ Regarding barriers to hand hygiene revealed by our study, they included costly antiseptics (86.7%), no need (82.6%), exhausting ideal practice (77.5%), forgetfulness (62.2%), lack of time (70.4%), inaccessibility of hand washing facilities (66.3%) or unattractiveness/uncleanliness of these facilities (53.2%) and skin irritation by hand hygiene agents (21.4%). Similar barriers were recorded in a previous study conducted to explore factors that may affect hand washing behavior among students and staff in primary schools in England in year of 2012.¹⁸ Our intervention provided solutions to these barriers that included: firstly; conducting cost benefit analysis for hand hygiene which concluded that hand hygiene is the cheapest and most effective way of protecting oneself and others against the corona virus even when using costly antiseptics provided that their use is limited to

Table (5): Relation between post intervention knowledge, attitude, practices related to face mask use and participants characteristics

Post intervention	Knowledge		Attitude		Self-reported practice		Observed Practice	
	Satisfactory N=77 (%)	Unsatisfactory N= 21 (%)	Positive N=84 (%)	Negative N=14 (%)	Satisfactory N =71 (%)	Unsatisfactory N= 27 (%)	Satisfactory N= 68 (%)	Unsatisfactory N=30 (%)
Gender:								
Male (No=56)	46 (82.1)	10 (17.9)	45 (80.4)	11(19.6)	39 (69.6)	17 (30.4)	39 (69.6)	17 (30.4)
Female (No=42)	31 (73.8)	11 (26.2)	39 (92.8)	3 (7.2)	32 (76.2)	10 (23.8)	29 (69.1)	13 (30.9)
χ^2 (P value)	0.99 (0.31)		3.0 (0.08)		0.51 (0.47)		0.004 (0.94)	
Residence:								
Urban (No=78)	59 (75.6)	19 (24.4)	66 (84.6)	12 (15.4)	60 (76.9)	18 (23.1)	57 (73.0)	21 (27.0)
Rural (No=20)	18 (90.0)	2 (10.0)	18 (90.0)	2 (10.0)	11 (55.0)	9 (45.0)	11 (55.0)	9 (45.0)
χ^2 (P value)	(0.22) **		(0.72) **		3.8 (0.05)		2.4 ()	
Marital status:								
Married (No=71)	59 (83.1)	12 (16.9)	61 (85.9)	10 (14.1)	55 (77.5)	16 (22.5)	53 (74.6)	18 (25.4)
Unmarried (No=27)	18 (66.7)	9 (33.3)	23 (85.2)	4 (14.8)	16 (59.3)	11 (40.7)	15 (55.6)	12 (44.4)
χ^2 (P value)	3.1 (0.07)		(1) **		3.2 (0.07)		3.3 (0.06)	
Social class:								
Low (No=19)	12 (63.2)	7 (36.8)	14 (73.7)	5 (26.3)	13 (68.4)	6 (31.6)	10 (52.6)	9 (47.4)
Middle (No= 46)	35 (76.1)	11 (23.9)	41 (89.1)	5 (10.9)	30 (65.2)	16 (34.8)	30 (65.2)	16 (34.8)
High (No=33)	30 (90.9)	3 (9.1)	29 (87.9)	4 (12.1)	28 (84.8)	5 (15.2)	28 (84.8)	5 (15.2)
χ^2 (P value)	5.8 (0.05)		(0.26) **		3.9(0.14)		6.6 (0.03)*	
Previous Covid infect:								
Yes (No=23)	20 (87.0)	3 (13.0)	20 (86.9)	3 (13.1)	16 (69.5)	7 (30.5)	13 (56.5)	10 (43.5)
No (No=75)	57 (76.0)	18 (24.0)	64 (85.3)	11 (14.7)	55 (73.3)	20 (26.7)	55 (73.3)	20 (26.7)
χ^2 (P value)	(0.38) **		(1) **		0.12 (0.72)		2.3 (0.12)	
Chronic disease:								
Present (No=38)	28 (73.7)	10 (26.3)	31 (81.5)	7 (18.4)	24 (63.1)	14 (36.9)	26 (68.5)	12 (31.5)
Absent (No=60)	49 (81.7)	11 (18.3)	53 (88.3)	7 (11.7)	47 (78.3)	13 (21.7)	42 (70.0)	18 (30.0)
χ^2 (P value)	0.88 (0.34)		0.86 (0.35)		2.6 (0.1)		0.02 (0.86)	
Age (Mean ±SD)	45.2±9.8	44.6±7.5	45.5±8.3	44.1±8.1	45.6±7.2	44.3±9.6	43.6±10.0	45.2±7.3
T test (P value)	0.34(0.7)		0.93(0.3)		0.7(0.4)		0.85(0.3)	

*Significant (p< 0.05) **Fisher exact test was calculated

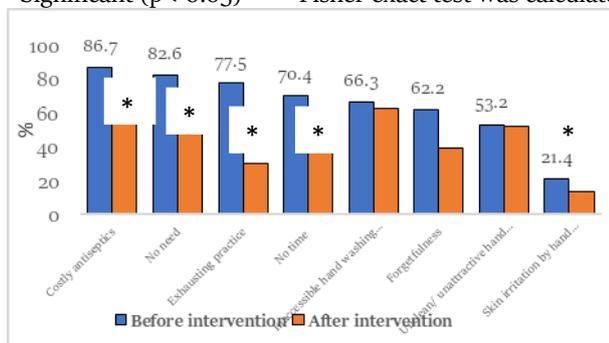


Figure (1): Main reasons of skipping hand hygiene before and after intervention. (*Significant (p< 0.05) when McNemar’s test was computed)

periods of inaccessible hand washing facilities. Secondly, distributing posters for hand hygiene everywhere in school and asking teachers to use similar posters at home to act as visual stimuli counter acting forget fullness. Thirdly, stressing on the role of teachers as role models helping in spread of healthy practices as social norms at home and school. Fourthly, practicing hand hygiene as a daily routine in all recommended times to make it as built-in habit. Fifthly, counteracting lack of time barrier by using antiseptics which do not need to leave classrooms. Sixthly, dependence on self-

efforts to provide hand washing facilities if not available or to make them clean and attractive if

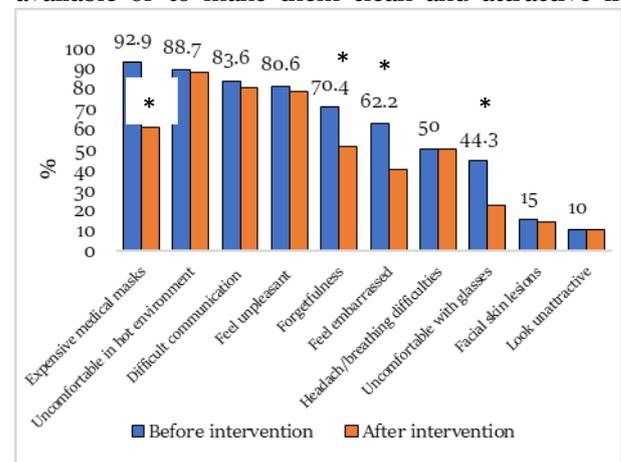


Figure (2): Main reasons of skipping face mask use before and after intervention. (*Significant (p< 0.05) when McNemar’s test was computed)

available. Finally, replacing irritant antiseptic agents with nonirritant ones like replacing alcohol spray with alcohol gel. These solutions produced significant changes in all barriers except those related to accessibility and cleanliness/attractiveness of hand washing facilities which indicates the importance of institutional role in providing such facilities.

Furthermore, our study shows that the knowledge, attitude, and practice related to face mask use were also unsatisfactory before the intervention and became satisfactory after intervention. The pre-intervention result is similar to the findings of a study conducted in Hong Kong in year of 2021 which found that the participants' practice of using a face mask was unsatisfactory¹⁹ and comes in contrary with the findings of a study done in Nepal in year of 2021 which demonstrated high level of public knowledge as regards using face mask during COVID-19 pandemic.²⁰ The post intervention result comes in agreement with a study conducted in China in year of 2020 which reported that people who watched the health education videos were more likely to wear masks and follow health related behaviors.²¹

Regarding barriers to face mask use revealed by our study, the most important barriers were expensive medical masks, uncomfortable in hot and humid environment, leads to difficult communication, the unpleasant appearance of face masks, forgetfulness, feel of embarrassment as it might cause people to criticize me about being in public while ill, leads to headache and/or breathing difficulties. Similar barriers were recorded in a previous study conducted to assess the benefits and burdens of wearing face masks in schools during the current Corona pandemic.²² Our intervention produced significant changes in some of these barriers such as expensive medical masks, forgetfulness, feel of embarrassment and lack of comfort ability with presence of glasses through providing the following solutions: firstly, conducting cost benefit analysis for face mask use which concluded that face mask is the cheapest and most effective way of protecting oneself and others against the coronavirus even when using the costly medical masks. Secondly, directing towards rational use of face masks through training on when, where, how to use masks appropriately and safely and what type of mask should be worn to counteract the false belief of inevitability of use of expensive medical masks which can be replaced by reusable homemade masks. Thirdly, distributing posters for face mask use everywhere in school to act as visual stimuli counteracting forgetfulness. Finally, stressing on the role of teachers as role models helping in spread of healthy practices as social norms at school to counteract stigma and

promote social and psychological acceptance of face mask use.

Additionally, our study revealed positive correlations between knowledge, attitudes and practices related to hand hygiene and face mask use before and after intervention indicating that good knowledge was associated with positive attitudes and correct practices. This is consistent with the results of many studies that investigated the relation between knowledge, attitude and practice and almost always recorded a positive correlation between them.^{16, 23} Health education intervention will largely affect the knowledge, attitude, and practices of target audiences according to the KAP theory and always will keep a positive correlation between them.²³

Our study also revealed that the health education intervention was effective in improving the KAP scores related to both hand hygiene and face mask use of all participants regardless of their characteristics except association of satisfactory observed practices with some characteristics. This exception could be attributed to just individual variations as it was related only to observed practices without self-reported practices and this may be due to the method of assessment of observed practices which depended on achieving 100% of total score.

The limitations of this study included: first, it is one group pretest-posttest study with no control group, a practice that might identify ineffective programs, but could not show causal relationships between program and outcome. Second, lack of long-term follow-up that may be needed to track the maintenance of preventive behaviors. Third, inability to generalize the results because of small sample size which necessitates further studies. Finally, in a self-reported study, respondents may over-report practices related to hand washing and face mask use leading to inflated results.

CONCLUSION AND RECOMMENDATION

Our study demonstrated the effectiveness of health education intervention, which incorporated barriers elimination and practical training in improving the knowledge, attitudes and practices related to hand hygiene and face mask use among K-12 schools' teachers. Based on the result of this study, we recommend that health authorities and health care professionals can depend on this type of intervention to increase people's awareness of the proper practice of hand hygiene and face mask use.

Such intervention should target influential persons like teachers as a priority group who can spread healthy practices as social norms in their schools and subsequently to whole community.

Ethical Considerations

The research protocol was approved by Institutional Review Board (IRB) of the Faculty of Medicine, Zagazig University (reference no: ZU-IRB#6602). Sharkia Governorate, Egypt from March 2021 to July 2021.

Official permissions were obtained from Educational Directorate in Sharkia Governorate, Zagazig Educational East Districts, and administrators of the selected schools. An informed verbal consent was obtained from every participant after clarifying the purpose and procedures of the study. Participants were informed about their right to reject participation and to withdraw whenever they want without giving reasons and with no consequences. Total confidentiality of any given information was assured.

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Conflict of interest: All authors have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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