

Assessment of Respiratory Infection Prevention and Control Practices Adopted in Governmental Preparatory Schools in Alexandria

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Abstract

Background: Respiratory infection is a significant global public health problem. It causes considerable morbidity and mortality among all age groups especially in developing countries **Aim:** To assess respiratory infection prevention and control practices adopted in governmental preparatory schools in Alexandria **Settings:** The study was carried out at sixteen governmental preparatory schools chosen by multistage stratified random sampling technique. These schools were affiliated to Ministry of Education in Alexandria Governorate, Egypt. **Research design:** A descriptive research design was used to conduct this study **Subjects:** The study subjects were 384 preparatory students who selected randomly from the previous mentioned settings. **Tools:** Two tools were used. Tool one: Students Structured Interview Schedule that includes part one: Socio-demographic characteristics of the students and their family, part two: Students' Health and Educational Profile, part three: Students' awareness about Respiratory Infection Prevention and Control Practices, part four: Students' Practices about Respiratory Infection Prevention and Control. Tool two: School Physical Environment Observation Checklist. **Results:** The study showed that the majority (86.5%) of preparatory student's had fair level of practice while the rest (13.5%) had poor one. Regarding level of awareness, more than half (60.8%) of the students had a fair level as compared to 30.2% who had poor level. There was a significant relation between student' place of residence as well as their academic achievement and their level of practice ($P= 0. 0.008$ and $P= 0.000$ respectively). More than two thirds (68.8%) of the observed school environment had a poor supportive level for prevention and control practices of respiratory infection **Conclusion:** Based upon the study findings it could be concluded that, student's practice level about infection prevention and control was only fair level and needs more intimate supervision for some poor behaviors done at school. **Recommendations:** An intensive program should be planned periodically, executed, and monitored to improve awareness, and practice of the school students for prevention of respiratory infection. The school health committee/authority should seize every opportunity to prevent the transmission of respiratory infections by promoting healthy/safe school environment.

Keywords: ARI, Influenza like illness, COVID-19 prevention and control practices, Safe school environment.

Introduction

Respiratory infection (RI) is a significant global public health problem. It causes considerable morbidity and mortality among all age groups especially in

developing countries (De Conto et al., 2019; Tomczyk et al., 2019).

Worldwide Acute Respiratory infection (ARI) has been referred to as a "forgotten pandemic", as it causes around 4% of all deaths in children aged 0–14 years.

ARIs that lasting less than 30 days considered the fourth leading cause of death among people of all ages, and responsible for both 11-22% of deaths among children aged less than 5, and 4 million deaths annually among adults aged 15-49 years. So it is estimated to be the most prevalent illnesses in low-and middle-income countries (LMICs) (WHO, 2017). Respiratory infections are associated with misuse of antibiotics and finally relevant contributor to health care cost and indirect societal costs (Lewnard et al.,2021).

In Egypt, the prevalence of ARIs in school students was high and ranged from 46-51% (Eneyew et al., 2021; Yousef & Hamed, 2016). Respiratory infectious diseases aren't new disease but spreading and identified from thousand years. It can be a major cause of death among school children and affect their schooling by causing absenteeism and delay school achievement. In Alexandria governorate different preparatory school based survey studies across a period from 2014 till 2019 had found that the most self-reported health complaints among school students were respiratory infections including common cold (khaled A 2019).

Poor environmental conditions support the transmission of respiratory infections and can worsen the morbidity from it. In fact schools are an important part of community's infrastructure, as they provide safe and supportive learning environments for students. But at the same time they provide an opportune setting for the spread of infectious diseases especially respiratory infections because students are in close social contact and share supplies and equipment with each other (Donnelly, P. H. R. A.,2021; Meinck et al., 2022).

In 2013, the Egyptian Ministry of Health and Population (MOHP) had developed a guideline to increase students and school staff awareness regarding prevention and control measures of communicable diseases at the educational settings. Then this guideline was updated in

2022 in collaboration with ministry of education emphasizing on COVID-19 respiratory infection and to ensure schools are healthy and safe environments for students and staff (MOHP, 2022).

Preventive measures contribute to reducing the risk of transmitting respiratory infections. In school settings there are many opportunities for students to learn good health practices. These practices consist of hand hygiene, respiratory hygiene, and usage of personal protective equipment as wearing face masks, maintain social distance at least 1 meter away (Younie et al.,2020). Moreover, keeping well ventilation in indoor setting, avoiding crowds through commitment to social distancing by minimizing the number of contacts, promote vaccination administration in addition to environmental cleaning of frequently touched surfaces should be emphasized (WHO, 2017).

According to COVID-19 Preparedness and Prevention in Elementary Schools guidelines 2021; presence of common regulations and compliance for all students with health practices help in preventing infectious diseases especially respiratory ones. So it is very important to assess the students' related practices and the students' level of adherence to school regulation (Ontario, 2021).

Aims of the Study

This study aims to assess respiratory infection prevention and control practices adopted in governmental preparatory schools in Alexandria.

Research Questions

- What are the preventive and control practices followed by preparatory school students to protect themselves and others from respiratory infections?
- To what extent do the schools' environments support preventive and control practices for respiratory infection?

Materials and Method

Materials

Design: A descriptive research design was used to conduct this study.

Settings:

This study was conducted at sixteen governmental preparatory schools affiliated to Ministry of Education in Alexandria Governorate. The selected schools were representing the eight educational zones in Alexandria governorate. From each zone two preparatory governmental schools were randomly chosen.

Subjects:

The study was conducted on 384 preparatory students from the previous mentioned settings. The sample size was calculated using Epi-info7 program based on the following parameters;:

Total population size = 240000 students
Expected frequency =50%, Acceptance error =5%, Confidence coefficient =95%.
Accordingly, the estimated sample size was 384 students aged 12-16 years .

-By using multistage stratified sampling technique, the following steps were conducted to select till the study subject selection..

-From each educational zone two preparatory governmental schools (one for boys and one for girls) were randomly selected from 288 governmental preparatory schools to be 16 schools.

-By using equal proportional allocation method, 24 Students were selected from each of the previously selected schools. (384 students /16 schools) =24 students

-From each school; three classes representing 1st, 2nd, 3rd grade were selected randomly to collect data and 8 students were selected from each class by using systematic random sampling technique (from each class students 'name list, the researcher selected the first student randomly then every 2nd student was selected till got the needed subjects)

Tools:

In order to collect the necessary data for the study two tools were used:

Tool one: "Students Structured Interview Schedule". This tool was developed by the researcher after reviewing related literature (Ministry of health and population Infection Prevention and Control guideline, 2022, World Health Organization key messages and Actions for COVID-19 Prevention and Control in Schools,2020). This tool was used to collect the required data from preparatory school students. It consists of three parts:

Part I: Socio-demographic characteristics of the students and their health profile.

Socio-demographic data included the following; Age, sex, place of residence, crowding index, students' scholastic achievement, school attendance..etc. This part included also data about previous infection with respiratory infections and family history of covid19..etc

Part II: Students' Awareness about Respiratory Infection Prevention and Control Practices.

This part included 19 items/ statement to get a quick view on the students' awareness level regarding respiratory infection etiology, mode of transmission, high risk population, symptoms, the different preventive and control measures e.g. hand hygiene, respiratory hygiene vaccination, social distance, nutritional status which increase body's immunity. Responses to each statement were scored two which was given for "correct complete response", while a score of one was given to "correct incomplete response" and a score of zero for "incorrect or don't know response". The total awareness score was calculated and transferred to percentage and classified into: Poor awareness scores were less than 50 % of scores.Fair awareness scores were ranged from 50 to less than 75% of scores.Good awareness scores were equal to or greater than 75% of scores.

Part III: Students' Reported Practices about Respiratory Infection Prevention and Control. This part contained 31 statements to assess students' actual various preventive and control measures of respiratory infections such as personal hygiene such as (hand-washing technique, coughing and sneezing practices. The reported practice responses were scored as "correctly done" equal two, while a score of one given to "somehow correctly done" and a score of zero was given for "Incorrectly done or not done practice". The total practice score was calculated and transferred to percentage and classified into: Poor practice scores were less than 50 % of scores. Fair practice scores were ranged from 50 to less than 75% of scores. Good practice scores were equal to or greater than 75% of scores.

Tool II: School Physical Environment Observation Checklist. This tool was developed by the researcher to identify to what extend the school environment is supportive for prevention and control practices of respiratory infection. It contained data about the school building characteristics, school classes (student's number in each classroom, number of seats, seat's inserts cleanliness, ventilation, distance between seats, and presence of trash bins, and disinfectants as alcohol, educational posters encouraging hygienic practices). Toilets, water and sanitation facilities as (number of hand washing basins, toilets, cleanliness, ventilation, odor, water flow, maintenance, cleaning and disinfectant materials availability. School clinic (cleanliness, ventilation, lightening, trash bins , hand washing basins, cleaning and disinfectant materials availability as ,soap, alcohol, disposable towel.etc. School emergency and contingency plans.(presence of health committee to monitor the preventive measures, sterilization gate at entrance to take thermal scanning, isolation room, records for administering vaccinations to students and infectious disease outbreaks. The tool included 74 items/statements with

the answer of either "Yes", or "NO". (Cleveland, & Fisher, 2014; Ministry of Health and Population guideline, 2022). The score one for "Yes" answer and zero for "No" answer. The total score was calculated and transferred to percentage and classified into: Poor environment with a score Less than 65.% . Fair environment with a Score from 65 % to less than 75.% and Good environment with a Score equal to or greater than 75%

Method

Approval from the Ethical Research Committee, Faculty of Nursing, Alexandria University was obtained. An official letter from the Faculty of Nursing, University of Alexandria was directed to Central Agency for Public Mobilization and Statistics (CAMPAS) and the Directorate of Education in Alexandria to obtain their permission to collect data from the selected schools .Approval letters directed from the Directorate of Education in Alexandria to directors of the eight educational districts, and the selected schools' directors. Meetings were held with the directors of the selected schools to clarify the purpose of the study and to gain their cooperation during data collection. The tools were subjected to a jury composed of five experts in the field of community health for content validity. Recommended modifications were done accordingly. A pilot study was carried out on 10% of the study sample in order to test the clarity and applicability of the research tools. Reliability of the tools was tested using Cronbach's Alpha test. The reliability coefficient was 0.780 for tool I-(partII), 0.805 for tool I-(part III) and was 0.834 for tool II which is acceptable. Data was collected by the researchers during the period from October 2020 to May 2021.

The study was conducted in three phases: Phase I: The students were individually interviewed by the researcher to collect necessary data by using tool I after holding an appointment with them at their schools during break and activity

time. The interview took approximately 45-60 minutes for each student. **Phase II:** By using tool II each school environment was observed by the researchers within 3 to 5 days for each school to assess if each school environment is supportive for respiratory infection prevention and control measures.

Ethical considerations:

A written informed consent from the study subjects was obtained after explanation the aim of the study. Confidentiality of the data was maintained. Anonymity of the study subjects was maintained and participation was on a voluntary basis. The study subjects were assured that they have the right to withdraw from the study at any time. The researcher will credit the study subjects and everyone who assisted in the study in the research acknowledgment.

Statistical Analysis

The collected data were organized, tabulated and statically analyzed using the statistical package for social studies (SPSS) Version 25.0. Qualitative data were described using number and percent. Quantitative data were described mean \pm standard deviation. Finally analysis and interpretation of data were conducted. P-values of 0.05 or less were considered statistically significant.

Results

Table (1) shows the socio-demographic characteristics and health profile of the studied students regarding the students' age; it was ranged from 12 to 16 years with a mean of 13.76 ± 0.72 years. Slightly less than half (47.4%) of the students were rural residents. Regarding the crowding index, it ranges from 1-4 persons/bed room with a mean of 2.42 ± 0.69 . The table also shows that, only 18.5% of students didn't suffer from respiratory infections in the last 6 months compared to a nearly equal percent (31.0% and 29.4 %) of them who always or

sometimes suffered respectively. Regarding the family history of Covid19, less than three less than one third (29.9%) of the students' families had exposed to Covid19 More than half (51.3%) of those exposed to covid19 were home isolated.

Figure (1) reveals the total student awareness level regarding respiratory infection prevention and control practices; more than half (60.8%) of them had a fair level of awareness while the rest (30.2%) of them had a poor one.

Table (2) shows students' reported practices levels about respiratory infections by domains

This table portrays that, the majority (88.8%) of students had a fair level of hand washing practice. Regarding share personnel equipment, it was found that more than half (57.8%) of the students had a good level. While more than two fifths (42.2%) of them had a poor one. Regarding respiratory hygienic practices, it was found that more than half (57.3%) of the students had a poor level while more than two fifths (42.7%) of them had a fair one. Regarding social distance, it was found that more than three quarters (76.6%) of the students had a fair level and 16.1% had a poor level while only 7.3% of them had a good one. Concerning applying the received health education messages, more than two thirds (69.8%) of the students had a poor level while less than one third (30.2%) of them had a good level. It was observed that all of the students (100.0%) had a fair level concerning body immunity and maintain healthy school environment. The total student's practices level showed that the majority (86.5%) of them had a fair level in another meaning they had fair adherence to the prevention and control practices while 13.5% had poor adherence to the preventive and control practices.

Figure (2) shows physical school environment supportive level for prevention and control of respiratory infection; more than two thirds (68.8%) of the observed school environment had a poor level for prevention and control of respiratory

infection while one third (31.3%) of them had a satisfactory one.

Table (3) shows the relationship between the students' level of practice and their socio demographic characteristics; their health profile and their level of awareness about prevention and control of respiratory infections; statistically significant differences were found between student's place of residence, their academic achievement and their practice level ($X^2= 9.723$, $P= 0.008$ and $X^2= 13.00$, $P= 0.000$ respectively). Poor practice level was more prevalent among squatter residents and those student with a poor academic achievement. Moreover, a significant relation was noted between family history of Covid19 and students' practice level ($X^2= 19.532$, $P= 0.001$). As families who hadn't exposed to Covid19 had a poor practice level as compared to those who had exposed.

Discussion

The main goal of public health as well as infection prevention and control is the prevention of infectious disease transmission in population and community settings. Emerging infectious disease outbreaks brought on by respiratory viruses, including severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), pandemics of influenza A and H1N1, and finally to the latest novel coronavirus (COVID-19) pandemic, have recently attracted significant global attention (Hussein et al., 2021).

ARIs is highly prevalent among school aged children that ranged from 46-51% as reported by Eneyew et al in 2021 in Ethiopia (Eneyew et al., 2021). The overall prevalence of ARI was 60.8% in study done in 2022 in Kathmandu Valley which revealed higher prevalence percentage of respiratory infection than the national data findings in a study done in 2016 in Egypt that revealed a significant frequency of ARI (51.23%) (Ghimire et al., 2022; Yousef, F. M., and Hamed, A. F., 2016). The current study findings also revealed that, a significant

number of students (60.4%) always and sometimes exposed to respiratory infections during last 6 months from collecting data and these infections hindered them to go their schools

The main findings of the current study revealed that significant percentage of the students had only fair level of awareness (less than three quarters 69.8%, and about one third of them had low level and none of them showed good awareness level regarding infection prevention and control practices. The same result was unfortunately observed regarding their level of practice. Similarly studies conducted by Naseef et al., 2022; Yesuf & Abdu, 2022; Hussein et al., 2021; Shehata et al., 2021.

With respect to the total student's practice level; it was noted that the majority (86.5%) of them fairly adhere to preventive practices guidelines while 13.5% of them not adhere to these practices and none of them showed good adherence level to infection prevention and control practices.

Therefore, the student's practice level about infection prevention and control needs more intimate supervision for some poor behaviors done at school as well as more improvements through organizing educational campaigns especially in the area of sharing personal equipment, respiratory hygienic practices, social distance, applying the received health education messages. The study results are incongruent with another studies done in Egypt in 2021 that revealed the majority of the students (96.9%) had high performance of preventive behavior and another study done in Iran (Bashirian et al., 2021; Hussien et al., 2021).

In the current study results, a significant relation was noted between place of residence and student's practice level about infection and prevention and control practices as the findings showed that, poor practice level was more prevalent among squatter and rural residents than urban ones. As well as similar studies done by ALBashtawy, 2017; Naila

Nisar et al., 2017; and Yuan et al., 2015 revealed that, rural residents' awareness and practice level was quite low.

School absenteeism is another issue facing students as it increases the likelihood of their academic failure as students who are repeatedly absent from school do not perform as well academically as students who are rarely absent as reported by Klein et al (2022). The present findings revealed that, high percentage of students was irregularly attending at school with absence period three days or more per week. Moreover, the highest percentage (96.1%) for their absenteeism causes was fear of cross infection and to get infected with COVID-19. This finding was disagree with Ali (2016) who reported lower school attendance rate by students in study done among school students in Alexandria and of course this results before COVID-19 (Ali M.,2016).

In fact, Healthful physical school environment is very essential for students' wellbeing and safety because students are constantly interacting with their physical environment consciously or unconsciously (Cleveland, & Fisher, 2014).

Surprisingly, in the era of COVID-19 pandemic the present study revealed that, more than two thirds (68.8%) of the studied schools had poor environmental condition in relation to respiratory infection and control practices. More than half of them had a poor building cleanliness due to unavailability of covered garbage bins with plastic bags and presence of garbage at playground and classrooms, unavailability of disinfectant at entrance & exits also poor classrooms due to absence of hand sanitizers or disinfectant materials and also poor sanitary system. The present findings were in line with a recent study conducted by El- Sartaway et al who reported that the vast majority of schools weren't adapted for school students (El-Sartaway et al.,2015).

Conclusion

Despite, students had a good awareness level in hand washing, a significant percentage of them hadn't washed their hands at school, and those who washed it, not maintain the appropriate technique of hand washing. Students also weren't carrying hand sanitizer in their bag and those who carrying it didn't use it. Moreover, they had a poor respiratory hygiene practice as they cough/sneeze in front of others, not maintain wearing facemask also its use correctly. They were sharing personal equipment as drink from each other's bottles. Poor practice level was more prevalent among student with a poor academic achievement which resulted from their high school absenteeism and their poor awareness level.

Moreover, more than two thirds of the observed schools weren't suitable for prevention the infection due to lack of cleaning supplies and materials regarding sanitation, sinks, toilets according to standards and guidelines which created great challenges for full school participation of students and school personnel.

Yet less attention is paid to the importance of physical environment for learning as it should be neat and tidy to encourage all school personnel to get happily especially the teachers in their classrooms to be focus on their lessons. But when the school is equivalent to a garbage bag, all their energies are drained out while dealing with the dust and grime and it can distract both teachers and students from their lessons in the classrooms and so on it could affect the student's performance and scholastic achievement. When the classroom is free from bacteria and germs, the teachers and students stay away from diseases. Hence, school cleanliness is a vital issue that must be

followed each day for ensuring the health and safety of the students and the teachers.

Recommendations

In line with the findings of the study, the following recommendations are made:

- An intensive program should be planned periodically, executed, and monitored to improve awareness, and practice of the school students for prevention of respiratory infection.
- Integrate students in group activities e.g educational plays and drama to enhance learning more about respiratory infections/diseases and how to prevent it and the importance of the personal hygiene practices
- The school health committee/authority should seize every opportunity to prevent the transmission of respiratory infections by promoting healthy/safe school environment
- Supervise all staff workers following the isolation guidelines for COVID-19 to prevent the occurrence of outbreak in accordance with Ministry of health and population guidelines, 2022.

Table (1): Socio-demographic characteristics and health profile of the studied students.

Students' socio demographic characteristics		Total N=384	
		No.	%
Age (years)			
- 12-		98	25.5
- 13-		123	32.0
- 14-		110	28.6
- 15-16		53	13.8
Min -Max	12-16	X ± SD	13.76 ±0.721
Sex			
- Male		192	50.0
- Female		192	50.0
Place of residence			
- Urban		118	30.7
- Squatter		84	21.9
- Rural		182	47.4
Crowding index			
- 1		108	28.1
- 2		199	51.8
- ≥3		77	20.1
Min -Max	1-3.5	X ± SD	2.419 ±0.689
Health profile of the studied students			
Previous exposure to respiratory infections in the last 6 months			
- Never		71	18.5
- Sometimes		113	29.4
- Always		119	31.0
-Don't remember		81	21.1
Family history of covid19		n= 384	
- No		269	70.1
- Yes		115	29.9
Home isolation after Covid 19		n= 115	
- Home isolation done		59	51.3
- Home isolation not done		56	48.7

Figure (1): Total students' awareness level regarding respiratory infection prevention and control practices

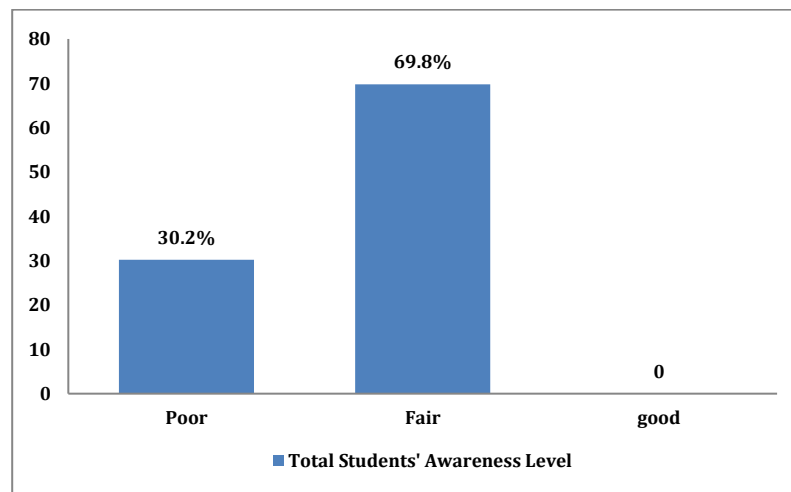


Table (2): students' practices levels about respiratory infections (BY DOMAINS).

Items	Total n=384	
	No.	%
Hand washing		
- Poor	10	2.6
- Fair	341	88.8
- Good	33	8.6
Share Personal Equipment		
- Poor	49	42.2
- Fair	113	0.0
- Good	222	57.8
Respiratory hygienic practices		
- Poor	220	57.3
- Fair	164	42.7
- Good	0	0.0
Social distance		
- Poor	62	16.1
- Fair	294	76.6
- Good	28	7.3
Applying the received health education messages		
- Poor	268	69.8
- Fair	0	0.0
- Good	116	30.2
Keep and increase their Body immunity		
- Poor	0	0.0
- Fair	384	100.0
- Good	0	0.0
Maintain healthy school environment		
- Poor	0	0.0
- Fair	384	100.0
- Good	0	0.0
Total students' practices' level		
- Poor	52	13.5
- Fair	332	86.5
- Good	0	0.0

Figure (2): Physical school environment supportive level for prevention and control of respiratory infection

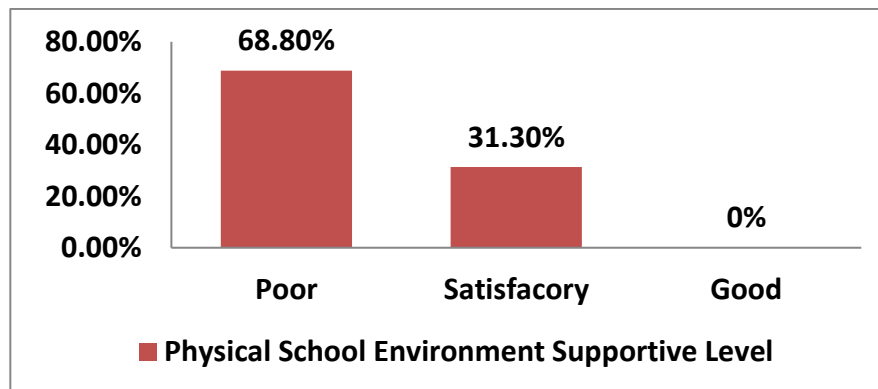


Table (3): Relationship between the students' level of practice and their socio demographic characteristics, health profile and their level of awareness about prevention and control of respiratory infections:

Students' characteristics	Level of Practice				Total n=384		Test of Significance
	Poor (n= 52)		Fair (n= 332)				
	No.	%	No.	%	No.	%	
Age (years)							
- 12-	17	17.3	81	82.7	98	25.5	X ² = 5.686 P= 0.128
- 13-	20	16.3	103	83.7	123	32.0	
- 14-	8	7.3	102	92.7	110	28.6	
- 15-16	7	13.2	46	86.8	53	13.8	
Sex							
- Male	21	10.9	171	89.1	192	50.0	X ² = 2.224 P= 0.136
- Female	31	16.1	161	83.9	192	50.0	
Place of residence							
- Urban	12	10.2	106	89.8	118	30.7	X ² = 9.723 P= 0.008*
- squatter	20	23.8	64	76.2	84	21.9	
- Rural	20	11.0	162	89.0	182	47.4	
Grade level							
- First	19	14.8	109	85.2	128	33.3	X ² = 2.981 P= 0.225
- Second	21	16.4	107	83.6	128	33.3	
- Thirds	12	9.4	116	90.6	128	33.3	
Academic achievement							
- Poor	7	53.8	6	46.2	13	3.4	X ² = 13.00 P= 0.000*
- Good	5	20.0	20	80.0	25	6.5	
- Very good	19	14.2	115	85.8	134	34.6	
- Excellent	21	9.9	191	90.1	212	52.1	
Absenteeism from school							
- One	4	5.9	64	94.1	68	17.7	X ² = 1.070 P= 0.072
- Two	20	13.1	133	86.9	153	39.8	
- Three or more	28	17.2	135	82.8	163	42.4	
- Previous exposure to resp. infections in the last 6 months							
- Never	8	11.3	63	88.7	71	18.5	X ² = 0.733 P= 0.865
- Sometimes	15	12.6	104	87.4	113	29.4	
- Always	17	15.0	96	85.0	119	31.0	
Don't remember	12	14.8	69	85.0	81	21.1	
- Family history of Covid 19							
- No	50	18.6	219	81.4	269	70.1	X ² = 7.884 P= 0.005*
- Yes*	2	1.7	113	98.3	115	29.9	
- Level of awareness							
- Poor	16	13.8	100	86.2	116	30.2	X ² = 0.009 P= 0.925
- Fair	36	13.4	232	86.2	268	69.8	

X² Chi Square Test * statistically significant at p ≤ 0.0

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