



## ORIGINAL ARTICLE

## Epidemiology of COVID-19 cases diagnosed at quarantine facilities in Paraguay

*Epidemiologia dos casos de COVID-19 diagnosticados nas instalações de quarentena no Paraguai*

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### ABSTRACT

**Aims:** This study aimed to describe the epidemiological characteristics of COVID-19 cases diagnosed in quarantine facilities in Paraguay.

**Methods:** This was a descriptive, cross-sectional, temporarily retrospective study. The time scope was from April 1 to September 30 2020. The variables were sex, age and administrative departments. The open access data available on the website of the Ministry of Public Health and Social Welfare was used. Frequencies expressed in percentages and the Chi square value were calculated to observe the statistically significant differences between cases and age and sex.

**Results:** from April 4 to September 30 2020, 1,581 cases were diagnosed in COVID-19. The fewest number of positive cases were reported in April (50) and the highest number was reported in May (628). From the total, 69.6% (1,101) were male, (male / female ratio 2.3), 42.1% (666) were aged between 20-29 years, the average age was 30.23 years (range 0 to 87, standard deviation 14.66, 95% CI 1.5 - 58.95). The departments with the highest number of cases were Caaguazú 21.7 % (343), Alto Paraná 17.3 % (274), Central 13.3% (210) and Asunción 11.4% (180). The least number of cases of COVID-10 in women were registered in the Departments of Amambay, Pdte. Hayes, Ñeembucú and Boquerón, and in men the Departments of Ñeembucú and Boquerón. The largest number of male cases were registered in Caaguazú 70.8% (243), Alto Paraná 66.1% (181), Central 69.5% (146) and Asunción 68.9% (124). The number of Covid-19 infected people in quarantine facilities presented statistically significant differences between the variables sex and age.

**Conclusion:** the quarantine facilities are one of the measures that the Paraguayan government needed to avoid the rapid spread and dispersion of the virus. The epidemiology of the cases diagnosed in them corresponds to what was expected according to the characteristics of the country.

**Key words:** Covid-19; epidemiology; shelter; Paraguay

**ABREVIATIONS:** MSPBS, Ministry of Public Health and Social Welfare; WHO, World Health Organization

### RESUMO

**Objetivo:** descrever as características epidemiológicas dos casos de COVID-19 diagnosticados em instalações de quarentena no Paraguai.

**Metodologia:** estudo descritivo, transversal, temporalmente retrospectivo. Quanto ao âmbito temporal foi considerado o período de 1 de abril a 31 de setembro de 2020. As variáveis analisadas foram: sexo, idade e Departamentos Administrativos. Foram utilizados dados abertos de acesso público que estão disponíveis na página oficial do *Ministério da Saúde Pública e Bem-Estar Social*. Foram calculadas frequências expressadas em porcentagem e aplicado o teste de qui-quadrado para ver diferenças estatisticamente significativas entre os casos, idade e sexo.

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**Resultados:** De 4 de abril a 30 de setembro de 2020, foram diagnosticados 1.581 casos de COVID-19. Em abril houve a menor quantidade de casos positivos (50) e em maio a maior quantidade (628). 69,6% (1.101) foram em indivíduos do sexo masculino (relação homem/mulher de 2,3). 42,1% (666) tinham idade compreendida entre 20-29 anos, com uma média de 30,23 anos (classificação 0 a 87, desvio padrão 14,66, IC 95% 1,5 – 58,95). Os Departamentos com maior número de casos foram 21,7 % (343), Alto Paraná 17,3 % (274), Central 13,3% (210) e Assunção 11,4% (180). O menor número de casos de COVID-19 em mulheres foi registrado nos Departamentos de Amambay, Pdte. Hayes, Neembucú e Boquerón, e nos homens, os Departamentos de Neembucú e Boquerón. A maior quantidade de casos no sexo masculino foi registrado em Caaguazú 70,8% (243), Alto Paraná 66,1% (181), Central 69,5% (146) e Assunção 68,9% (124). O número de infectados por COVID-19 nos albergues apresentou diferenças estatisticamente significativas entre as variáveis sexo e idade.

**Conclusão:** Os abrigos temporários são uma das importantes medidas adotadas pelo governo paraguaio para evitar a rápida dispersão e propagação do vírus. A epidemiologia dos casos neles diagnosticados corresponde às esperadas para as características do país.

**Palavras-chaves:** COVID-19, epidemiologia, albergues, Paraguai.

## Introduction

On December 31, 2019, the Chinese health authorities informed the World Health Organization (WHO) about atypical pneumonia cases (1, 2). A new coronavirus was identified as Coronavirus 2 (SARS-CoV-2) (3), spreading rapidly around the world (4, 5). On February 11, the WHO called the new disease "COVID-19" (4, 5).

Faced with this situation, the countries have taken different types of measures. Thus, for example, China has issued the largest quarantine in history in which all residents were to remain isolated in their homes, closing all types of public transport in the cities (buses, trains, ferries and airports). Due to these measures, COVID-19 cases began to slow down (6, 7).

In Europe, the first positive cases were reported in Germany, France, Italy and Spain (7, 8) and preventive measures such as those in Asia were adopted. In addition, special precautions were implemented for suspected or confirmed COVID-19 visits and contacts (9,10). Regarding healthcare professionals, the measures taken were even stricter considering the high risk that they are exposed to (9, 11-13).

In South America, the first positive case was reported in Brazil on February 26 (14), while in Paraguay the first positive case reported was on

March 7 (15). As in Europe, the measures in South America were similar, with some particularities for each country. Brazil (16 - 19), Argentina, Uruguay and Paraguay determined quarantine and social distancing measures with different degrees of restrictions, including judicial measures in some cases (20, 21).

In Paraguay, when the first diagnosed case was confirmed, the educational and social quarantine was established (22, 23), thus breaking the WHO protocol, which establishes the quarantine in the phase 4 of community transmission (24). Other early actions taken by the Paraguayan government were: the suspension of flights from Europe (March 11) (25), declaration of a national health emergency (March 16), the total closure of borders (March 24) (26, 27) and declaration of national emergency (March 26) (28). One strategy was the creation of quarantine facilities, declared on the basis of the Decree Number 3526/2020, which authorizes the Ministry of Public Health and Social Welfare (MSPBS) to set up quarantine facilities for supervised isolation of people who have tested positive for COVID-19 in order to cope with the pandemic and prevent its spread in the general population (20, 25).

The Resolution S.G. Number 166/2020 establishes the situations in which people who have tested positive for COVID-19 must keep supervised isolation in authorized quarantine facilities (26). These situations are for those people who voluntarily wish to get away from their family environment or home; people in a situation of vulnerability who do not have the possibility of isolation at home; people who have violated the required isolation measure; people from coming from foreign countries who are in quarantine in places provided for this purpose and who have tested positive.

Resolution S.G. Number 173/2020 was adhered to the previous one (27), which states that Paraguayans coming from other countries for humanitarian reasons must comply with preventive isolation in a quarantine facility or other place designated for this purpose. However, the measure adopted by the government brought with it many grievances and complaints, not only due to its mandatory nature, but also because of the physical and material infrastructure and services provided by them.

As defined in the Resolution S.G. Number 228/2020 (28) dated May 31, 2020, a quarantine facility is any physical place that meets the technical requirements established by the MSPBS, for people who need to be in quarantine or isolation. In addition, it defines the criteria and roles of the different levels involved in the operation of the quarantine facilities (27). In this context, the “health hotels” were created for those people who were looking for more comfort during the isolation (14 days). To date, 175 quarantine facilities, 38 health hotels, and 2 health lodging have been set up, assisting 8,000 people (29 - 31). The objective of this study was to describe the epidemiological characteristics of Covid-19 cases diagnosed in quarantine facilities in Paraguay.

## Materials and methods

The study was descriptive, with an analytical, cross-sectional and temporally retrospective component. The geographical area considered for this study was the 18 departments of Paraguay, (including the capital, Asuncion), which corresponds to the political division of the country and which also corresponds to the health divisions (**Figure 1**). The time frame considered was from March 7 (the date of the first case diagnosed in the country) until September, 30, since the quarantine facilities stopped working at the end of September approximately (1, 2, 3).



**Figure 1** – Political and Health Division of Paraguay (40).

The variables considered were; confirmed cases, sex (male, female), age (average and range) and Departments.

The open access data available on the MSPBS website were used as a data source (15, 32).

The statistical analysis of the variables were frequencies expressed as percentages and the Chi-square to analyze the statistically significant

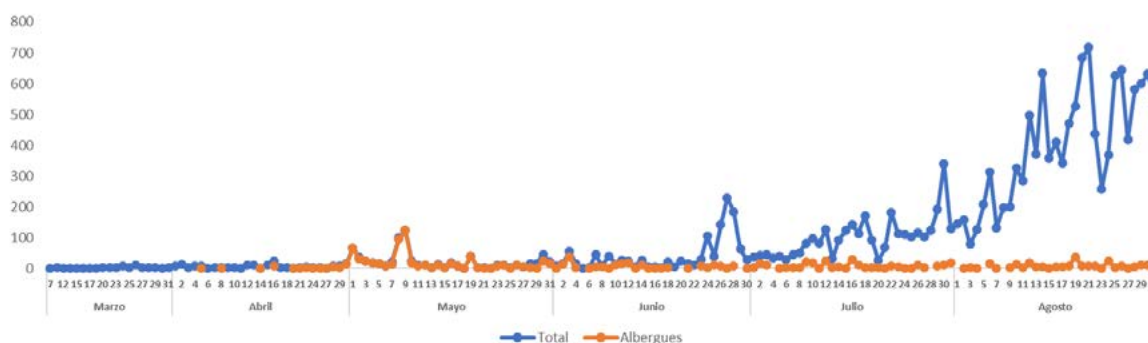
differences among variables of COVID-19 cases with respect to age and sex.

Regarding the ethical criteria, since this is a secondary data source research with no participation of human beings, the protocol of this work does not need the approval of the Research Ethics Committee based on Resolution CEP/ CONEP. 510, of April 7, 2016 (33).

## Results

From April 4 this until September 30, 2020, 1,581 cases of COVID-19 have been diagnosed in the quarantine facilities. The lowest number of positive cases was reported in April, with 50 cases, and the highest number of positive

reported cases was May with 628 cases. During this month, the number of cases diagnosed at the quarantine facilities were practically equal to those in the community, since there were 720 cases of community transmission (**Figure 2**).



**Figure 2** – Distribution of COVID-19 cases diagnosed at quarantine facilities, Paraguay (April - August 2020). **Source:** Ministry of Public Health and Social Welfare. Paraguay (15).

The male / female ratio was 2.3 of whom 69.6% (1,101) were male. The mean age was 30.23 years (range 0 to 87, standard deviation 14.66. 95% CI 1.5 - 58.95). The ages of 42.1% of the cases (666) ranged from 20 to 29 years. Only 0.3% (4) of the cases were reported in people over 80 years of age. A progressive increase in the average ages

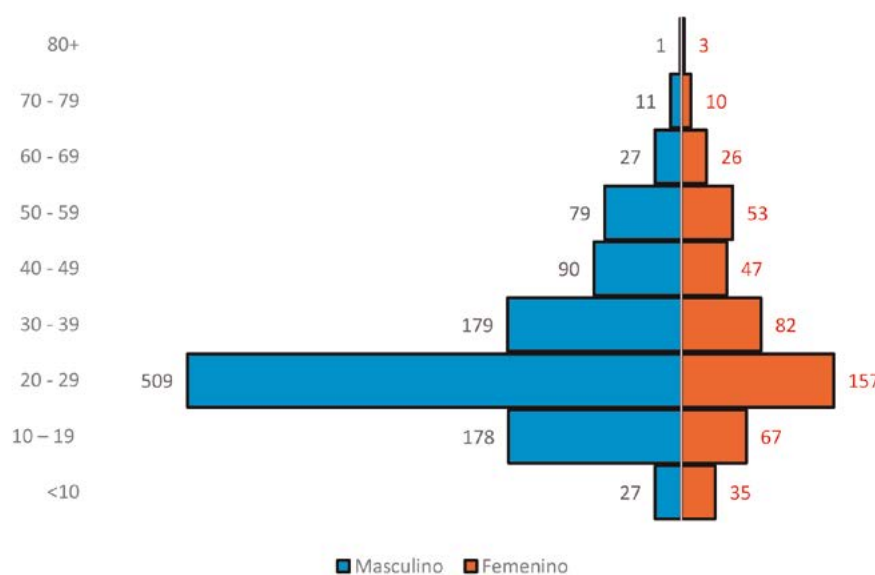
was observed throughout the months. In the month of April, the average was 25.1 years, May 24.3 years, June 27.8 years, July 35.3 years, August 37.6 years and September 36.6 % year. 86.7% of the reported positive cases (1,371) was reported in patients under 50 years of age (**Table 1**).

**TABLE 1** – Monthly distribution of COVID-19 cases in quarantine facilities, Paraguay (April - September 2020). N=1,581

COVID-19 cases in quarantine facilities		
Months	n	%
April	50	3.2
May	628	39.7
June	192	12.1
July	256	16.2
August	245	15.5
September	210	13.3

**Source:** Ministry of Public Health and Social Welfare. Paraguay (15).

When relating sex to age, for both sexes, the highest number of cases occurred in the age group 20 to 29 years (**Figure 3**).



**Figure 3** – Pyramid of COVID-19 cases diagnosed at quarantine facilities, Paraguay (April - September 2020). **Source:** Ministry of Public Health and Social Welfare. Paraguay (15).

Regarding the geographical distribution of the cases according to the Departments, the Departments with the highest percentage of cases were reported in the Departments of were Caaguazú 21.7 % (343), Alto Paraná 17.3 % (274), Central 13.3% (210) and Asunción 11.4% (180). The least number of cases were registered in patients from the Departments of Amambay, Pdte. Hayes, Ñeembucú and Boquerón (**Table 2**).

When relating sex to the Departments, 75% of the female cases were presented in the cases of the Departments of Ñeembucú and 50 % Boquerón. Meanwhile, the highest number of male cases occurred in the Departments of Caaguazú (70.8%, 243), Alto Paraná (66.1%, 181), Central (69.5%, 146) and Asunción (68.9%, 124) (**Table 3**).

**TABLE 2** – Geographical distribution of COVID-19 cases in quarantine facilities by Department, Paraguay (April - September 2020). N=1.581

Departments	n	%
Caaguazú	343	21.7
Alto Paraná	274	17.3
Central	210	13.3
Asunción	180	11.4
San Pedro	143	9.0
Itapúa	113	7.1
Cordillera	56	3.5
Guaira	54	3.4
Misiones	53	3.4
Caazapá	42	2.7
Paraguarí	37	2.3
Canindeyú	33	2.1
Concepción	23	1.5
Amambay	7	0.4
Pte. Hayes	5	0.3
Ñeembucú	4	0.3
Boquerón	4	0.3

**Source:** Ministry of Public Health and Social Welfare. Paraguay (15).

**TABLE 3** – Distribution of COVID-19 cases in quarantine facilities by sex according to Department, Paraguay (April - September 2020).

Departments	Male, n (%)	Female, n (%)	Total n (%)
Caaguazú	243 (70.8)	100 (29.2)	343 (100)
Alto Paraná	181 (66.1)	93 (33.9)	274 (100)
Central	146 (69.5)	64 (30.5)	210 (100)
Asunción	124 (68.9)	56 (31.1)	180 (100)
San Pedro	91 (63.6)	52 (36.4)	143 (100)
Itapúa	81 (71.7)	32 (28.3)	113 (100)
Cordillera	43 (76.8)	13 (23.2)	56 (100)
Guaira	42 (77.8)	12 (22.2)	54 (100)
Misiones	42 (79.2)	11 (20.8)	53 (100)
Caazapá	32 (76.2)	10 (23.8)	42 (100)
Paraguari	21 (56.8)	16 (43.2)	37 (100)
Canindeyú	26 (78.8)	7 (21.2)	33 (100)
Concepción	16 (60.6)	7 (30.4)	23 (100)
Amambay	6 (85.7)	1 (14.3)	7 (100)
Pte. Hayes	4 (80.0)	1 (20.0)	5 (100)
Ñeembucú	1 (25.0)	3 (75.0)	4 (100)
Boquerón	2 (50.0)	2 (50.0)	4(100)
<b>Total cases</b>	<b>1101</b>	<b>480</b>	<b>1,581</b>

**Source:** Ministry of Public Health and Social Welfare. Paraguay (15).

Regarding the distribution of cases by sex, according to the different age categories, a high percentage of male patients was observed, except for the extremes of age (<10 and over 70 years) (**Table 4**).

Statistically significant differences were observed when relating the positive reported cases of COVID-19 to age and sex variables.

**TABLE 4** – Distribution of COVID-19 cases in quarantine facilities by age categories according to sex, Paraguay (April - September 2020).

Age Categories	Male, n (%)	Female, n (%)	Total n (%)
<10	27 (43.5)	35 (56.5)	62 (3.9)
10 - 19	178 (72.7)	67 (27.3)	245 (15.5)
20 - 29	509 (76.4)	157 (23.6)	666 (42.1)
30 - 39	179 (68.6)	82 (31.4)	261 (16.5)
40 - 49	90 (65.7)	47 (34.3)	137 (8.7)
50 - 59	79 (59.8)	53 (40.2)	132 (8.3)
60 - 69	27 (50.9)	26 (49.1)	53 (3.4)
70 - 79	11 (52.4)	10 (47.6)	21 (1.3)
>80	1 (25.0)	3 (75.0)	4 (0.3)
<b>Total cases</b>	<b>110</b>	<b>480</b>	<b>1581 (100)</b>

**Source:** Ministry of Public Health and Social Welfare. Paraguay (2020) (15).

## Discussion

Paraguay is the country with the lowest number of cases in South America and one of the countries with the lowest number of cases in the world, compared to the United States of America (7,095,422 cases) and Brazil (4,732,309 cases) (34). Presents one of the lowest fatality rates (0.95), compared to countries such as the United Kingdom (15.5), Mexico (12.2), the United States (5.1), and Brazil (3.1) (35). This could be explained by the rapid measures taken by both the national government and the Ministry of Health, being the first to enable quarantine facilities to isolate groups of people and thus avoid the rapid spread of the virus (22, 23, 25 – 29, 31).

In June the highest number of cases was reported when 231 cases were diagnosed on June 27th. This was due to an outbreak of COVID-19 in the Ciudad del Este prison, where out of the 231 cases, 110 corresponded to inmates (35). Another outbreak of lower proportions of COVID-19 took place in July inside the main prison in Paraguay: the Tacumbú prison in the capital Asunción (36). Ciudad del Este was the first of the prisons in the country where a COVID-19 positive case was reported, and where the death of a prisoner and two guards was recorded (35). 3.9 % (1,581) of the cases were diagnosed in quarantine facilities, the protocol at first was to carry out the tests at the end of 14th day of quarantine, later the test was performed upon entering the quarantine facilities (37).

Among the reported cases, 69.6 % were *male*, with a male / female ratio of 2.3. The predominance of males is greater than in countries such as Austria (male / female ratio of 1), Croatia (male / female ratio of 1.6) or countries (5) such as Italy, France, and Germany where this ratio is 0.95. The high prevalence of the males can be explained by the fact that men have not complied correctly with the restriction measures due to the economic need to maintain the household and therefore an increasing exposure to the virus (38).

Besides that, 86.7 % of the positive reported cases (1,371) were in those under 50 years of age. These results differ from other countries such as Italy, where the majority of cases occurred in

older adults. This would be due to the population pyramid. Paraguay has 1,954,150 young people (ranging from 15 to 29 years), and 486,662 older adults (65 years and above) (39).

According to the geographic distribution, the largest number of positive cases occurred in Caaguazú 21.7 % and the Alto Parana Department 17.3 %. This number is justified in the first place to the outbreak that occurred in prison and its subsequent spread. Secondly, the geographical location of the city of Caaguazú in the center of the Eastern Region as well as the proximity to Ciudad del Este which constitutes the largest commercial department in the country and the third largest commercial center in the world lagging behind Miami and Hong Kong. This could explain the large number of positive cases in this location. Asunción is the capital of the country and it is where the first cases were confirmed, therefore, a greater number of cases is to be expected.

## Conclusion

The quarantine facilities are one of the measures that the Paraguayan government needed to avoid the rapid spread and dispersion of the virus. The epidemiology of the cases diagnosed in them corresponds to what was expected according to the characteristics of the country.

## Notes

Part of this work was presented at *Jornadas Iberoamericanas Virtuales Coronavirus y Salud Pública - Lecciones aprendidas de la Covid-19 y retos para los sistemas de salud*, (<https://www.easp.es/web/jornadasiberoamericanascovid/>) held during september, 28 – 30, 2020, organized by *Red Iberoamericana Ministerial de Aprendizaje e Investigación para la Salud* (RIMAI) Institute of Health Carlos III, Madrid, Spain, and *Escuela Andaluza de Salud Pública* (EASP), Andalucía, Spain.

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### Conflicts of interest disclosure

The authors declare no competing interests relevant to the content of this study.

### Authors' contributions.

All the authors declare to have made substantial contributions to the conception, or design, or acquisition, or analysis, or interpretation of data; and drafting the work or revising it critically for important intellectual content; and to approve the version to be published.

### Availability of data and responsibility for the results

All the authors declare to have had full access to the available data and they assume full responsibility for the integrity of these results.

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