

The Institut Pasteur of Côte D'Ivoire (Ivory Coast) in the Emergency Management of Air Travellers during the COVID-19 Pandemic: A Unique Experience in Supporting the Response Strategy in Côte D'Ivoire from 2021 to 2022

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Abstract

Since its outbreak in December 2019 in Wuhan Province (China), the Coronavirus (COVID-19) disease quickly spread around the world in such a way that most response plans were outdated. There was an urgent need to change and adapt response strategies as the virus globally spread. Entire firms and economies were brought to a standstill in order to reduce the virus' capacity to spread and to limit some of the short-term impacts in order to save time and find out solutions to come back to a more or less normal way of life. Thus, most of the countries that closed their air, sea and land borders had to reopen them progressively, with travel restrictions submitted to rigid controls. In Côte d'Ivoire, as in all other countries, air travellers leaving the territory were required to provide a certificate for a negative COVID-19 test, valid for 24 to 72 hours depending on the country of destination. However, the national system implemented could not provide a result before 48 hours. The objective of this work was to develop an alternative strategy to the system for air travellers who were in a hurry and those who had a computer bug in ob-

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taining their result. A total of 38,444 air travellers benefited from this strategy implemented by the Institut Pasteur de Côte d'Ivoire during these two years.

Keywords

COVID-19, Institut Pasteur de Côte D'Ivoire (IPCI), Air Travellers, Emergencies, Strategy, Hurry Computer Bug

1. Motivation and New Contribution

This activity enabled us to deal with urgent, diverse and complex situations during this hot period. The physical assistance provided consisted, among other things, of direct exchanges with travellers in difficulty in order to obtain their results online, despite the guidance of switchboard operators. This had the advantage of solving certain problems by taking into account the humanitarian and emotional aspects that machines (computers, tablets, mobile phones, etc.) could not consider.

2. Introduction

On March 11, 2020, Côte d'Ivoire (CI) recorded its first case of Coronavirus disease (COVID-19) [1]. He was an ivorian of forty-five (45) year old, who had stayed in Italy, with a suspicious symptomatology ([1] [2]). Since then, the country entered the great era of the global COVID-19 pandemic. Firstly, found in Abidjan, the economic capital, the disease gradually spread within the country, affecting all healthcare centers. Two years later, on March 10, 2022, the country has recorded 81,577 cumulative confirmed cases of COVID-19 and 795 deaths caused by the disease (Sitrep COVID-19 Côte d'Ivoire). As part of the response, the World Health Organization (WHO) backed up the country in implementing key strategies, such as improved screening and covering medical costs, laboratory surveillance and diagnosis, risk communication and community engagement, training of frontline health workers, through advisory, technical and logistical support.

In order to stop the spread of the virus, a set of public health measures were decided and implemented by the country, such as the isolation of the city of Abidjan from the rest of the country, the suspension of international travel by land, quarantining of relatives, the closure of educational institutions, the limitation of gatherings, the closure of leisure and catering places [3]. All of these measures significantly helped in reducing transmission, with a gradual decrease in the number of (positive) COVID-19 cases in Côte d'Ivoire.

The new challenge was to return to more or less normal life. The lessening of some restrictive measures was announced, such as the reopening of air borders with the requirement for all travellers to provide a certificate of negative COVID-19 test. A solid system involving three major public health structures (order

n° 470/pm/cab of 10 April 2020) had been set up to establish these certificates within 72 hours by a government decree. First, nasopharyngeal swab samples were taken by the National Institute of Public Hygiene (INHP) through eleven (11) sampling centers distributed in all the district of the city of Abidjan and six (06) other centers in cities within the country. Then, all samples collected were sent to the Respiratory Viruses Unit of the Institut Pasteur de Côte d'Ivoire (IPCI) for virological diagnosis using the real-time Polymerase Chain Reaction (PCR) technique, the only test authorized by WHO for the diagnosis of COVID-19 for air travellers. The analysis certificates were all edited and signed in situ by the Director of the IPCI at first and this over a period of six (06) weeks until the setting up of an automatic online generator of certificate of analysis in June 2020 (Diplo *et al.*, 2021). Finally, the Infectious and Tropical Diseases Service (SMIT) hosted by the teaching hospital of Treichville (Abidjan) was required the first days to take care of air travelers with a positive COVID-19 test.

However, the results of analyses were mostly available within 48 hours. Thus, the issue of countries whose test validity should last 24 hours or emergency cases such as missions of local authorities or not, the question of medical evacuations quickly arose and required special management since they had not been taken into account by the national system. This article describes the process implemented by the institut pasteur de Côte d'Ivoire (IPCI) for air traveller emergency management in the aim to support the national COVID-19 response strategy.

3. Methodology

Since 16 August 2020, the Institut Pasteur de Côte d'Ivoire implemented a strategy for managing the delivery of COVID-19 analysis certificates to travellers by means of a memorandum and with the creation of a premises to carried on this activity. The experience of this working group helped to manage air travellers' emergencies.

The organisation of air travellers' emergency management activities was summarised in four (04) main stages, as followed:

3.1. Definition of "Emergency" Cases

Firstly, it was important to identify all the situations that were considered urgent and classify them in order to set up inclusion criteria for travellers. Thus, the situations selected as emergencies were quickly described and treated by priority. In general, we had:

- Missions of local authorities (the presidency, ministries, diplomatic corps, deputies, mayors) or international authorities (ECOWAS, Interpol, Embassy)
- Passengers in transit
- Medical evacuation abroad
- Countries with a 24-hour test validity period

3.2. Setting up a Place

Two areas were set up within the IPCI for the management of travellers when

the air borders reopened. One to accommodate travellers and the second to serve as operations base according to Diplo *et al.*, 2021. Thus, to manage air travellers' emergencies, a third space was added to collect nasopharyngeal swab samples in compliance with biosafety rules. Thus, all samples collected were recorded via a national data entry platform for air travellers. The collected samples were forwarded to the IPCI Level 3 Tuberculosis Laboratory for analysis.

3.3. Performing Analyses with the GeneXpert® System

To fight against tuberculosis, the IPCI was equipped with a GeneXpert® platform for the diagnosis of tuberculosis at the atypical tuberculosis mycobacteria unit. It seemed obvious to rely on this expertise to manage air traveller emergencies.

The interest in using the GeneXpert® platform for the detection of SARS-CoV-2 lies in the following points: 1) the Xpert® Xpress SARS-CoV-2 test showed perfect concordance with RT-PCR, the only detection method recognised by the WHO; 2) the time taken to deliver results is shorter (approximately 1 hour compared to 3 - 4 hours for conventional PCR), 3) the setting up of the GeneXpert® requires lighter logistics and less training time, 4) the implementation of this technique ostensibly reduces the risks of contamination of both samples and the operator [4].

All samples collected as part of emergency management were analysed by the GeneXpert® Xpress SARS-CoV-2 system at the IPCI Level 3 Tuberculosis Laboratory. The results obtained were given by the laboratory and recorded on the national platform for publication by relevant authorities. This process was developed by the national health authorities in accordance with the Ministry of Transport in Côte d'Ivoire to facilitate access to results for all travellers. Thus, the publication step was necessary for travellers to have access to their results via the online platform for generating certificates of analysis [5].

Diagram 1 below provides a better understanding of the method used in the activity.

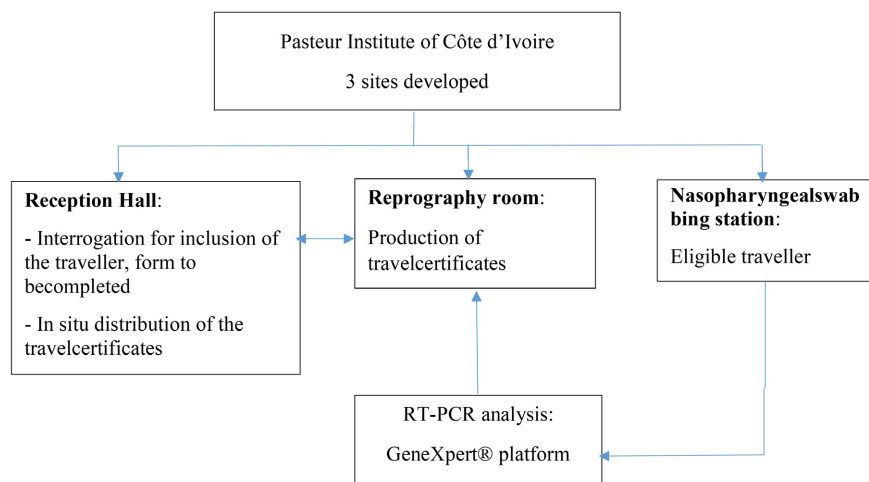


Diagram 1. Flow chart for the air traveller emergency management process at the Pasteur Institute of Côte d'Ivoire (Cocody).

3.4. Results Management

The implementation of an online platform that automatically generates the certificate of analysis tremendously contributed to lessen the burden of managing the results. Practical, the traveller receives a barcode (corresponding to the client's sample number) after his nasopharyngeal swab sample. This code was linked to his personal data (the date of the sample, surname and first names, sex, date of birth) via the online platform and thus enables him to record his result as soon as it is available. Thus, the client (traveller or suspected client) would only have to consult his result by entering his ID code on the website interface generated for this purpose from a local internet network. Also, physical certificates of analysis authenticated and signed by the Director of the IPCI were issued to travellers whose results were not available online. The team of biologists also benefited from the permanent assistance of SAH Analytics structure, designer of the online platform, encompassed of computer scientists and analysts. Collaboration between these multidisciplinary teams helped to overcome most of the technical problems linked to the platform and met the needs of passengers.

4. Results and Discussion

A total of 38,444 attestations signed by the Director of the Institut Pasteur de Côte d'Ivoire were issued during these two years 2021-2022. This adaptability of the staff made it possible to deal with urgent travel by national and international authorities and also to catch up with all other travellers who had difficulties in obtaining the attestations online.

The number of emergency in situ certificates issued per day during the first eight months of 2021 ranged from a low of 54 to a high of 167, as shown in **Table 1** below.

Table 1. Annual distribution of COVID-19 certificates delivered in situ at IPCI during year 2021.

Month	Number of Certificates delivered
January	2317
February	2499
March	2118
April	1390
May	1688
June	2277
July	2189
August	4336
September	698
October	100
November	211
December	427

Table 2. Comparative table of COVID-19 certificates delivered in situ during the years 2021 and 2022 at the Institut Pasteur de Côte d'Ivoire.

PERIOD	Number Certificates delivered	
	2021	2022
January-march	6934	5507
April-june	5355	3587
July-september	7223	4613
October-december	3260	1965
TOTAL	22,772	15,672

After August 2021, this difficult situation improved significantly. This could be explained by a better appropriation of the computer system on the one hand and by the fact that travellers had started to vaccinate since March on the other. The two peaks of travellers observed from July to September during these two years correspond to the period of the major school holidays and the beginning of the school year as shown in **Table 2**.

5. Conclusion

Experiences of this kind have been reported in the literature by Faye [6] and Yao [7], the former of whom worked on the management of COVID-19 patients in a totally improvised medical service at Senegal. As for Yao, he highlighted the lessons learned by young researchers from this totally unprecedented health situation through the support provided to senior staff for the management of travellers. This experience showed once again that the IPCI was not only a “laboratory” but was an essential support to the response strategy for the COVID-19 pandemic in Côte d'Ivoire [7].

Contribution of the Authors

All the authors participated intellectually in the preparation and revision of the manuscript before its submission.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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