NASAL SWAB SAMPLING FOR ANTIGEN TEST IDENTIFIES COVID-19 WELL IN ALL AGES

Juusela M[1], Koskinen JM[2], Aaltonen V[1], Sarna S[3], Sipilä M[2], Koskinen JO[2], Qvist E[1]. 1 Pikkujätti Medical Centre for Children and Youth, Helsinki, Finland 2 ArcDia International Ltd, Turku, Finland
3 Department of Public Health, Helsinki University, Helsinki Finland. [Contact: maria.juusela@pikkujatti.fi; I have no real or perceived conflicts of interest that relate to this presentation.]

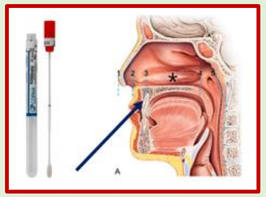
INTRODUCTION

Testing is essential for detecting COVID-19. Despite of repeated vaccinations the insidence of new COVID-cases is increasing. As part of differential diagnostics the identification of the pathogen causing symptoms is crusial in order to manage new variants and the pandemic. The role of small children in transmitting the COVID-19 has stayed unclear, which may effect opinions on distance working and the use of protective wear outside home. **We investigated** the sampling depth to optimize the COVID-19 diagnostics in a real world decentralized setting.

SUBJECTS & METHODS

Subjects: First, 160 randomly selected subjects were included in a 30 days' study cohort, all visiting medical center either exposed to COVID-19 or as symptomatic. Mean age was 17 years (range 1-79), and 57 subjects were ≤ 6 years of age. The final study lasted for five months. Total of 454 randomly selected subjects from three Aava & Pikkujätti Medical Centres were included. Mean age was 21 years (range 0-79), and a half of the studied (49%) were small children and youth. (Table 1).

Methods: Nasopharyngeal (NP) and anterior nasal (NS) specimen were collected from all and a subgroup of PCR- or mid-turbinate (≥18 years) samples were included. All COVID-19 positive findings (NP or NS) were assumed to be true positives based on the high specificity of the used automated mariPOC® (ArcDia Ltd, Finland) SARS-CoV-2 antigen test (>99.8%). Symptoms, COVID-19 vaccines and other background information were obtained. Paired COVID-19 PCR by N-gene analysis and Ct-values were assessed.



Picture 1. NS-swab with Copan 552C, anterior nasal specimen were collected from both nostrils.

Picture 2. Respitory panel in mariPOC® includes antigen diagnostics for 11 pathogens, COVID-19, Influenza A and B, RSV, OC43, *Streptococcus pneumoniae* included.

RESULTS

After the first 30 days, detection of 11 possible different respiratory pathogens resulted in the primary cohort 41 NP-positive (26%) and 33 NS-positive (21%) samples, of which positive for COVID-19 were 26 NP and 21 NS cases, respectively. The best detection rate for COVID-19 was among subjects ≤6 years of age, 100% for NS compared with 88% for NP. The negative percent agreement was high among all subjects regardless of symptoms (91-99%), whereas detection rate diminished by the length of sick days of ≥ 4. These results are in line with results of the final cohort below (n=454).

Results: We found 171 NP-positive (37%) and 164 NS-positive (37%) results, of which positive for COVID-19 were 124 NP and 113 NS samples, respectively (Tables 2 & 3). The PSI-values* for positive NP and positive NS are presented in Figure 1.

	No. subjects
Total	454
Valid	436
Age (years)	
0-6	156
7-14	67
15-20	40
21-	173
Men	225
Women	229

Table 1. Demographic data, n=454.

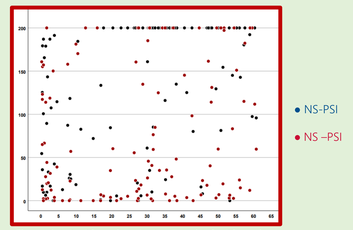


Figure 1. NP –PSI- values in BLUE and NS –PSI –values in RED by the age of study subjects.

Detection rate for NP-COVID-19 was 96% and NS-COVID-19 88% (Table 2 & 3). In a subgroup (n=160) where PCRs were assessed, the detection rate for NP was 99% and for NS 97%, respectively.

			NP COVID- 19 NO	YES	TOTAL
NPorNS_pos	0	Count	322	0	322
		% within NPorNS_pos	100,0%	0,0%	100,0%
	1	Count	5	124	129
		% within NPorNS_pos	3,9%	96,1%	100,0%
Total		Count	327	124	451
		% within NPorNS_pos	72,5%	27,5%	100,0%

Table 2. Detection rate for COVID-19 by NP-spicemen is 96%.
Cross tabs: NP positive or NS positive *vs* NP-positive and NP –negative.

			NS COVID- 19 NO	YES	TOTAL
NPorNS_pos	0	Count	322	0	322
		% within NPorNS_pos	100,0%	0,0%	100,0%
	1	Count	16	113	129
		% within NPorNS_pos	12,4%	87,6%	100,0%
Total		Count	338	113	451
		% within NPorNS_pos	74,9%	25,1%	100,0%

Table 3. Detection rate for COVID-19 by NS spicemen is 88%.
Cross tabs: NP positive or NS positive *vs* NS-positive and NS–negative.

NP positive n=124 Spearman nonparmetric correlation, sig 2-tailed, p-vaule	Age	No. of vaccines	Length of symptoms
NP-PSI value	**<0.001**	**<0.001**	**ns**
No. of symptoms	**0.034**	**ns**	**0.059**
No. of vaccines	**<0.001**	**x**	**ns**
NS positive n=113 Spearman nonparmetric correlation, sig 2-tailed, p-value	Age	No. of vaccines	Length of symptoms
NP-PSI value	**ns**	**ns**	**ns**
No. of symptoms	ns	**ns**	**0.017**
No. of vaccines	**<0.001**	**x**	**ns**

Table 4. NS-PSI values are independent of age , number of COVID-19 vaccines and length of symptoms.

CONCLUSIONS

Nasal swap sampling for antigen test identified COVID-19 well in all ages. The virus load (NS-PSI) can be as high in small children as it is in adults.

Positive (NP/ NS, both) findings correlated to symptoms, vaccination status, having had COVID-19 (p< 0.001) and fever (p=0.015), respectively.

PSI-values for NP were correlated with vaccination status (p<0.001) and having had COVID-19 (p=0.003), respectively.

PSI-values for NS were not correlated to these variables above, solely to PSI-NP values (p<0.001). (Figures 4 & 5)

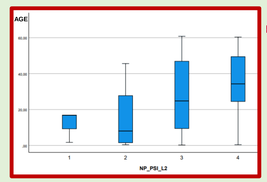


Figure 4. Age vs NP-PSI categories, p< 0.001.

PSI_L2 categories	No.of subjects
PSI-NP_L2	
-5, cat 1	3
5-50, cat 2	23
50-100, cat 3	12
100 - , cat 4	77
PSI-NS_L2	
-5, cat 1	15
5-50, cat 2	40
50-100, cat 3	12
100- , cat 4	45

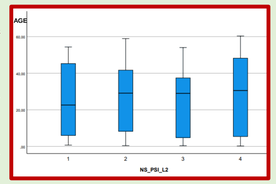


Figure 5. Age vs NS-PSI categories, p=0.913.

PROs for NS-COVID-19 sampling

NON-INVASIVE and MORE CONVENIENT THAN NP-sampling

LESS LAB STAFF NEEDED

FAST and INEXPENSIVE

EXACT TO USE IN MONITORING ALL AGED SUBJECTS

INDEPENDENT of the vaccination status and having had COVID-19 before

POST EXPOSURE - PRE SYMPTOMS OR WITH OR WITHOUT SYMPTOMS

Conclusions: Anterior nasal specimen from the nostrils shows high potential in detecting COVID-19 in small children with a rapid antigen test. Nasal sampling may decrease the need of COVID-19 testing resources compared to NP swab, thus enabling allocation of resources for more effective infection control.

* The mariPOC®(ArcDia Int. Ltd, Finland) is an automated and fluorescent rapid antigen test system (Picture 2). Primary results of positivity is reported on site in 20 minutes and final results in 120 minutes. mariPOC® can provide quantitative information as a semi-quantitative signal strength value PSI (ψ) of the pathogen load in the sample. PSI (ψ) value is a multiple of the cut off signal level. For SARS-CoV-2 the range of PSI-values is 0-200. Different PSI-values for COVID-19 have not yet been clinically indicated.

Ref. Koskinen, J.M., Antikainen, P., Hotakainen, K. et al. Clinical validation of automated and rapid mariPOC SARS-CoV-2 antigen test. Sci Rep 11, 20363 (2021). https://doi.org/10.1038/s41598-021-99886-6
mariPOC®(ArcDia Int. Ltd, Finland) https://www.arcdia.com/maripoc/tests/respi-tests/

ERS International Congress 2022 Abstract # 32395
04 September 2022 12:00 AM TP-1 in thematic poster area, Biomarkers in COVID-19, PA860