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Port State Control: A Risk of The International Spread Of COVID-19 Disease on Board Ships?

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Abstract

On January 30th, 2020, the WHO declared China's COVID-19 outbreak a public health emergency of international concern, presenting high risk to countries with vulnerable health systems. The emergency committee said the spread of COVID-19 can be halted through early detection, isolation, prompt treatment and implementation of a robust contact traceability system. A propagation monitoring study was carried out at the Douala Port, a major sub-Saharan Africa vessel Point of Entry. The study of the cargo vessel port of call and the detection of COVID-19 transmission shows that approximately 0.51% of the crews on aboard the cargo vessel after 61 epidemiological weeks are diagnosed positive for COVID 19 at the Douala Port. 98% of those detected early are asymptomatic. The vessels for which positive cases have been detected belong to the WHO Europian region (33%), Pacific region (25%) and American region (21%). However, no cargo vessel coming directly from WHO regions outside Africa has had positive cases on board. Vessels with positive cases on board all made stops in West Africa prior to their arrival in Cameroon.

Keywords: COVID-19, Risk, Port, Sub-Saharan Africa

Introduction

On 31st December Wuhan Municipal Health Commission, China, reported a cluster of cases of pneumonia in Wuhan, Hubei Province. A novel coronavirus was eventually identified. The epidemic has rapidly spread to other countries in the Asian, European and American regions forcing the World Health Organization to declare the Public Health Emergency of International Concern on January 30th, 2020. The 27th February 2022, the WHO reported 433,139,235 cumulative confirmed cases for 5,939,137 deaths from COVID 19 in the world. The countries of the WHO Africa region having recorded to this date 8,319,957 confirmed cases and 169,702 deaths [1-3].

As of 16th February, 2022, 119,107 cumulative confirmed cases and 1,920 deaths have been reported in Cameroon [4]. At points of entry, several measures have been taken by designated border health posts [5,6] to limit the international spread of the disease with reference to those recommended by the WHO in case of Public Health International Emergency event [7]. At sea and river Points of Entry (PoE), surveillance and response data as well as the strategies deployed are still insufficient to allow harmonization of procedures. Thus, the evaluation of the covid 19 test results of the crew members aboard cargo vessel associated with the examination of these vessel ports of call was experimented in the second epidemic wave at the Douala port.

The main objective of this action was the prevention of international spread of the disease, through protective measures, disease control and response by public health action proportionate and limited to the risks it presents to public health, avoiding creating barriers unnecessary to international traffic and commerce [8].

Method

Study of the Crew's Itinerary

It was done using lists of ports of call ships. Indeed, the last potential exposure of crew members on the ships board would correspond to the time elapsing between the last port of call and the inspection/surveillance at the Douala Port. This probable incubation period is calculated from the stopovers dates and times mentioned on the Ports of Call List and gives an indication of the risk level, the approximate probability of developing signs and symptoms of disease in a crew member, compared to viral multiplication curve and the probable date of symptoms onset referenced by the published studies.

Target of Systematic Testing

Any crew of a ship with a negative PCR test result (from any point of entry) of less than 72 hours was systematically subjected at the PoE of Douala Port to the Antigenic COVID-19 type of the PanbioTM brand Rapid Diagnostic Test (RDT).

Storage and Usage Kits Conditions

The kits have been stored in accordance with the manufacturer's storage conditions. The temperature of the storage point varied between 15 and 28°C, measured twice daily using a wall thermometer. Then, the positive and negative controls were performed in order to assess their ability to give reliable results.

Collection Technique and Sample Preparation

The sailors were collected with a nasopharyngeal swab rubbed and rolled 3-4 times at the bottom of the nostril. Then, each swab sample was swirled at least 5 times in the buffer fluid contained inside the extraction tube. After breaking off the outer end of the swab, the tube was closed with the stopper and 5 drops of the extracted samples were distributed vertically into the wells (S) of the cassette.

Results Interpretation

After 15 to 20 minutes of migration of the drops by capillary action, the bands of red coloration will appear representing the positive control (proof that the test is valid), and the test sample (reagent). The absence of the positive control strip means the test is invalid. The simultaneous presence of the two bands (positive control and test sample) reflects the reactivity of the test sample. While the presence of the positive control band alone means the sample is unreactive.

Management of Positive Cases on Board

The positive cases put under treatment at the Douala Port PoE were transferred to a quarantine and care site. The other crew members who remained on board and contacts around the confirmed case were retested on the 7th day. While the ship was systematically disinfected after the medical evacuation of the case.

Collection of Data

The crew member and their vessel data were collected in a 24-hour interval starting at 6 p.m. They were subject to a qualitative analysis relating to their completeness, consistency, reliability, concordance and accuracy before being compiled and translated into indicators.

Statistical Indicators and Analyzes

Several indicators have been defined on the basis of the activities carried out (Table 1). Analysis of these indicators for risk assessment and decision making was done per epidemiological week using QGIS software.

Activities	Indicator	Abbreviation
SC and SI	Percentage of Ships Distribution by Flag State and by last country of call	PSD
EBS/IBS and Response	Number of sailors tested	NST
	Positivity Rate	PR
	Number of New Cases Variation	NNCV

* EBS: Event-Based Surveillance, IBS: Indicators-Based Surveillance, SC: Sanitary Control, SI: Ships Inspection

Table 1: Indicators of incident management according to activities

Results

From the 53rd epidemiological week of the year 2020 to the 08th epidemiological week of the year 2022, 21,492 crew members were tested with the SARS-CoV2 antigenic TDR aboard 1,195 cargo vessels. 110 positive cases recorded aboard 31 cargo vessels (Positive rate on board: 0.51%) including 108 asymptomatic (around 98%) and 2 symptomatic (2%). (Figure 1). The two symptomatic cases detected being the contact subjects who returned positive 4 days after detection of the first case on board. Positivity rate on board: 0.28%.

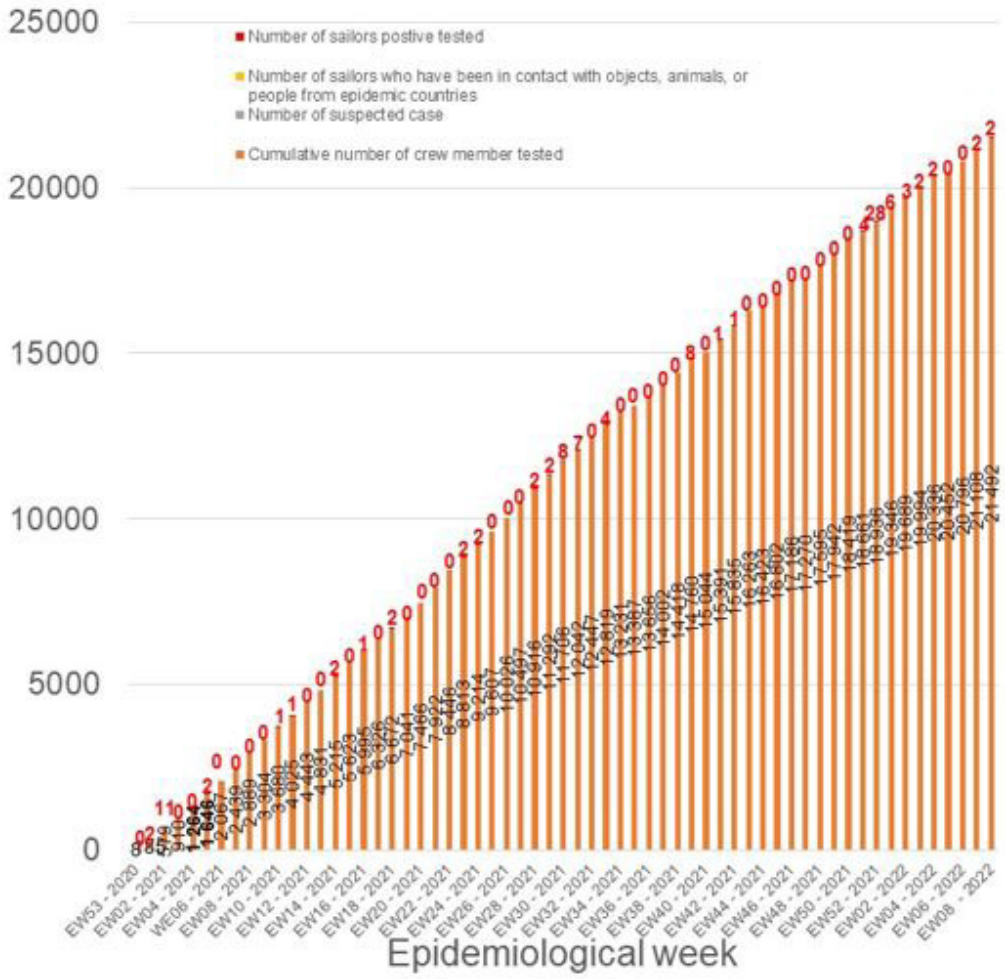


Figure 1: Cumulative surveillance and response data aboard cargo vessels, Douala Port PoE, December 2020 - February 2022

The highest number of cases was observed in the 52nd epidemiological week of the year 2021 (28 cases) on four vessels board. The median of positive cases recorded on board is reached at the 39th epidemiological week. (Figure 2). In other words, during the last 21 epidemiological weeks (EW41-2021 to EW08-2022), the Port of Douala captured the same number of cases as in the first 40 weeks (EW53-2019 to EW39- 2021). This would reflect an increase of the frequency of occurrence of cases aboard vessels. Eliminating the extreme values (EW 35-2021, EW42-2021 and EW50-2021), the average number of vessels per epidemiological week is around 20 ± 2. The percentage of cargo vessels with at least one positive case on board being approximately 2.5%, the probability of having a vessel with at least one positive case on board after 4 epidemiological weeks, would be estimated at approximately 2%. The number of cases per vessel varied from 1 to 12. Six peaks of cases aboard 6 cargo vessels were identified (EW02-2021, EW30-2021, EW31-2021, EW39-2021 and EW52-2021), three of which during of the first 40 epidemiological weeks and the three others in the last 20. When the peaks of cases on board are removed, the average number of cases aboard vessel is estimated to be around 2 ± 1. (Figure 3).

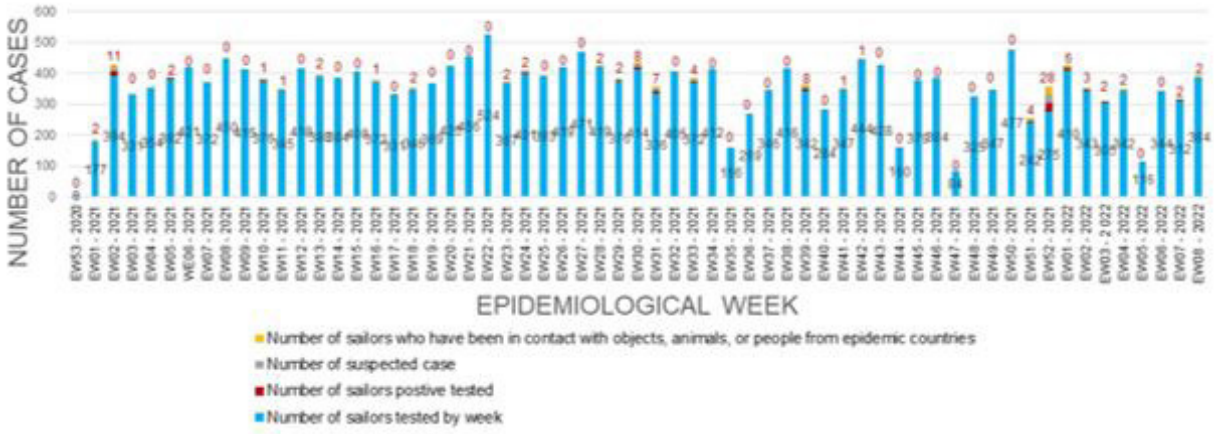


Figure 2: Surveillance and response data aboard cargo vessels by epidemiological week, Douala Port PoE, December 2020 - February 2022

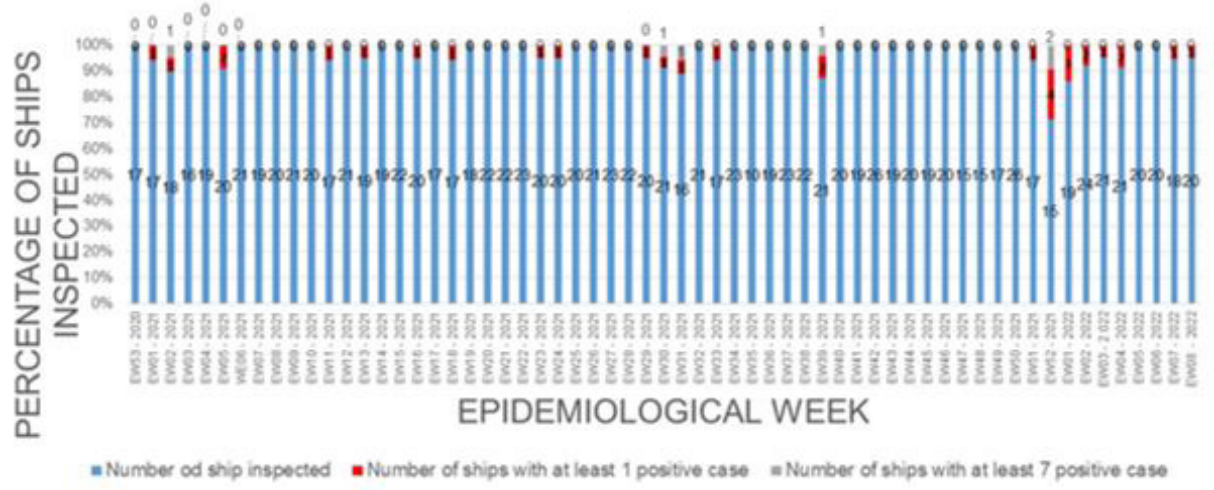


Figure 3: Variation number of vessels with at least one positive case aboard cargo vessels per epidemiological week, Douala Port PoE, December 2020 - Febuary, 27th 2021

From these observations, it emerges that at the Port of Douala, the number of positive cases detected aboard vessels as well as the number of vessels having at least one positive case on board evolve 0.5 times proportionally to the time between the first two waves of the epidemic and the last two (SE 41-2021 to SE 45-2021; SE 50-2021 to SE 22-2022).

About 33% of the vessels for which positive cases have been recorded belong to the WHO European Region, 25% to the Pacific and 21% to the America. Cargo vessels of the WHO European region were flying Malta, Portugal, Cyprus and Italy Flags; those of the Pacific flying the Marshall Island and Singapore flags; and finally, those of the WHO America region flying the Panama and Antigua and Barbuda flags. Vessels with positive cases had made their last stopover in West Africa (62%), mainly in Nigeria, Ghana, Côte d'Ivoire and Togo, and only during the last 20 epidemiological weeks in Central Africa (42 %). The first 3 peaks of cases were detected aboard Panama-flagged Pacific vessels (for the first 40 weeks) and the last 3 aboard Europe flagged Malta and Italia (2) and Pacific vessels flagged Panama (1). Only one cargo vessel coming from central africa registered positive cases.

These results suggest that the most cargo vessels at risk at the Port of Douala are those from the WHO European, Pacific and America regions (Figure 4), which make their last call in West Africa and particularly those who have the highest port call percentage. It should however be noted that the mainly positive crew members were Filipino, and no case has been detected aboard vessels coming directly from the WHO region outside Africa (means that has not made a call in Africa) (Figure 5).

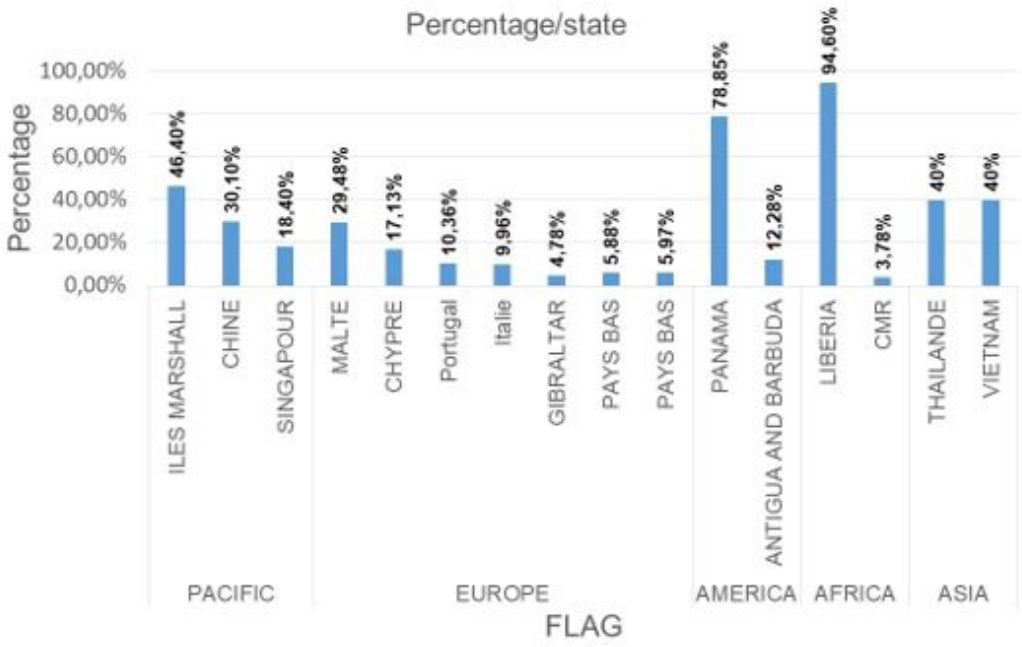
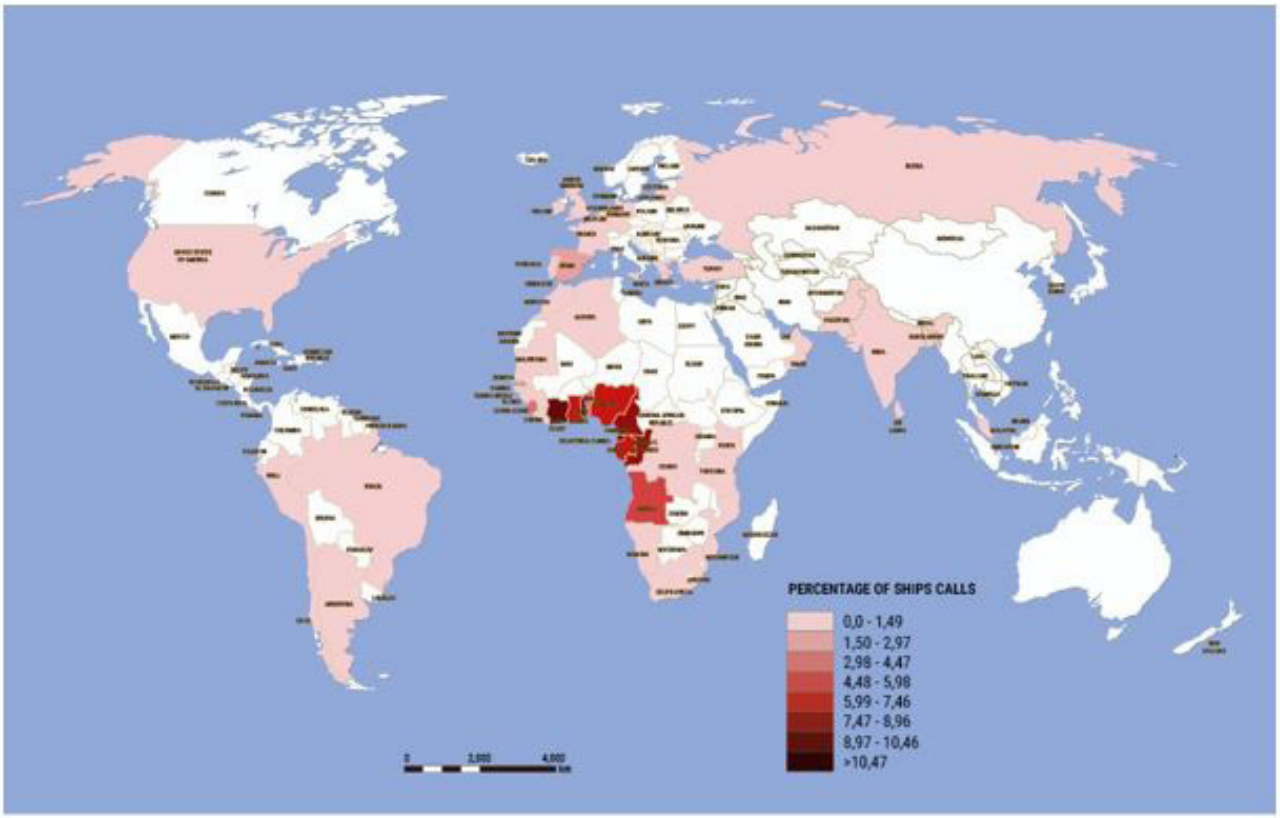


Figure 4: Percentage of Distribution of inspected Ships / monitored by Flag State (PDS), Douala Port PoE, February - February 2022



Percentage of distribution of vessels according to the last call, PSF-PAD,
1st April 2020 - 27th february 2022

Figure 5: Percentage of distribution of vessels according to the last call, PSF-PAD, 01st April 2020 - 27th February 2022

Discussion

The observation made about the most commercial vessels at risk at the Port of Douala is concordant to the proportions of positive cases of the concerned regions and reported by the WHO [2]. The average number of COVID 19 cases detected on board is similar to those reported by Schlaich and *al.* in 2009 about communicable diseases aboard cargo ships (attack rate range 3 – 10) [9].

According to the results obtained at the Port of Douala, the positivity rate of sailors aboard of cargo vessels fell from 0.3% (at the end of the second epidemiological wave) to 0.51% (at the end of the 4th wave). But it remained low compared to the national positivity rate (in order of 2%) [4] and the cumulative Africa cases (2%) [2]. The main explanation for this phenomenon is the application of preventive measures aimed at limiting the importation and dissemination of cases aboard vessels such as usual testing of COVID 19 of the seaferers before entry the vessel, the knowledge and observance of attitudes and practices on COVID 19 aboard vessels (wearing masks, regular hand washing, social distancing aboard, clean vessel, possible undocumented care on board, daily temperature control by the crews themselves). In fact, the impact of these measures to the COVID 19 outbreaks aboard vessels had been reported by Codreanu and *al.* in 2021 [10]. More over, the evaluation of such knowledge, practices and attitudes in the prevention of this disease has already been made in Asian communities [11]. In addition, during the first two waves, seaferers remained stranded aboard vessels due to the several awareness-raising and border restriction measures applied in several States, which has limited the contact of seafarers with the communities and their repatriation [12].

On the other hand, during the last two waves, the measures were relaxed in several ports and airports with the re-opening of several borders motivated primarily by the institutionalization of vaccines. This has encouraged exchanges with the communities. It is also possible that the duration between stopovers (considered as the last point of a potential exposure), the limitation of exchanges between crew members on board due to the constraints of their activities, and the control of sailors in border ports have also helped to reduce the spreading risk of the disease.

Systematic testing of crews aboard cargo vessels, early case management and healthy measures applied on vessels reduced the risk of spreading COVID 19 disease. This response strategy, which meets WHO requirements on the capacities of Points of Entry for epidemiological surveillance [13,14], allowed to observe a low risk of the spread of the COVID 19 disease by the crews of commercial vessels at the Port of Douala.

However, the absence of cases detected aboard commercial vessels coming directly from countries in WHO regions outside Africa suggests that the most likely source of transmission is linked to the stopover's ports. Indeed, according to the SOLAS convention [15], an IMO instrument ratified by the State of Cameroon, any vessel is subject, in a port of another contracting government, to the control of officials duly authorized by this government to the extent that the purpose of this check is to verify that certificates issued under Rule 12 or Rule 13 are valid. Port State control consists of verifying that a foreign vessel, its crew, equipment and cargo meet the provisions of international conventions. It is therefore possible that, in the absence of a shore-pass granted to these crews, they may be contaminated during these checks by Port State actors.

Conclusion

About 0.51% of sailors on cargo vessels board after 61 epidemiological weeks are diagnosed positive for COVID 19 at the Douala Port. This low rate of positivity on board would reflect a low international spread of the disease through the crew member of the commercial vessels who would probably become contaminated in the ports of call during the controls by the actors of the Port State.

Acknowledgment

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Conflicts of Interest

The authors declare no conflicts of interest

Data Availability

The data that support the findings of this study are available from request

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