

Review

Perspective on Two Major Pandemics: Syphilis and COVID-19, a Scoping Review

Aliete Cunha-Oliveira ¹, Talita Katiane de Brito Pinto ^{1,2}, Mónica Raquel Pereira Afonso ^{3,*}, Maria Angélica de Almeida Peres ⁴, Paulo Joaquim Pina Queirós ¹, Diana Gabriela Santos ^{1,5} and Maria Sagrario Gómez-Cantarino ^{1,3}

¹ Health Sciences Research Unit: Nursing (UICISA: E), The Nursing School of Coimbra (ESENFC), 3004-011 Coimbra, Portugal

² Laboratory for Technological Innovation in Health, Federal University of Rio Grande do Norte, Natal 59078-970, Brazil

³ Faculty of Physiotherapy and Nursing, Toledo Campus, University of Castilla-La Mancha, Avda Carlos III, s/n, 45071 Toledo, Spain

⁴ Anna Nery School of Nursing, Federal University of Rio de Janeiro, Rio de Janeiro 20211-130, Brazil

⁵ Coimbra Hospital and University Centre, EPE, 3004-561 Coimbra, Portugal

* Correspondence: monicaraqael.pereira@alu.uclm.es

Abstract: The syphilis and COVID-19 pandemics have marked a turning point in the history of mankind. The aim of this review is to analyze what two pandemics caused by different diseases have in common. It is a scoping review made up of papers covering everything related to syphilis and COVID-19. The dialectical structural model of care (DSMC) is applied, focusing on three thematic plots that explain the historical and current context of the topic addressed. To this end, we compiled information from books, journals, and databases such as Cochrane, National Library of Spain, PubMed/Medline, Scielo, and Google Scholar. Syphilis is a bacterial disease transmitted sexually. COVID-19 is a viral infection transmitted by droplets. Despite their similarities and differences, both have triggered pandemics that have claimed the lives of thousands of people. Both still exist as active diseases. The origin of both remains a scientific enigma; many human and material resources have been devoted to tackling these two infections, and a wide range of drugs have been developed to combat them.

Keywords: syphilis; COVID-19; pandemic; sexually transmitted infections; communicable diseases; health; health care; public health; treatment; sustainability; contagious diseases



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1. Introduction

Humanity has experienced multiple pandemics throughout history, such as those caused by syphilis and COVID-19. Currently, nursing is bringing its practice closer to concerns related to ecology in order to make care sustainable. At first glance, they may appear to be two different diseases, but neither of them has left our society indifferent. The main objective of this article is to show the reality of two epidemics.

Thus, in the syphilis and COVID-19 pandemics, the emergency to care for a large number of people, the difficulties of accurate diagnoses, and the need for secondary and tertiary care in the short and long term were not met with sustainable plans and were trampled by immediate decisions with little rationality regarding the resources used. It is important to emphasize that public health is responsible for defining its instruments and means of work, considering global initiatives to face pandemics and future policies for control and reduction of harm to patients; at the same time, it must establish targets for early detection of cases in order to reduce or even extinguish contaminations.

Currently, more than one million people contract a sexually transmitted disease every day. Among the group of sexually transmitted diseases, only four are curable, one of which

is syphilis [1]. On the other hand, COVID-19 has posed a global threat in which more than six million people have died. Severe acute respiratory syndrome (SARS) has left multiple sequelae in the population, some of them severe, such as erratic pain and depression [2]. Humanity has known about the existence of syphilis since at least 1493 [3]. It is a disease of considerable antiquity, as Hippocrates reported in the “Corpus Hippocraticum” about epidemics [4], like smallpox and syphilis, triggered by the austere conditions of the time [5].

Syphilis is a systemic and infectious disease caused by the bacterium *Treponema pallidum*, which belongs to the Spirochaete family. This Gram-negative bacterium is transmitted directly via sexual transmission (anal, oral, or vaginal) by the exchange of secretions present in mucous membranes, or by sharing infected objects, blood transfusions or vertical transmission from mother to fetus. This is how it has spread worldwide, affecting only humans [1]. If no curative measures are taken, syphilis can develop in three stages, which follow one after the other if no treatment is administered. Primary syphilis begins with the appearance of an ulcer called a syphilitic chancre at the infected site; it does not cause pain to the individual and presents a serous exudate at the base of the lesion; over a period of 3–6 weeks, it usually heals and disappears. In the case of secondary syphilis, the bacterium has reached the hematogenous pathway, causing a visible maculopapular rash on the hands and feet, mucosal involvement, diffuse alopecia, otitis, and meningitis, among others. If the disease continues to evolve, it results in tertiary syphilis, which usually appears several years after infection; its symptoms are much more accentuated, evidenced by lesions in multiple organs and bones, even leading to the dreaded neurosyphilis. It occurs in periods of latency and exacerbation. Early latent syphilis is usually associated with primary and secondary syphilis if there is a positive serology at the time of consultation or negative serology in the 12 months prior to consultation or positive serology together with having had intimate relations with someone infected. Manifestations of the disease that do not meet these conditions are treated as late latent syphilis [2].

We are therefore faced with one of the most serious sexually transmitted diseases experienced throughout history until the appearance of AIDS. It is estimated that more than one million people acquire a sexually transmitted disease every day, most of them asymptomatic, and in 2020, it was estimated that there were more than 374 million new infections, with syphilis accounting for 1.89% of those affected [3]. The latest data show that more than one million pregnant women had contracted syphilis in 2016, causing numerous problems during childbirth and even 200,000 deaths of fetuses and newborns. This led the World Health Organization (WHO) to write guidelines for the treatment of *Treponema pallidum* and a guideline on screening and treatment for syphilis in pregnant women [4].

On the other hand, COVID-19 infection was reported for the first time in 2019. It is a virus of the coronavirus family that is associated with severe acute respiratory syndrome. Designated SARS-CoV-2 or COVID-19, it belongs to the genus Beta coronavirus and is part of the family Coronavirinae [5]. It has a high pathogenic capacity, and its transmission mechanism is by droplets leaving the infected person’s mouth or nose. Depending on the size of the particle, we refer to “respiratory droplets” if they are large or “aerosols” if they are small [6]. These secretions can travel a short distance if they are close to each other. Droplets or aerosols may remain suspended in the air or travel up to one-meter intervals, thus over long distances. COVID-19 can also be contagious if the person meets contaminated fomites [7]. The main signs and symptoms are fever above 38 °C, cough, headache, muscle pain, dyspnea, anosmia, and ageusia, although others such as conjunctivitis and arthralgias may occur [8]. In terms of epidemiology, we currently know that there have been around 572,609,869 confirmed cases worldwide, with 46.46% of the population having fallen ill in Europe, 15.74% in the Americas, 33.86% in Asia and the Middle East, 23.96% in Oceania, and only 0.88% of people in Africa having contracted the disease. On the other hand, up to 6,389,428 deaths due to coronavirus are known worldwide [9]. Studies linking COVID-19 to the syphilis

pandemic are scarce, as few studies have addressed a respiratory disease in conjunction with a sexually transmitted disease.

Therefore, the present research study is scientifically relevant for its contribution to filling gaps in the comparison of the performance of two different diseases that have become epidemics. This article allows us to reflect on public health and the performance of health professionals who work to improve and protect the health of the population. In fact, they are in charge of carrying out prevention campaigns promoted by the United States, in which they perform, among other functions, the control of pandemics. This situation reduces damage by promoting the early detection of new cases because new epidemic outbreaks entail economic, social, and death costs and even produce disability in people, which delays sustainable development [2,5,9].

For this purpose, historical data on syphilis are used, as they are almost as old as the disease itself. This leads to a version as close as possible to how the disease has developed up to the present day. Thus, Section 1 presents the study, while Section 2 presents the materials and methods behind the research. Section 3 presents the results, while Section 4 contains the conclusions.

The Birth of Two Pandemics

The origin of both pandemics remains an enigma to science as there are several hypotheses to explain the origin of these two diseases.

Regarding syphilis, the “Columbus hypothesis” claims that syphilis originated in America. In 1493, Columbus’ crew was responsible for bringing it to Spain. This theory is supported by two Spanish physicians, Fernández de Oviedo and Ruy Díaz de Isla. The former stated that the disease was known to the inhabitants of the American continent and that they even used some treatments to combat it, while Ruy Díaz de Isla, on the other hand, stated that it arose on the Spanish island and that some of Columbus’ crew were already infected on their return. In contrast, the “pre-Columbian hypothesis” argues that syphilis was already widespread in both places, but Europe confused it with leprosy. They link the birth of the disease to the emergence of the arid climate in 7000 BC. They assume that sexually transmitted syphilis resulted from the low temperatures in the postglacial era, which led to the arrival of the bacterium in Europe and the other continents. They even define it as a disease whose symptoms were initially mild and that due to mutations increased its virulence. A third theory, the “unitary hypothesis”, arises, which states that syphilis undergoes mutation of the bacterium *Treponema pallidum* due to changes between cultures. Cultures have interrelationships with each other and there are variations in the environment. Yaws, an endemic trepanomycosis, develops into syphilis in places with cold, dry temperatures and poor hygiene. Sexually transmitted syphilis would occur in more educated and hygienic societies. The theory that the crew of Columbus was infected with the disease is ruled out [10–13]. Syphilis is a disease that is still present in the population, so it is important to explore and compare with new pandemic diseases.

COVID-19 was first reported in Wuhan, China, in December 2019. It is a relatively new disease as the coronavirus family was already known. Up to four animal-to-human zoonotic pandemic events have been recorded [14].

The first zoonotic jump, 120 years ago, from cattle to humans, resulted in COV-043. Subsequently, HCoV-229E was detected in 1967. Both provoke a common cold that poses no danger to mankind. The second recorded coronavirus occurred in 2003, originating from bats and the animal *pangolin*, which spread to humans and gave rise to SARS-CoV. This led to an epidemic within China, which had to be quarantined. This was followed by the recognition of CoV HKU4 and CoV HKU5, which are present in two types of bats; these became known as MERS-CoV and led to the Middle East respiratory syndrome epidemic. The latest zoonotic jump event is the current SARS-CoV-2. Its true origin remains an enigma, as it is not known which animal is its reservoir. Several studies have shown 91.02% similarity in the genome of the coronavirus present in Malayan pangolins and 97.4% similarity in the amino acids present in both.

There is no clear determination that it originated from this animal. Another hypothesis speaks of a predecessor of SARS-CoV-2 infecting humans and acquiring genomic mutations during human-to-human transmission [15].

What we do know is that it was detected in the Wuhan market where seafood and wild animals were sold, the conditions of the place where the ideal nucleus for an epidemic to develop that would eventually become a pandemic [16].

We are looking at a picture that has been bleak at many points, with numerous contagions and many deaths. This is the latest pandemic we have experienced, and we are still struggling to reduce the number of people who are ill and, therefore, the number of deaths caused by the virus.

The aim of this research is to compare these two realities, which will lead us to observe how two different diseases can have similarities as well as differences regarding their respective pandemics.

2. Materials and Methods

2.1. Structure of the Article

In this article, a review of the scope, from the first records found to the present day, was carried out as a method of addressing the objective of the study. The aim is to make a comparison between two pandemics caused by syphilis and COVID-19 and how health professionals acted in both of them, as well as to know the physical spaces where health care was carried out, without forgetting the legislation passed as a result of these pandemics. Using the review process, the scope of the existing bibliography on the specific topic of study was determined. It provides an idea of the volume of publications and studies available. In addition to knowing the focus of the works, it allows researchers to evaluate, synthesize, and criticize the evidence inherent to the objective of the study [17]. Next, various sources of knowledge were used, consulting primary sources such as manuscripts in the national library of Spain. Electronic databases (SciELO, PubMed, Cochrane, Google Scholar) dealing with the topic of study were also reviewed.

The dialectical structural model of care (DSMC) was used. This is an organic vision that relates the cultural system with the biological system of the people who integrate it. In other words, people are under cultural pressure that shapes the forms of behavior in the process of satisfying needs from roots in which values, beliefs, and feelings nest. This approach allows for the interrelation between culture and need satisfaction; that is, the 7 basic needs of people according to Malinowski (nutrition, reproduction, body care, security, movement, growth, and health) and a culturally articulated function are related through a response [18,19]. Therefore, this model is suitable for studying the people who carry out socio-health activities and the scenarios where they occur, as well as the links between norms, beliefs, values, and social structures [18,20]. For this study, its application is of utmost importance, taking into account the social and cultural aspects that interact in the assistance and care provided by health professionals at a given historical moment, since there is a great cultural need for health during pandemics, and the cultural response, in this context, would be hygiene, care, and the places where they were developed, as epidemics have been a setback in the sustainability of public health, economy, environment, and society. Accordingly, regulation is important for minimizing the negative effects of Syphilis and COVID-19.

The structures used in the DSMC are as follows: (1) The functional unit (FU), which represents the social structure of coexistence and socialization that transmits values, norms, beliefs, knowledge, and feelings, through which social systems are built. In this case, it has to do with legislation, regulation, and standardized treatment protocols, as well as the notification of cases and their repercussions in the socioeconomic sphere. (2) The functional framework (FF), referring directly to the socio-health context, which determines the application of care, such as clinics, monographic hospitals (which are hospitals dedicated exclusively to the study and treatment of a specific disease, in this case, to the study of syphilis and COVID-19), venereal treatment stations. (3) The functional element (FE) inte-

grates the social actors in charge of care, i.e., health and the role of the care figures, as well as the care actions themselves, which in this study is circumscribed to the health professionals who acted in the face of the syphilis and COVID-19 pandemics and the characteristics of these professionals [15]. This research proposes four thematic blocks: (1) healthcare professionals facing two pandemics; (2) healthcare institutions; (3) treatment of syphilis and COVID-19; and (4) healthcare legislation, analyzed using the DSMC, each of which represents structures specific to the cultural and social history model (Figure 1).

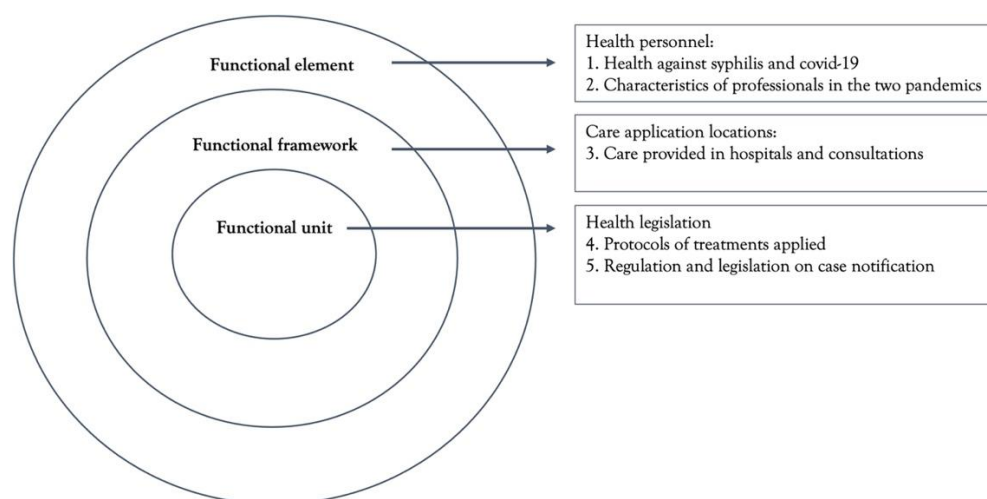


Figure 1. The structures used in the DSMC. Modified from [21].

2.2. Data Research Process

The review process began with an exploratory research question [17] aimed at systematically synthesizing and critiquing existing knowledge [18], in this case: “how do two pandemics caused by two different diseases compare: Syphilis and COVID-19?” To answer this question, the DSMC was applied. The review included books, peer-reviewed articles, and official dissertations.

We began with an initial search to determine the background and delimitation of the object of study. In this phase, various databases were consulted: (1) Cochrane; (2) PubMed/Medline; (3) SciELO; (4) Scopus; as well as (5) Google Scholar. After this initial search, we proceeded to consult manuals in physical and virtual format from different territories through the service of the National Library of Spain. In order to have up-to-date information, the search was limited to the last 10 years. However, since this is a historical topic, earlier publications were consulted and selected. For database exploration, a natural or free-text language, normalized and controlled with MeSH and DeCs descriptors, was used. These were combined with Boolean operators (“and/and”, “or/or”, “not/not”). The search equations and filters used in all databases were as follows: syphilis and COVID-19; healthcare OR nurse OR pandemic OR treatment AND syphilis OR COVID-19 OR medicine OR psychologist OR physiotherapist AND treatment AND dispensary OR hospital AND notification are summarized in Figure 2.

The search of the Spanish Archives portal, known as PARES, provided us with information on historical documents of important value for information concerning Spain and the terms used were “Syphilis”, “pandemic”, “sanitary”, “treatment”, “dispensaries”, “hygiene”, and “health care”. The period of study was filtered from the appearance of syphilis to the present day.

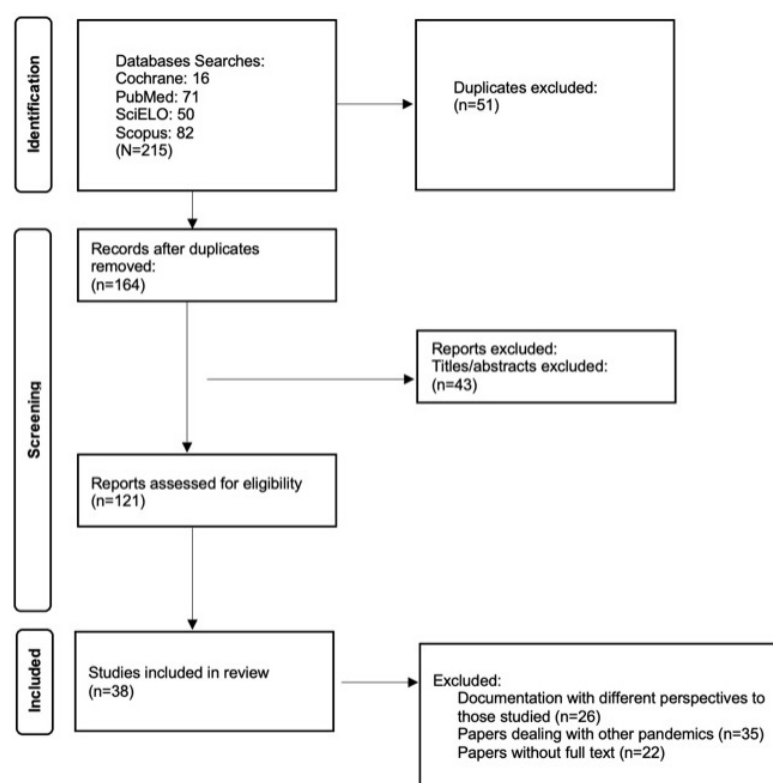


Figure 2. Search results and study selection. Source: elaboration of the authors.

2.3. Information Review Process

The database search was conducted between January and July 2022. The archival search as well as the analysis and transcription of the records found took place between August and October 2022. This type of review aims to explore the existing evidence on a particular topic and historical period, as well as to identify and fill existing gaps.

The inclusion criteria were the following: (1) papers directly addressing the subject of pandemics; (2) papers dealing with the origin and evolution of both diseases; (3) pharmacological and nonpharmacological treatment; (4) process of notification of new cases; (5) papers in English, Spanish, and Portuguese.

The exclusion criteria applied were (1) documents that considered the subject from different perspectives to those studied; (2) works included in the study period that dealt with other pandemics; (3) documents that did not exist in full text. By consensus of the authors, articles, books, and legislation were reviewed. A total of 38 documents were found that met the inclusion and exclusion criteria.

2.4. Study of the Documents Used

The documentary analysis was conducted from a qualitative perspective, systematically following the objective of the study. The steps followed in the analysis were (1) thematic linkage; (2) preliminary classification of the documents according to inclusion and exclusion criteria; (3) selection of relevant information; (4) interpretation and comparison of the documents. The selected material was analyzed from the point of view of the four thematic blocks of study each of them encompassed within the DSMC structures: (1) health professionals facing two pandemics [11,18–20,22–39]; (2) health institutions [27,31,40–46]; (3) treatment of syphilis and COVID-19; and (4) health legislation [47–61].

To extract and summarize the data, the first and second authors (A.C.-O. and T.K.d.B.P.) performed a general data extraction. The third, fourth, and fifth authors (M.R.P.A., M.A.d.A.P., and P.J.P.Q.) examined the results in depth. The sixth and seventh authors (D.G.S. and S.G.-C.) analyzed the thematic blocks encompassed in the DSMC structures, from the functional unit (FU) to the functional framework (FF) and the functional structure

(FE). Thus, after working with all the material, it was possible to answer the initial question of this study: “How can two pandemics caused by two different diseases, Syphilis and COVID-19, be compared?”

2.5. Ethical Issues

The authors declare that they have no conflicts of interest in the publication of this article, that the document is original, that it has not been previously published and has not been simultaneously submitted for review to another journal, and that it does not contain plagiarism or manipulation of images. They state that they comply with the requirements established in terms of research and publication ethics.

3. Results

The origin of both pandemics has led to strong social stigmatization of the disease. Syphilis was even called “the disease of many names”. Each population attributed the blame to a different one, as it was a shameful disease for which they did not want to be the perpetrators, and, to prove it, they assigned the name of the disease to the “guilty country”, which was usually an enemy country.

Thus Italy, because of the French invasion, called it “the French disease”, the English called it “the plague of Bordeaux” because they had contracted it through their wine business in the city, Germany and Switzerland also blamed France, and France called it “the Neapolitan disease” or “the Indian disease”, in India they called it “the Portuguese disease”, blaming Vasco de Gama for bringing it when he arrived in Calcutta, and in Japan they called it “the Chinese ulcer”, so it was widespread in the world, everyone blaming another population for having contracted and spread it [11].

However, the stigma was not only for reasons of war; within cities and towns, those infected with syphilis were severely criticized. Syphilis was considered a shameful and impure disease because it was transmitted through sexual practices. Strict sexual morals held that syphilis was a divine punishment, and this discrimination became much harsher during the Victorian era, when severe punishments and prohibitions were imposed. This was a time of sexual repression of various kinds, such as contracting sexual diseases, having extramarital relations, or being homosexual.

As a result, people did not want to go to the doctor, their illness was seen as a sin, and they did not acknowledge to their sexual partners that they were ill. This contributed to the continued global spread of syphilis.

On the other hand, syphilis was known to be widespread in prostitution and infected men were directly accused of using it. These factors meant that people were truly marginalized in society for suffering from this pathology. The fear of contracting the disease, known as “silophobia”, was unleashed, with sufferers suffering from generalized states of anxiety and panic attacks, and was also influenced by the strong antivenereal campaign of the 19th century [18,19].

COVID-19 has analogies with syphilis, as the term “the Chinese virus” or “Wuhan virus” became widespread in the early 2020s. The Chinese population was directly blamed for spreading the disease. This led to racist attitudes towards Asians all over the world, including more than 1800 discrimination complaints in more than 40 US states, which continued to increase over time, with one French magazine even reading the headline “the yellow peril”. Chinese people also experienced physical and verbal attacks, were hindered in their commercial activities, and were prevented from accessing institutions [20].

On the other hand, the infected population was also affected by prejudice. There is evidence of attacks on those who did not wear masks in public places and a strong exclusion of infected people, also from their careers. This was mainly because there was widespread fear, partly due to the media, of contracting the coronavirus [18,22,23].

Finally, there was severe employment discrimination, targeting all those in employment, but especially health professionals. Many had to leave their place of residence,

stop using public transport, and even stop wearing their uniforms for fear of being insulted or assaulted [24,25].

3.1. Health Professionals: On the Frontline of the Battle against Syphilis and COVID-19

In order to combat diseases throughout history, health professions have evolved in order to provide a response to the sick population. This has been the case with syphilis and COVID-19, two different diseases that have made it necessary to implement similar measures to combat them.

The first medical records kept on syphilis speak of cases of syphilis patients. Gaspar Torella did so in 1497 in *Tractus cum consiliis* (against) *Pudendagram, seu morbum Gallicus*. In 1502, Juan Almenar, another physician, wrote about the transmission of the disease: coitus, breastfeeding, and air. Gradually, medical evidence increased through the treatises written by different physicians explaining the etiology and treatment of the disease.

Another important figure, who also gave the disease its name, was the Veronese physician Girolamo Fracastoro. He is very important in the history of medicine for his contributions to microbiology after describing how contagious diseases are transmitted.

In some monographic hospitals, there is a figure of the surgeon and the apothecary. During the 16th century, the physician measured the heart rate of the syphilitic patient and analyzed their urine. He would then dictate to the surgeon which cures to be administered as well as the bleeding and shaving to be performed. Another of his functions was to tell the apothecary what medication to prepare.

It was in the 1970s that the nurse became more important and took over most of the care of syphilitic patients. There were also other non-health professionals who took care of these patients, who were considered to be less qualified and worked in exchange for housing and food [26–28].

Today, the situation has changed. The disease is usually detected in primary care, where the general practitioner, after an anamnesis, indicates to carry out the relevant tests if he or she suspects that a patient may be infected. Another essential figure is the public health nurse, who not only prevents the disease through sex education but also helps to detect it. In cases of congenital syphilis, they are responsible for neonatal screening using antepartum blood tests to rule out the disease.

Therefore, the intervention of the nursing team leads to a decrease in sexually transmitted infections (STIs) in the population. They educate about sexual behavior inside and outside the consulting room (schools, institutes) and in places where the risk is higher. Another function is the control of people who have or are suspected of having syphilis [29,62–65].

The health team is in charge of carrying out direct or indirect tests to detect syphilis.

In direct tests, samples are taken from primary or secondary lesions. They are then examined using a darkfield microscope, direct immunofluorescence or polymerase chain reaction.

Indirect tests look for the presence of antibodies in a serology. They are divided into treponemal and nontreponemal. Treponemal tests measure the amount of antibodies against *Treponema pallidum* antigens. Nontreponemal tests look for antibodies that are attacking cells affected by the infection, notably the syphilis serology test (VDRL) and rapid plasma reagin (RPR) [30].

The pandemic caused by the coronavirus has marked a turning point in the history of humanity and the health system worldwide.

Since the WHO officially declared the COVID-19 pandemic on 15 March, health professionals have been working hard to contain it. During the first waves, due to the uncertainty and the surprise it caused for all countries, a large majority of places had not gathered the material or the human and institutional resources to be able to deal with the disease [31].

At the beginning, there were no personal protective equipment (PPE) or tests to detect the disease, so they were faced with an invisible enemy that was becoming more

widespread every day; stress was present in every health center, as well as exhaustion after many hours of work.

The medical and nursing team was subjected to a situation unthinkable until now. Healthcare practice has to be evidence-based (EBM, EBP), and the pandemic was a setback to this principle, as drugs whose evidence was not strong enough to be used in patients had to be used. One example was hydroxychloroquine, which was even out of stock.

It was surprising and demanding that regulatory authorities such as the Food and Drug Administration (FDA) approved treatments with a low level of proven efficacy, albeit on an exceptional basis. This leads us to reflect on whether we should have a healthcare system that provides quicker and easier responses to trigger clinical trials in these situations.

Moreover, at a calamitous time when health care staff had to decide which patients could use a ventilator or go to an intensive care unit, bioethics was affected. This was due to the lack of resources that caused the massive surge of people in hospitals. A difficult decision, as in a way, the Hippocratic principles governing the profession broke down. These had to take on a different meaning in order to comply with justice, beneficence, and nonmaleficence. It is worth mentioning that the mental health of healthcare workers has been severely affected, with many of them suffering from burnout syndrome.

Currently, the incidence of this illness has decreased, so that situations of this dimension do not arise. However, conditions should be improved as these workers are still often overwhelmed [32–34].

The Food and Drug Administration (FDA) has approved two tests for the detection of the disease. The reverse transcription polymerase chain reaction (PCR) test involves obtaining a nasopharyngeal or oropharyngeal sample by inserting a swab through the nose or mouth to detect the presence or absence of nucleic acids from the virus. On the other hand, antigen testing consists of introducing a nasal swab to detect certain proteins of the virus. The presence of antibodies can also be measured using a serological test, which indicates immunity after passing COVID-19 or after vaccination.

In SARS-CoV-2-infected patients with symptoms of pneumonia, a CT scan of the chest can be used; in positive cases, bilateral parenchymal ground-glass opacities and unilateral lung with subpleural lesions are observed [35].

The importance of healthcare professionals in making differential diagnoses should be emphasized. Syphilis has long been confused with leprosy, among other diseases, due to the dermatological lesions present in both.

In the case of COVID-19, it is not only necessary to differentiate between influenza and other bacterial pneumonias, as well as syphilis, when presenting skin alterations such as erythema multiforme, vesicular rashes, palmoplantar pulpitis, and urticaria, there have been errors in the diagnosis until it was discovered that it was this condition. We are dealing with two diseases that simulate skin diseases [36].

Just as the role of nursing became more important during the syphilis pandemic, the same occurred during the COVID-19 pandemic: the rise of professions that had previously been less well known. Nursing, physiotherapy, and psychology became more visible.

The psychological consequences of confinement and the development of the syndemic itself left their mark on the population and on the professionals who had to continue working during quarantine. The intervention of psychologists was fundamental as a therapy for anxiety, anguish, and fear. Physiotherapy maintains an essential role in airway management when airway difficulties occur. Their presence in intensive care units has been paramount, as they provide therapy to improve lung function and capacity even for patients leaving the hospital [37,38]. Table 1 shows the differences between the two diseases: syphilis VS COVID-19.

Table 1. Syphilis VS COVID-19: differences.

Differences	Syphilis	COVID-19
Infection caused	Bacterium <i>Treponema pallidum</i> , which belongs to the Spirochaete family [1]	SARS-CoV-2 or COVID-19, it belongs to the genus Beta coronavirus and is part of the family Coronavirinae [5]
Disease characteristics	Syphilis can develop in three stages: - Primary syphilis begins with the appearance of an ulcer called a syphilitic chancre at the infected site; it does not cause pain to the individual and presents a serous exudate at the base of the lesion; over a period of 3–6 weeks, it usually heals and disappears. - Secondary syphilis: the bacterium has reached the hematogenous pathway, causing a visible maculopapular rash on the hands and feet, mucosal involvement, diffuse alopecia, otitis, and meningitis, among others. - Tertiary syphilis: usually appears several years after infection, its symptoms are much more accentuated, evidenced by lesions in multiple organs and bones, even leading to the dreaded neurosyphilis [9].	COVID-19 signs and symptoms are fever above 38 °C, cough, headache, muscle pain, dyspnea, anosmia, and ageusia, although others such as conjunctivitis and arthralgias may occur [8]. In some cases, “long COVID” or post-COVID symptoms may arise [39].

3.2. From Clinics to Hospitals

Since 1870, syphilis has been rife in hospitals, infirmaries, and surgeries. Already in World War I, the rise of this disease meant that thousands of soldiers were infected by sex workers who had not passed through health controls.

France, a country with a high incidence of syphilis among its troops, created “washing stations”, where the soldier would go after having had sexual relations, if no more than three hours had passed. There, a professional would look for the presence of the disease. If nothing was found, he would go to another room where he was washed with hot water and soap, where a solution of protargol was injected into the urethra and held for 3–5 min. The name of the soldier and the day and time of the visit were recorded for a three-month follow-up. If the soldier subsequently tested positive for syphilis, he was not punished, as he was considered to have followed the treatment guidelines.

In 1918, the presence of syphilis was still strong among the population, which led to the creation of “venereal treatment stations for soldiers and civilians” as a prophylactic measure, providing sex education and attempting to regulate the conditions of prostitution [40,41].

World War I marked a setback in the prevention of venereal diseases, which had been controlled since the 19th century. As early as 1623, Philip IV, King of Spain, banned prostitution to prevent the further spread of these diseases. Thus, legal brothels disappeared, and prostitution began to be practiced in the streets, which caused an uproar in society.

At the end of the 18th century, proposals arose to regulate prostitution once again, and at the end of the 19th century, the creation of a doctor in charge of inspecting sex workers and their brothels was approved. As a result, in 1910, a team of medical hygienists was formed to take sex workers to antivenereal dispensaries. From then on, multiple dispensaries were set up to combat syphilis, offering their services to men and women if they came at separate times.

These dispensaries were not sufficient, so numerous monographic hospitals were created, such as the Hospital San Juan de Dios and the General Hospital of Valencia in Spain.

The first was founded in 1552 and was run by the brothers of the Order of St. John of God. This hospital achieved worldwide fame and was considered one of the best health centers for the mercurial treatments applied to treat syphilis [40,41].

The General Hospital of Valencia allocated up to four rooms for syphilitic patients, two for women and two for men. Infected people went there of their own free will, except in the case of sex workers, who were obliged to do so if they showed any signs or symptoms. This hospital acquired a great reputation for the treatments it used (Figure 3).

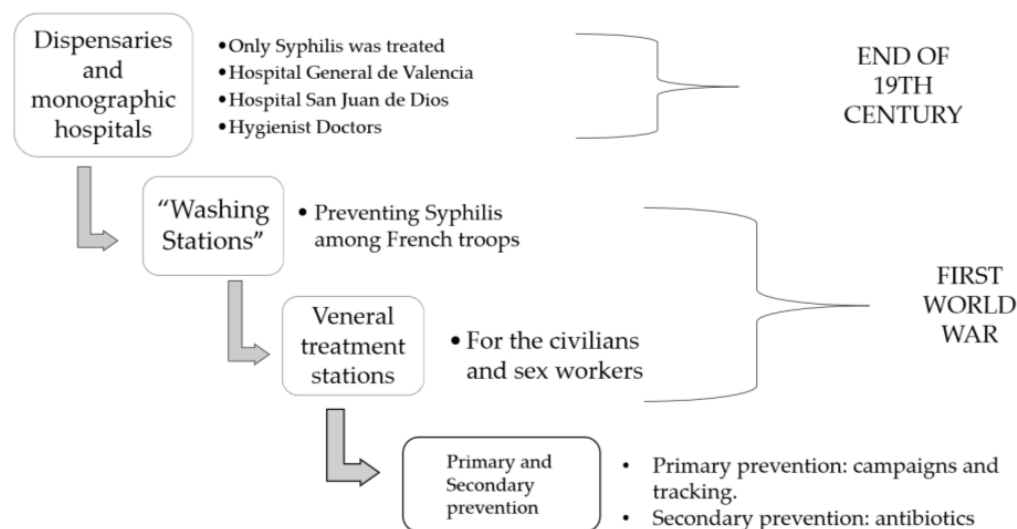


Figure 3. Dispensaries and hospitals where syphilis was treated. Source: authors' elaboration.

However, the increase in the number of patients led to a serious care crisis, as there were also no suitable places for mercurial treatments. It was very common for these facilities to be overcrowded and not everyone could be accepted. Patients were spread out among the different hospitals in the area, thus aggravating public health. On the other hand, the lack of sufficient stays reduced the length of time patients were admitted, affecting the effectiveness of treatment [27,42].

During the first wave of COVID-19, field hospitals were set up all over the world to combat the disease. Primary care centers were even closed to allocate these resources.

In Spain, two of them were the Madrid Trade Fair Institution Consortium, IFEMA in Spanish. A fairground that had to be converted into a 1300-bed hospital that was in operation for 42 days and treated a total of 3817 patients, it was the largest in the region and the first to treat only patients infected with COVID-19 in Spain. Subsequently, the Isabel Zendal monographic hospital was built with up to three hospital wards. The UK also advocated an exhibition center with up to seven centers with more than 4000 beds. The Excel center in London was the largest in Europe. Indoor stadiums, sports centers, and even ice palaces were created, as in Moscow.

High demand led to the construction of complexes made of canvas or inflatable materials for diagnostic tests or oxygen administration. This type of construction made it possible to build institutions in places with poor communications or difficult access, such as the Pachuca Hospital in Mexico or the La Fe Hospital in Valencia, among thousands of other examples [31,43] (Figure 4).

At the same time, a service that was hitherto unknown in public centers began to be offered: telematic consultations, which ensured patient safety and enabled the high demand of the population to be met [44,45].

Hospitals had to close most of their wards to convert them into COVID-19 units, and all other nonemergency activities ceased [46].

Table 2 presents the timelines for syphilis and COVID-19.

From dispensaries to hospitals: Covid-19

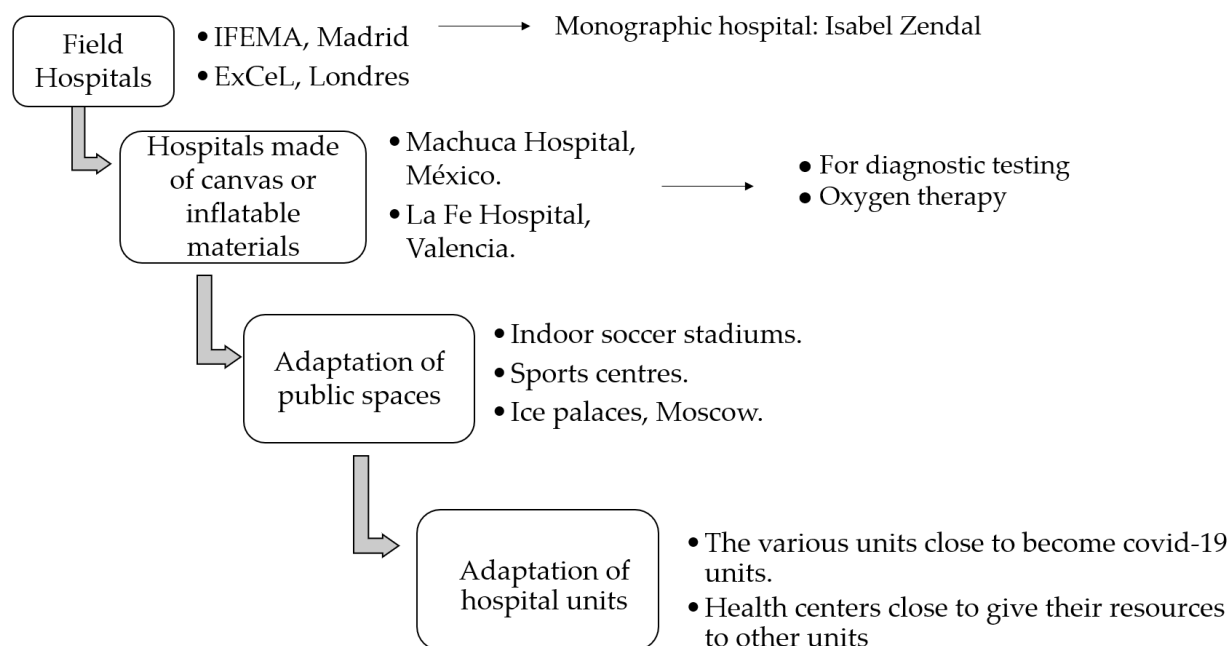


Figure 4. Hospitals and buildings where COVID-19 was treated [31,43]. Source: authors' own elaboration.

Table 2. Syphilis VS COVID-19: timelines for syphilis and COVID-19.

	Syphilis	COVID-19
Year	1493 [3]	2019 [5]
Timelines of Syphilis and COVID-19	1552: St. John of God Hospital achieved worldwide fame and was considered one of the best health centers for the mercurial treatments applied to treat syphilis [40,41]; 1623: Philip IV, King of Spain, banned prostitution to prevent the further spread of these diseases [40,41]; 1870: Syphilis was rife in hospitals, infirmaries, and surgeries. In World War I, the rise of this disease meant that thousands of soldiers were infected [40,41]; 1910: A team of medical hygienists was formed to take sex workers to antivenereal dispensaries [40,41]; 1918: The presence of syphilis was still strong among the population, which led to the creation of "venereal treatment stations for soldiers and civilians" as a prophylactic measure [40,41].	2019 and 2020: Field hospitals were set up all over the world to combat the disease. Primary care centers were even closed to allocate these resources. Telematic consultations were realized [44,45]. Hospitals had to close most of their wards to convert them into COVID-19 units, and all other nonemergency activities ceased [46].

3.3. Treatments Applied to Combat Two Pandemics and Notification of New Cases

To talk about treatments for syphilis, we must go back to the year 1517. At that time, the wood of the guaiac tree that existed in America was used because it was thought that "God had put the remedy next to the disease". After this, mercury began to be used, a method that spread over the decades and that was applied in various ways: by means of active rubbing or by means of sweating vats. In these tubs, the patient was placed inside the tub and the head was left outside. Mercury is a diuretic element that was thought

to eliminate the toxins that caused syphilis, but it was not without side effects such as hypersalivation, loss of teeth, or intoxication.

In 1907, Paul Ehrlich discovered a compound consisting mainly of arsenic. He called it product 606 or salvarsan. It was administered as a painful hypodermic injection, which caused it to have to be combined with morphine. Some healing of the chancre was observed, but it was highly toxic, even causing the death of some people.

In 1917, Julius Waggner-Jauregg developed an innovative treatment that consisted of provoking fever in the syphilitic patient who was paralyzed. The fever could reach up to 41°C and had to be maintained for a few hours. Subsequently, the combination of iodine and mercury was tried, but it had many adverse reactions such as nephritis and pneumonia. Between 1922 and 1932, bismuth and sulphonamides were introduced, finally replacing the much used mercury [47].

COVID-19 has also posed a challenge to health professionals because, as a new disease, there was no drug approved for its use; in fact, there is currently no consensus on a drug that has specificity to treat this condition. As with syphilis, several treatments had to be tried before an effective one was found.

The star treatment for syphilis came in 1943, when penicillin began to be used. Discovered by Alexander Fleming in 1928, this antibiotic began to be used by injection. The results were so astonishing that it is now the first line of treatment for syphilis. A single dose of penicillin G benzathine is effective in treating primary, secondary, and tertiary syphilis; in fact, it is the only approved treatment that pregnant women can receive. However, currently, the treatment of syphilis can be disparate, as it presents different forms of administration. In some countries, not only penicillin G benzathine is used, but also other oral antibiotics; leaving the intramuscular route of administration as hospital treatment, dosage depends on the stage of the disease [48,49].

The most common adverse reaction to this treatment is what is called a Jarisch–Herxheimer reaction, which causes fever, chills, nausea, and headache, lasting about 24 h.

For those allergic to penicillin, there are alternatives, although it must be taken into account that the efficacy is not the same. They usually undergo a desensitization process. As a second option, ceftriaxone is the most commonly used, although other antibiotics are also known, but azithromycin is under study as it is considered a good candidate for treatment [47].

Unfortunately, we do not have an infinite supply of penicillin, and this has led to shortages in many countries. It has even resulted in many people not being able to receive this treatment. There are only four global suppliers of this antibiotic, so there is currently very little production of this treatment. The active ingredient is obtained by producers other than the suppliers, so when the suppliers fail, the amount of drug they can produce is directly affected. At present, to supply the health system with this drug, we have to turn to China, which controls the market there, having three of the four companies that manufacture penicillin.

This fact does not occur only in the present, as the first consignments of penicillin arrived legally in Spain in 1944. They came from Brazil and consisted of 12 injections, a ridiculous quantity for the demand that existed. At that time, the United States controlled the antibiotic market, and Spain had to sign an agreement to supply the country. Even so, the administration of this drug was far from simple, as the patient had to go before the National Penicillin Committee with a series of medical tests proving the need to be treated with penicillin. It was the committee that considered whether it was necessary and provided vouchers that could be used in pharmacies. This meant that most of the drug was obtained by smuggling. Therefore, in 1948, the possibility for Spain to make its own penicillin was approved [50–52].

For syphilis, there is still no vaccine, but there are studies trying to develop one; so far, Lithgow et al. have identified Tp0751, a vascular adhesin involved in the transmission of *Treponema pallidum*, but it has only been tested in animals with good results. If anything else, this pandemic has broken records in vaccine development at an unthinkable pace,

with 184 vaccines in preclinical trials and 104 in clinical development by 2021. Vaccines come in four types: whole viruses, protein-based, viral vectors, and nucleic acids.

At the end of 2020, vaccination campaigns were conducted, and the following vaccines were approved by the European Medicines Agency: Comirnaty[®] from Pfizer-BionTech, Spikevax[®] from Moderna, Vaxzetria[®] from Astra Zeneca, and COVID-19 Vaccine[®] from Janssen [35,53–55]. The characterization of COVID-19 vaccines is presented in Table 3.

Table 3. COVID-19 Vaccines.

COVID-19 Vaccines	Production	Date/Local	References
Comirnaty [®]	Pfizer-BionTech	Approved by the European Medicines Agency in 2021.	[35,53–55]
Spikevax [®]	Moderna		
Vaxzetria [®]	Astra Zeneca		
COVID-19 Vaccine [®]	Janssen		

For COVID-19, different lines of treatment are being pursued. There are drugs that inhibit RNA-dependent RNA polymerase such as remdesivir. This drug is in trials for the treatment of Ebola, and the FDA had to approve its use as a matter of urgency as it is still in phase 3 studies. This preparation was applied to the first US patient and provided good results.

In the same vein is favipiravir, an antiviral approved in Japan to treat influenza A, B, and C. It is in clinical trials for use in the US. It is in a clinical trial for use in patients with COVID-19 but shows a lower viral load in the upper respiratory tract and lungs.

On the other hand, there are protease inhibitors, such as lopinavir/ritonavir, which is used in combination with other antivirals to treat human immunodeficiency virus. COVID-19 has shown low to moderate efficacy, so better results are expected with nelfinavir, the first choice for HIV treatment.

There are also viral entry inhibitors such as hydroxychloroquine, a drug used for autoimmune diseases that is beneficial for the thrombotic events that frequently occur in COVID-19 infection. APNO1, used for pulmonary hypertension, reduces lung damage caused by the virus.

Immune modulators and monoclonal antibodies are also available, among which tocilizumab stands out for its promising results in critically ill patients.

Finally, Janus kinase inhibitors are used to reduce SARS-CoV-2 symptoms such as pulmonary oedema, liver damage, and kidney damage, as well as nutritional supplements such as vitamin C, vitamin D, and folic acid [35].

It is worth mentioning that, during the pandemic, there was almost daily reporting of cases on media platforms. One of them was Johns Hopkins University. The Spanish Ministry of Health also issued a survey to keep track of confirmed cases at the state level. In addition, Spain has a system of obligatory notifiable diseases that includes mandatory reporting of the incidence of syphilis and COVID-19 usually on a weekly basis [35,56–60].

The reporting and diagnosis of sexually transmitted diseases during the pandemic suffered a large decline [61].

4. Discussion

Health professions have played a fundamental role throughout history, as there are almost as many diseases as there are people. In the face of a pandemic, they take on even greater importance as the first line of defense in combating the disease. According to our research, there are few studies on the presence of health professionals in the face of syphilis and COVID-19. Therefore, it is possible to leave open the possibility of further studies on the activities carried out by these personnel in the holistic treatment of the person. During the COVID-19 pandemic, however, we can observe that the figure of the nurse is more present in the writings [12,66,67].

Going back to the beginning of COVID-19, China states, and this appears in the official documents, that pneumonia of unknown origin was reported on 31 December 2019. However, a study carried out by three researchers from the Spanish National Research Council (CSIC) indicates that the actual date is closer to 17 November 2019. Knowing the date of appearance of the virus can bring us closer to patient zero and, therefore, to understanding how the disease was transmitted. In the numerous articles found, the origin of the coronavirus is still unknown; some claim that it came from the pangolin, other studies argue that it was probably the bat, while others blame it on the *pagum larvata* [14,68].

It is true that ignorance of the origin of both diseases did not paralyze health professionals. They responded tirelessly to the pandemic. A new service that had never been offered in Spanish public institutions, telemedicine, was even standardized.

It was carried out mainly over the telephone and was accepted by the whole population. But was it legal? During 2018, a systematic review was presented that confirmed the efficacy and safety of this method. But the truth is that, according to the Spanish legal system, there is no regulation for this assistance activity. In fact, if we consult article 26.3 of the Code of Ethics and Medical Deontology, we can find that clinical practice carried out over the telephone radio, press, or letter is against the rules of ethics. It is considered that the healthcare activity carries with it the burden of presence in which direct contact is established between the healthcare professional and the patient. However, during the pandemic, they avoided anxiety, psychological, and psychiatric disturbances at home due to the impossibility of in-person meetings [69]. With the evolution of the pandemic, telemedicine gained prominence not only in Spain, but also around the world.

The treatments that were applied during the two pandemics are not free of contradictions either. One of the main lines of treatment for syphilis was mercury, which lasted until the 20th century. In old treatises, we can see that the benefits of mercury have been mentioned. Nowadays, there are numerous articles that speak of the side effects of this treatment, which was highly toxic and of doubtful effectiveness [13].

As for the use of penicillin, it is currently the only alternative for pregnant women to combat syphilis. According to a systematic review published by Godfrey JA Walker in the Cochrane database, although this is an effective treatment, more rigorous studies should be carried out on the appropriate treatment in terms of dosage, duration of the cycle, and form of administration [70].

Of note is the use of remdesivir. It was applied to the first US patient with coronavirus. We found studies claiming that the treatment was effective with no adverse reactions. But a narrative review published in 2020 states that when remdesivir was used to fight Ebola, liver inflammation, nausea, sweating, chills, and low blood pressure were found as part of the side effects. In April 2022, the WHO decreed that the use of this drug against the severe effects of the disease is still under study [71].

Ritonavir is present in the literature listing treatments used for COVID-19. The benefits reported for its use were medium to low. However, according to the WHO, it is a highly effective treatment for non-severe forms of the infection in people susceptible to developing severe forms of the disease. Such claims are based on two randomized trials in which an 85% reduction in the risk of being hospitalized was obtained and calls were made on pharmaceutical companies (Pfizer, New York, NY, USA) to be transparent in their pricing and agreements so that the drug can reach all hospitals [72].

Paxlovid is also indicated for the treatment of COVID-19 in adults who do not require supplemental oxygen and who are at increased risk of progression to severe COVID-19 [73].

The notification of cases of venereal diseases has suffered a decrease during the pandemic, which leads us to think that their incidence has also decreased; however, we found studies carried out in several countries that show that the contagion of these diseases has not ceased; in some places it decreased slightly, but not as expected. Elsewhere, the number of infected people has remained the same [74]. The authors of study in the literature think the distancing and mobility limitation measures apparently generated a decrease in the incidence of diseases [74].

However, governments and health managers have the final say in how pandemics are dealt with, where treatment is administered, and which health professionals should be involved in the different specialties [66].

Sustainability is a goal formulated by the United Nations in the 17 Goals to Transform Our World by 2030, so it is an important issue in a pandemic. Pandemics have taught us that health is a priority for the inclusive social, economic, and sustainable development of countries [75]. Today, having experienced the COVID-19 pandemic, many of these countries are in a crisis that is a risk to the health of all people. It is clear that it is not possible to think of a sustainable and equitable economic recovery if we cannot achieve good socio-health development. In this way, the population cannot work, study, care, and perform other essential activities for development. This explains why the health crisis caused by the COVID-19 pandemic has led to the greatest economic crisis [76].

On the other hand, we have seen the interdependence that exists between the social, economic, and environmental dimensions. Therefore, it is therefore important to develop comprehensive health policies. In these policies, public health measures have been carried out to protect people's health with social protection programs and measures, distance education modalities and provide protection to micro, small, and medium-sized enterprises to minimize the loss of income of the population; therefore, increasing investment in health is a matter of urgency [77].

Worsening access to health and financial poverty have negative consequences on people's health. Urgency is needed to increase investment in health, increasing public spending and decreasing the payments that the population has to make through co-payments and other expenses that people had to assume to be treated for cases of COVID-19 and other diseases. A similar situation was experienced during the syphilis epidemic due to the shortage of antibiotics for some time, as mentioned above. This should be carried out with financial sustainability in mind in order to increase access to health services and ensure that they are of high quality. This would improve the health indicators of the population: on the one hand, health would be recovered and on the other hand, financial difficulties would be eliminated [78–81].

This review makes it possible to inform researchers and health professionals about the current state of the scientific literature in the context of COVID-19 and syphilis, contributing to a comparative reflection between the two diseases, promoting implications for practice in the context of future pandemics.

5. Conclusions

Humanity has experienced around 20 pandemics that we know of. In this article, we studied two that have had great impact. Syphilis and COVID-19 are diseases that are *a priori* different, but if we analyze them in a syndemic context we can see that they have more similarities than it may seem.

Studying these two events leads us to see what human beings are failing to do to keep repeating them. What is clear is that we must continue to invest in drugs and institutions that support a situation of this degree and provide answers for dealing with future epidemics.

Similarly, through COVID-19, clinicians and researchers have been able to observe how a pandemic disease interacts with other existing diseases. In this case, there is less notification of cases of syphilis, but not less incidence. Therefore, we must insist on the prevention of viral diseases.

Pandemics produce deficits in economic and social systems that impact and affect numerous groups. Changes in sociocultural and communicative habits are also having consequences at the psychological and mental level, in syphilis due to mother-to-child transmission and prejudice, and in COVID-19 due to isolation and loneliness, affecting people's wellbeing. In short, situations that generate inequality and poverty have arisen where pandemics have occurred. All these aspects are key if we analyze them from the perspective of economic, social, and health sustainability.

As limitations of the study, the rigorous methodology is a strong point of this review; however, the inclusion of studies with other languages would also be relevant. In addition, some research such as scoping reviews, theses, and conference contributions were not reviewed and may constitute a limitation. Regarding syphilis, the main figure appearing in the writings is the physician. Despite the fact that it was the nurse who performed the treatments, hardly any literature on this topic was found. As for COVID-19, there are many lines of treatment, but it should be noted that most are still under trial. We will have to wait for studies to come out with the results of the drugs used against COVID-19.

Finally, it is worth highlighting the value of health professionals who continue to fight against all types of existing pathologies; their care and research work has been the key to overcoming another pandemic, although, in both cases, there is still a lot of work to be done.

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