

Feasibility of a Saliva-Based Covid-19 Screening Program in Abu Dhabi Primary Schools

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Abstract

The pandemic has forced closures of primary schools resulting in loss of learning time on a global scale. In addition to face coverings, social distancing, and hand hygiene, an efficient testing method is important to mitigate spread of COVID-19 in schools. We evaluated the feasibility of a saliva-based SARS-CoV-2 PCR testing program on 18 primary schools in the Emirate of Abu Dhabi, United Arab Emirates. Qualitative results show that children 4 to 5 years had difficulty producing an adequate saliva specimen compared to those 6 to 12 years. A short training video on saliva collection beforehand helps demystify the process for students and parents alike. Informed consent was challenging and should be done beforehand by school health nurses or other medical professionals to reassure parents and maximize participation. Telephone interviews with school administrators resulted in an overall 83.3% response rate. 93% of school administrators had a positive experience with saliva testing and felt the program improved the safety of their schools. 73% of respondents supported the ongoing use of saliva testing for SARS-CoV-2 on their school campuses. On-campus saliva testing is a feasible option for primary schools to screen for COVID-19 in their student population to help keep their campuses safe and open for learning.

1. Introduction

The COVID-19 pandemic is a leading cause of morbidity and mortality worldwide and continues to exhaust healthcare resources on a large scale [1]. Efficient testing is critical to identify cases early and to help mitigate the deleterious effects of the pandemic [2]. Saliva polymerase chain reaction (PCR) nucleic acid amplification testing (NAAT) is more comfortable than nasopharyngeal (NP) NAAT and has been validated as a test for SARS CoV-2 [1]. Although children are less susceptible to severe disease, primary schools are considered a vector for transmission and community spread [3]. Efficient and scalable methods of routine testing are needed globally to help keep schools open. Saliva testing has proven a useful resource for this population [4, 5].

Abu Dhabi is the largest Emirate in the United Arab Emirates (UAE) with an estimated population of 2.5 million people [6]. The first case of COVID-19 was discovered in the UAE on January 29 2020 [7]. The UAE has been recognized worldwide for its robust pandemic response “providing a textbook example of how to handle a global pandemic” [8, 9]. The Abu Dhabi Public Health Department (ADPHC) works alongside the Ministry of Education (MOE) to establish testing, quarantine, and general safety guidelines for primary schools in Abu Dhabi. In December 2020, the ADPHC partnered with a local, accredited diagnostic laboratory to test the feasibility of a saliva-based screening program for COVID-19 directly on school campuses for 18 primary schools in the Emirate.

Saliva-based PCR testing for COVID-19 was approved for use in schools in the UAE on January 24 2021 [10]. As part of a greater mitigation strategy to reduce both school-based transmission and, hence, community spread, the ADPHC focused its onsite testing program on children ages 4 to 12 years. The program required collaboration among medical professionals, school administrators and teachers,

students, and parents. To our knowledge, this is the first study to evaluate the feasibility of implementing a saliva-based COVID-19 screening program directly on primary school campuses involving children as young as 4 years of age. We highlight the overall experiences of the program below.

2. Methods

The Abu Dhabi Public Health Center (ADPHC) in collaboration with G42 Biogenix labs conducted a saliva SARS-CoV-2 NAAT testing program on 18 primary schools in the Emirate. Schools were selected based on outbreak prevalence at the time and focused on “hot spot” areas. The school onsite saliva testing program included children ages 4 to 12 years old in a “bubble” attendance model during the school day. The well-established Saliva Direct protocol developed at Yale University was used for testing and included an RNA-extraction free, RT-qPCR method for SARS CoV-2 detection [11].

We conducted a qualitative study involving telephone interviews of school administrators to evaluate their experience with the ADPHC testing program at their schools. In addition, we interviewed the G42 Biogenix lab providers to understand logistics that supported on-campus collection of saliva specimens for this age group. We also gathered the attitudes of school children before and after testing. This study was reviewed and approved by the Abu Dhabi Health Research and Technology Committee and the Institutional Review Board (IRB), New York University Abu Dhabi.

2.1 Sample and Recruitment

The original sample collection of saliva specimens was performed by the ADPHC in collaboration with G42 Biogenix lab providers on school campuses between December 6 to December 10 2020. During this time, schools operated in a hybrid teaching model where learning took place both online and in-person. Inclusion criteria included asymptomatic students between 4 to 12 years attending in-person classes on campus. Students who were asymptomatic or not attending in-person classes were excluded.

2.2 Data Collection

The data were collected through video and telephone interviews between April 14 and April 29 2021. We first interviewed G42 Biogenix lab providers to obtain previously acquired qualitative and quantitative data which were collected during the intervention itself. Once obtaining this information, we designed a questionnaire and proceeded with a structured interview process for school officials.

We interviewed school principals and administrators to collect their overall experience with the saliva testing program. Before starting each interview, we established the interviewees preferred language, either English or Arabic. We then introduced the meeting attendees and provided study details, aims and objectives, and described collaborating entities. We obtained verbal informed consent from an informed consent script approved by the NYUAD IRB and then proceeded with the interview. There were four questions in the interview. The first three questions were answered on a five point Likert scale model which consisted of five answer options: 5 being completely agree, 4 agree, 3 somewhat agree, 2

somewhat disagree, and 1 completely disagree. The fourth question invited open ended feedback and comments. The questions included were:

1. I believe the COVID 19 saliva testing program improved the safety for my school campus.
2. Our community had an overall positive experience with the COVID saliva testing.
3. We would like to continue a saliva-based COVID testing program on our school campus.
4. Please provide any additional comments you feel important about the program.

During the interview, we transcribed the answers as the interviewee was answering. We then translated those in Arabic into English and collected the data in one Excel spreadsheet. School interviewees and school names were de-identified in the collection and storage process.

3. Results

mouth then express it into a collection tube. Adults can generally do this on command, but we found it took 10-12 minutes per child. Saliva production was stimulated by the advice to think about food, the projection of pictures food on a screen, and then by movies on a television screen. Children 4 to 5 years had more difficulty with the process despite active cueing. Those 6 to 12 years had an easier time with the process. We collected data on a cohort of children regarding their attitudes pre and post collection (**Figures 1**) and (**Figure 2**). Children felt happier, less nervous, and less scared after collection than before. This trend was reassuring that future collections would be easier for students.

A total of 15 of 18 school principals completed the telephone interview yielding a response rate of 83.3%. Overall, 93% of the school principals agreed or completely agreed that the COVID-19 saliva testing program improved school safety; 93% agreed or completely agreed that they had an overall positive experience with the program; and 73% supported the ongoing use of saliva testing in their schools (**Table 1**). Administrator's open-ended comments on their experience was overall positive (**Table 2**).

Table 1. Telephone Interview with School Principals

Question/Response	No. (%), n=15	Average Response Rating
COVID 19 saliva testing program improves school safety		
5 Completely Agree	9(60)	4.5
4 Agree	5(33.3)	
3 Somewhat Agree	1(6.7)	
2 Somewhat Disagree	-	
1 Completely Disagree	-	
Overall positive experience with the COVID-19 saliva testing		
5 Completely Agree	6(40)	4.3
4 Agree	8(53.3)	
3 Somewhat Agree	1(6.7)	
2 Somewhat Disagree	-	
1 Completely Disagree	-	
Support the use of the saliva based COVID testing program in schools		
5 Completely Agree	9(60)	4.2
4 Agree	2(13.3)	
3 Somewhat Agree	2(13.3)	
2 Somewhat Disagree	2(13.3)	
1 Completely Disagree	-	

Table 2. Qualitative Interview Findings

Variables	Outcome
Age Groups	Kids younger than 6 y/o had difficulty producing an adequate saliva specimen
Education Materials	A short training video on saliva collection beforehand would demystify the process for parents
Consenting	Informed consent was challenging and should be done beforehand to not slow down testing
Setting	Having testing done on school campus by familiar staff helped students feel safe; however, resulted in loss of learning time vs having them test after hours off-campus

4. Discussion

By March 2020, many Kindergarten to grade 12 (K-12) public and private schools suspended in-person classes due to the pandemic and turned to online learning platforms. The negative impact of school closures on academic achievement is projected to be significant [7, 12, 13]. Ensuring schools can stay open and run operations safely will require routine SARS-CoV-2 testing. Our study investigated the feasibility of routine saliva testing on children ages 4 to 12 years on their school campuses. The ADPHC school onsite saliva testing program involved bringing lab providers onto 18 primary school campuses and required cooperation among parents, students, school administrators, and healthcare professionals.

Children younger than 6 years had difficulty producing an adequate saliva specimen; whereas those 6 to 12 years did so with relative ease when appropriately cued. Schools considering onsite testing programs should consider the 6 to 12 years age range as a viable age for saliva screening. Children should fast for a minimum for 45 minutes prior to saliva collection and should be cued by thoughts of food, food pictures, or food commercials. Setting up a sampling station close to the cafeteria where students can smell meal preparation may also help [14, 15]. Sampling before breakfast or lunch where children are hungriest should also be considered.

The greatest challenge was obtaining informed consent from parents who were not yet familiar with the reliability of saliva testing as a tool for SARS-CoV-2 screening or on the saliva collection process as a whole. Having medical professionals directly answer parent's questions was helpful. Parents were reassured that the process was painless, confidential, and only used for school safety purposes. Despite school administrators being experienced in obtaining consent forms from parents for field trips, obtaining informed consent for a medical testing procedure is more complicated. Schools considering onsite testing should ensure their school nurse or other healthcare providers are on the front-line obtaining informed consent and allaying parents' fears.

School staff were able to effectively provide crowd control for testing and children felt at ease being in a familiar environment. Teachers and public safety officers are well-equipped at managing the shuttling of students to class, to lunch, to physical education, and finally to dismissal. They were equally equipped at handling logistics of students to and from testing, including minimizing crowds and helping students feel

at ease during the process. This effective collaboration allowed the lab personnel to focus on sample collection and storage while school staff managed all other aspects of the safety and care for the children.

5. Conclusion

Overall, school administrators had a positive experience with the testing program, felt the program improved safety of their schools, and supported the ongoing use of saliva testing for SARS-CoV-2 on their school campuses. The ADPHC school onsite saliva testing program proved a feasible way to manage student testing for children age 6 years and above. Our findings highlight the feasibility of an integrated on-site saliva testing model for school campuses. Further research is needed to determine the scalability of such a model and whether the added compliance and safety of onsite testing compensates for the potential loss of learning time that testing during school hours would require.

Declarations

Ethics approval and consent to participate:

Our study was approved by the New York University Abu Dhabi Internal Review Board (IRB) and the Abu Dhabi Research and Technology Ethics Committee (part of the Abu Dhabi Department of Health). Certificates are attached under supplementary material

Consent for publication:

Not Applicable

Availability of data and material:

The datasets during and/or analysed during the current study available from the corresponding author on reasonable request.

Competing interests:

The authors declare they have no competing interests

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Authors' contributions:

AV was the primary investigator and wrote most of the paper. OAH, BAS, and SAM were involved in original study design and coordination with lab team and school campus team at individual sites. AM and AAH worked as study coordinators and performed the interviews with school administrators. NAH

analyzed the data and contributed to the results section. RA consulted on the study throughout the process. All authors read and approved the final manuscript.

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Figures

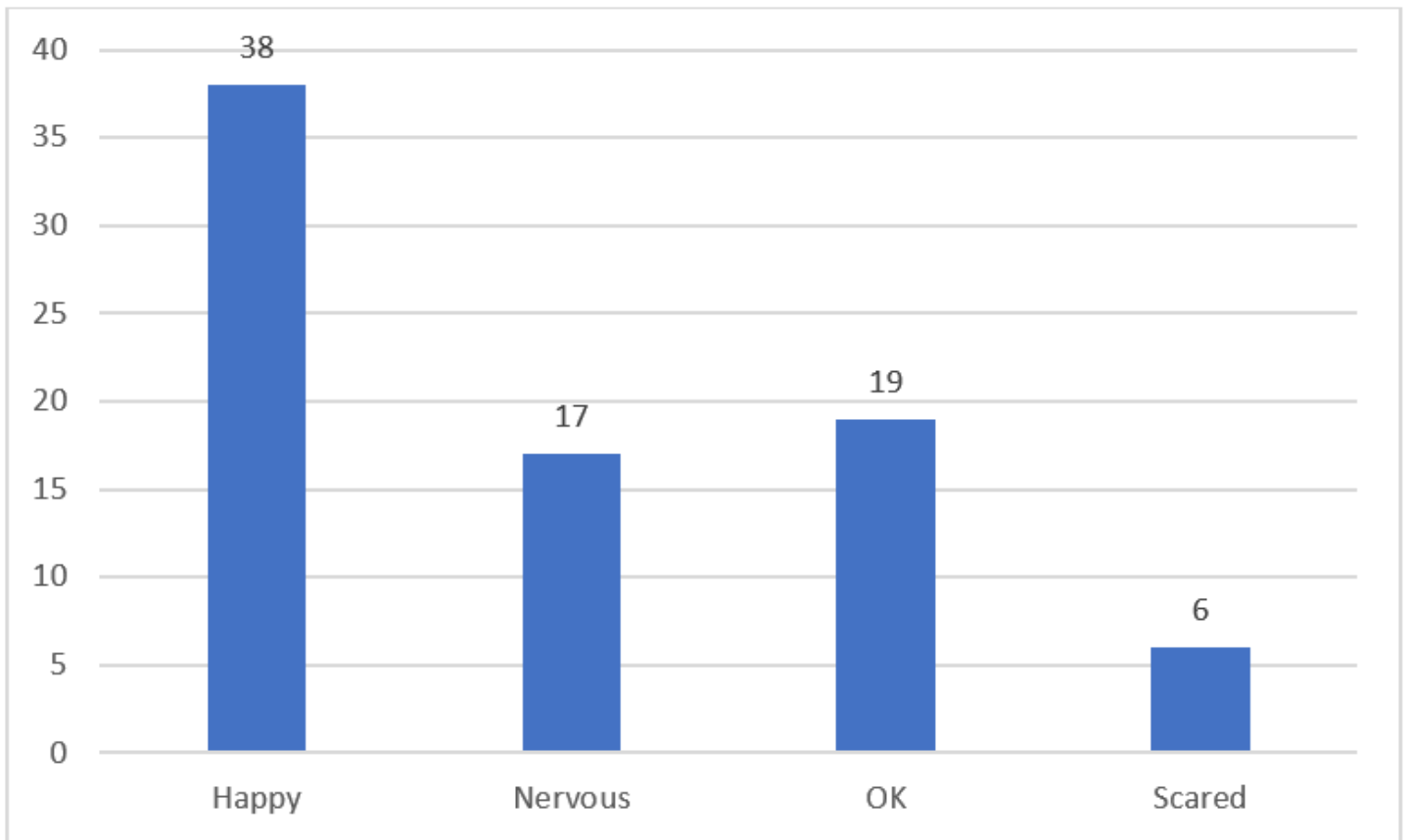


Figure 1

Assessment of schoolchildren's feelings before the saliva test

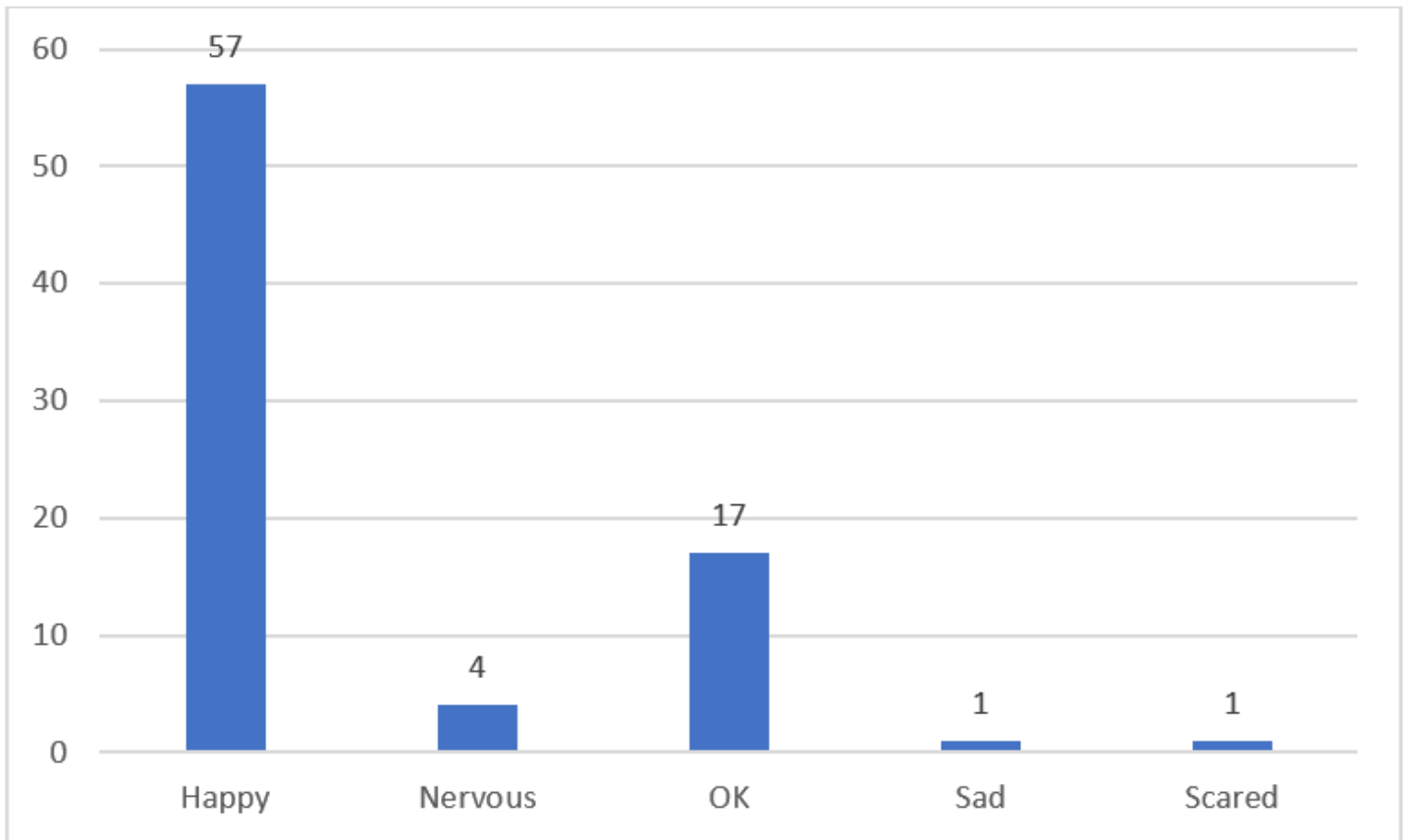


Figure 2

Assessment of schoolchildren's feelings after the saliva test

Supplementary Files

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