

Emerging Pathogens in Brazil: Laboratory Identification and Clinical Correlation

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ABSTRACT

With a population of 192 million, Brazil is the largest country in Latin America and has continental dimensions. Several physical and economic variances distinguish it. With a population of 20 million, São Paulo, located in the country's southeast, is the biggest metropolis and home to important medical institutions. Brazilian hospitals face a severe issue with bacterial resistance, which is difficult to cure even in its medical centres of excellence. The nation has no central microbiology reference laboratory, and the dearth of official publications makes it difficult to compile national statistics on bacterial resistance. It appears that resistance has more significance in the southern and southeastern states. The trend of local hospitals consolidating and moving off-site microbiology laboratory services has grown recently. This has resulted in a lengthier turnaround time for the findings of antibiotic susceptibility tests and culture tests. Despite the fact that most hospitals have antimicrobial stewardship groups, the delay in reporting microbiological findings may affect the prescription of certain antibiotics, which may lead to a high level of selective pressure due to the widespread use of broad-spectrum antibiotics. In Brazilian intensive care units (ICUs), the use of last-resort medications, including colistin, is quite commonplace because many isolates have developed resistance to practically all currently available medications. There is proof that one of the main factors influencing resistance selection is the total amount of antibiotics used. Ironically, subpar antimicrobials, poor adherence, and insufficient doses may contribute as much to resistance development as excessive usage. Antibiotic resistance may have its roots in Brazil, where the availability of medicines over the counter encourages self-medication. Antimicrobial resistance is becoming more common, which is a worldwide problem. Compared to Europe and the US, Brazil and Latin America generally have higher levels of bacterial resistance among most of their key pathogens, especially among non-fermentative gram-negative bacilli and Enterobacteriaceae that produce extended-spectrum β -lactamase (ESBL), but also among some gram-positive organisms (like *Staphylococcus aureus*).

Keywords: Pathogens (P), Brazil laboratory Identification (BLI), Clinical (CC), Correlation (CC)

INTRODUCTION

Recent studies have shown a risk of emerging pathogens in Brazil for many reasons. Because of various forms of single pathogens and complicated symptoms, it is the need of the hour to identify these pathogens in a timely manner, making treatment possible. In this introduction, we will discuss the important emerging pathogens in Brazil and the aspects of laboratory identification and clinical correlation. We can define *pathogens* as living organisms that can cause disease in any other living organism. These pathogens may be bacteria, algae, fungi, viruses or any other entity. In Brazil, the risk of emerging pathogens has increased because Brazil's climate is suitable for developing different pathogens. Suppose we enlist the names of emerging pathogens in Brazil. In that case, the important emerging pathogens are Zika Virus, Chikungunya virus, dengue virus, yellow fever virus, candida auris, *Histoplasma capsulatum*, *Paracoccidioides brasiliensis*, *Plasmodium vivax*, *Trypanosoma cruzi* and many other viruses [1]. All of these viruses have different methods of identification and clinical correlation. We will discuss important VI pathogens one by one. Zika Virus is the most emerging pathogen in Brazil, which is mostly transmitted by mosquito bites, by sexual contact, from mother to child during pregnancy, by blood transfusion or by organ transplant. In almost eighty per cent of cases, there are no predictable symptoms, but the most common symptoms are fever, rash, headache, joint pain and others. It is dangerous in this sense that it can cause severe complications such as microcephaly, congenital Zika syndrome, neurological disorders and many other complications [2]. As widespread as it was at the time, effective methods were developed to

diagnose this virus. The important laboratory identification methods used to diagnose this virus are reverse transcriptase polymerase chain reaction, serology and plaque reduction neutralization test. Despite effective diagnostic methods, there is no effective treatment for this virus other than preventive measures. These preventive measures include control of the mosquito population, improved methods of personal protective equipment and vaccines. The dengue virus in Brazil is another emerging pathogen caused by the humid environment there [3]. This virus is mostly transmitted by the female mosquito *Aedes aegypti* and by human-to-human contact. The important symptoms of this virus are fever, muscle pain, headache, rashes, nausea and vomiting. There are four important types of this virus. It can cause a variety of complications in the human body, such as dengue hemorrhagic fever, dengue shock syndrome, and organ impairment, such as kidney or liver. It has the same identification methods in the laboratory as the Zika virus. It can also be identified by NS1 antigen detection. There is no specific treatment for this virus except taking preventive measures to control the population of mosquitoes. Along with this, some important vaccines can be inoculated as preventive measures against the dengue virus. However, there are also some important challenges related to the dengue virus in Brazil, such as the lack of effective vaccines for the dengue virus [4]. There is limited understanding of the dengue virus in Brazil. There are still no policies related to vector control in Brazil. Because of various pathogens, the immune system of the Brazilian population has become weak, so they may get the dengue virus easily. The other

important emerging pathogen in Brazil these days is adenovirus. It is a non-enveloped virus that has DNA as genomic material. Respiratory droplets, close contact with contaminated surfaces, faecal oral routes, and waterborne transmission transmit this virus[5]. This Virus has common cold symptoms such as fever, cough, sore throat, gastroenteritis, urinary tract infections and others. The complications related to this Virus are fatal, Such as respiratory failure, pneumonia, bronchitis, encephalitis and others. It has been observed that the incidence rate of adenovirus is high in children compared to other populations in Brazil. The important identification methods for this Virus are PCR, which means polymerase chain reaction, serology, antigen detection, virus isolating and others. The important treatment for this virus is antiviral Therapy[6]. The vaccine has also been developed to prevent adenovirus. The important challenge related to adenovirus in Brazil is that there is a great diversity of this virus, making treatment and vaccine less useful. The other important emerging pathogen in Brazil in recent years was the SARS-CoV-2 virus. SARS-CoV-2 is an abbreviation for severe acute respiratory system coronavirus 2[7]. The important transmission modes for this virus are respiratory droplets, airborne transmission in healthcare sectors, human-to-human contact and others. The important symptoms of this Coronavirus are fever, fatigue, shortness of breath, sore throat, runny nose, muscle pain and joint pain. The complications that are related to this coronavirus are severe respiratory disorder, pneumonia, acute respiratory distress syndrome, multi-organ failure, Cardiac injury and disorders of the neurological system as well. Although it was first discovered in China, it became a pandemic for the whole world in 2019. The virus can be identified in the laboratory through reverse transcriptase polymerase chain reaction, serology, antigen detection, and imaging studies. Some antiviral therapies are provided as treatment for this virus[8]. Along with this, there has also been the development of a vaccine against this virus, which has proved effective and saved the whole world. Supportive care is needed to control the infection caused by this virus, such as wearing masks and regular hand washing. Five important variants of this virus have been discovered. These variants are alpha, beta, gamma, Delta and omicron[9]. A few important challenges are related to laboratory identification of pathogens in Brazil. The first challenge is that there is less technology adoption in pathology labs in Brazil, which is an obstacle to treating these pathogens. The other important challenge is the low resource allocation for the healthcare sector in Brazil[10].

Research Objective

This research's main objective is to understand Brazil's emerging pathogens, their laboratory identification, and clinical correlation. This study effectively explains Brazil's emerging pathogens' symptoms, causes, treatments, and vaccines.

LITERATURE REVIEW

Researchers claim that the infectious agent responsible for causing serious health consensus in patients is *Pseudomonas aeruginosa*. the ability of this pathogen to show its pathogenicity in patients with poor immune response makes it a drug-resistant pathogen. the combination of two drugs proves effective in providing therapies against *Pseudomonas*. the genetic behaviour of *Pseudomonas* is clinically studied in Brazilian health centres for the pathogen characterization and diagnosis process[11]. Studies have classified CPA into five types. each type causes complications in patients. due to its complicated types, the diagnosis process for CPA is

difficult. In different countries worldwide, microbial and antigen testing and diagnostic procedures are carried out in hospitals[12]. Studies explain that fungal infection due to *Sporothrix Brasiliensis* results in spirochetes. In Brazil, the transmission of this fungus from cats to humans is studied in laboratories. WGS studies are conducted to assess the genetic alteration caused by the spread of fungus [13]. Studies reveal that WHO has declared Coccidioidomycosis as an endemic-causing pathogen that is common in South America. For assessing the disease characteristics, a multi-institutional concept is used in laboratories. In Brazil, various epidemiological studies were made on the disease to provide treatment for Coccidioidomycosis in the American state [14]. Studies show that the occurrence rate of PCM is higher in Brazil. PCM has subtypes that become severe if not treated timely. understanding the clinical profile of Coccidioidomycosis is important to stop its spread [15]. Studies reveal that bacterial genes have developed resistance against the action of drugs. Using antibiotics to improve public health is important in diagnostic terms. In central Brazil laboratories, sediments from polluted aquatic water are used to determine the presence of antimicrobial resistance genes in pathogens [16]. Studies reveal that infections causing bacteria in humans are found to be *Providencia stuartii*. the virulence and other factors associated with this infectious agent are studied to determine the cause of infection. In southern Brazil, a cloud sample of hospitalized patients is taken to test the presence of *Providencia stuartii* in their blood. The main characteristic of the *Providencia stuartii* pathogen is that it forms a biofilm that eases the process of its characterization [17]. Studies show that in developing countries, *Cryptococcus* is the agent responsible for causing cryptococcal meningitis. The prevalence of this pathogen is common in HIV-affected patients. The clinical diagnosis process for this disease requires an epidemiological basis. The diagnosis process includes sample collection, clinical trials, and a conclusion based on the results [18]. Studies show that MPEC is a mammal pathogen that mainly affects mammalian cells. The clinical diagnosis process for this disease is done to understand its molecular and phenotypic behaviour. Clinical mastitis is a condition associated with MPEC and is common in Brazil. also, the strains of *E.coli* are responsible for causing MPEC in mammals [19]. Studies predict that EIDs are a global health condition that alters the behavioural activities of humans. The new and innovative technologies developed for monitoring pathogen activity helps overcome pathogenic disorders. Moreover, the process to control pathogenic disease is rapidly determining the complexity associated with recently identified pathogens [20]. Studies claim that the onset of NDM-1 is a global health problem mostly in developing countries. the bacteria responsible for causing NDM -1 is found mostly in the south of Brazil. the samples taken from Brazilian hospitals were analyzed to assess the presence of bacteria causing NDM-1. the samples reveal that the prevalence of this bacteria is higher in patients admitted to Brazilian hospitals because of the high spread of NDM-1 causing bacteria among people [21]. Scholars predict that wastewater is contaminated with a lot of impurities. These impurities give rise to enteric pathogen development. the presence of strains of HEV, as well as RHEV, in wastewater causes serious health problems. The presence of wastewater pathogens is identified through urban clinical water monitoring systems These systems are specially built to detect the wastewater pathogenicity and impurity [22]. Scholars' studies conclude that different micrograms are responsible for inducing several infectious diseases. The microorganism that affects the CNS is the

meningoencephalitis-causing bacteria. Using film arrays to identify the bacteria is employed in clinical labs [23]. Studies show that certain microbes resist antimicrobial treatments and have high virulence. *proteus mirabilis* is a pathogen that has high virulence and shows MDR. The resistance shown by *proteus mirabilis* makes its diagnosis and treatment challenging. Identifying the factors responsible for such resistance makes it easier to treat the infection due to *proteus mirabilis* [24]. Studies elaborate that the complexity associated with *candida haemulonii* closely resembles that of *candida auris* species. the rapid colonization of *candida haemulonii* makes it spread a speedy process. The spread of this pathogen poses serious health problems that could be life-threatening [25]. Studies reveal that the most drug-resistant pathogens are destroying people's health. These pathogens are getting stronger, and their treatment is becoming a challenging process. staphylococcus aureus shows great resistance to treatment-based drug therapies and thus poses a great health threat. In laboratories, diagnostic techniques are implemented to identify the antimicrobial resistance posed by different strains of bacteria [26]. Scholars suggest that symptoms produced by B19 infection and dengue are very much similar. this similarity in infectious symptoms make the disease diagnostic process a difficult task. the prevalence of enterovirus DNA in pregnant women is ten per cent. this ten percent of women face severe symptoms onset that makes the treatment of the disorder a complicated procedure [27]. Studies predict that foot ulcers are associated with staphylococcus bacteria. by studying the disease profile of Staphylococcus, it becomes easier for clinicians to determine the antibiotic therapy for foot ulcers.

In Brazil, the diagnostic procedure for ulcer diagnosis is carried out on diabetic ulcer patients to understand the disease complexity in such patients [28]. Studies claim that neo-tropical species are becoming endangered with time. understanding the infections caused by these species helps develop strategies for the infection-causing neo-tropical primates [29]. Scholars' studies suggest that *Salmonella Enterica* is characterized as a pathogen by virulence. the pathogenicity and complexity associated with this pathogen are studied using WGS. WGS provides detailed sequencing information about the pathogens. Sequential sequencing of the genome of this pathogen is required to develop effective medications for treatment-based therapies [30].

Methodology

The research determines emerging pathogens in the Brazilian laboratory and clinical correlation. The study was based on primary data analysis to determine the research using SPSS software and generate results that included descriptive statistics and correlation coefficient analysis; the research also described variance analysis between them. Various factors in Brazil gave rise to different pathogens in that particular area of the world. The first factor is the diverse climate of Brazil, which allows for the growth and reproduction of new variants of pathogens at the same time. The other factor that gave rise to emerging pathogens in Brazil is the dense population there. As we know, there are few specific transmission modes for each pathogen, and human beings may act as vectors for the transmission of pathogens. The other factor that caused new variants of pathogens in Brazil is the vast territory of Brazil. When we study emerging pathogens in Brazil related to their identification and clinical correlation, the following are important implications of it:

Novel Laboratory Identification Techniques, Clinical Correlation Related to Effects of Pathogens, Antimicrobial Resistance Monitoring:

Presently, a variety of laboratory techniques are used to identify these emerging pathogens. The first and foremost technique is molecular diagnostics, such as PCR, NGS, and others. It is the most important and advanced laboratory technique because it is based on the molecular identification of pathogens. In other words, this technique studies the molecular basis of the pathogens, which describes the causes of the pathogenicity of these pathogens and how they react with the host in terms of the reaction of their genetic material. The other important laboratory technique used to identify pathogens is serology, which includes IFA, western blots, and others. Another important laboratory technique used for diagnosing these emerging pathogens is immunohistochemistry, in which there is a complete study of the immune system's response to these pathogens. So, one of the most important implications of the study of emerging pathogens in Brazil is that this study will help develop novel laboratory techniques that will be more accurate for the diagnosis of emerging pathogens. The other important implication of the study of emerging pathogens in Brazil is the aspect of clinical correlation. As we know, the effects of each type of pathogen are specific to the human body. For example, the Zika virus, which is one of the most emerging pathogens in Brazil, can cause congenital abnormalities such as different types of syndromes which are caused by this particular virus. If we talk about the dengue virus, it can cause severe fever, shock, and other outcomes. If we describe the effect of the yellow fever virus, we may know that this virus can cause liver damage. This means that there are certain effects of each type of emerging pathogen, and this effect is described by clinical correlation. In this way, we can say that the study of emerging pathogens in Brazil also helps us study these important clinical correlations related to emerging pathogens in Brazil. The other important implication of the study of emerging pathogens in Brazil is the aspect of antimicrobial resistance monitoring. As we know, there are severe and negative changes in our environment; in the same way, there are a variety of variants of single pathogens that are discovered day by day in Brazil. Although the most important treatment suggested for these pathogens is antibiotics, it has also been seen that these pathogens have developed antibiotic resistance. The study of emerging pathogens in Brazil is also important in this way that it can be helpful for pathologists to Monitor antimicrobial resistance in them. This aspect is also important because it will help pathologists to develop such treatment methods for these emerging pathogens which will prove effective in the future.

Vaccine Development and Evaluation, Vector Controlling Programs, Epidemiological Studies

Medical science proves that the prevention of disease is far better than the treatment of disease. In this regard, vaccination is the better preventive option against these emerging pathogens. Usually, vaccination is done before the onset of disease in the body because it stimulates the body's immune system by inoculating weak pathogens in the body. The status and rate of emerging pathogens in Brazil suggest that there is a need to develop an effective vaccine against these emerging pathogens. When vaccination is done in major parts of the population, there will be very little risk of disease caused by these emerging pathogens. Not only is the development of these vaccines necessary, but the proper evaluation of these vaccines is also mandatory. This evaluation will help get an idea about vaccine

efficiency in that particular area and a specific population. So, the important implication of the study of emerging pathogens in Brazil is that it will help develop and evaluate vaccines. The other important

implication of the study of emerging pathogens in Brazil is the aspect of vector control programs. As we know, some living organisms act as vectors for transmitting these emerging pathogens (Figure 1).

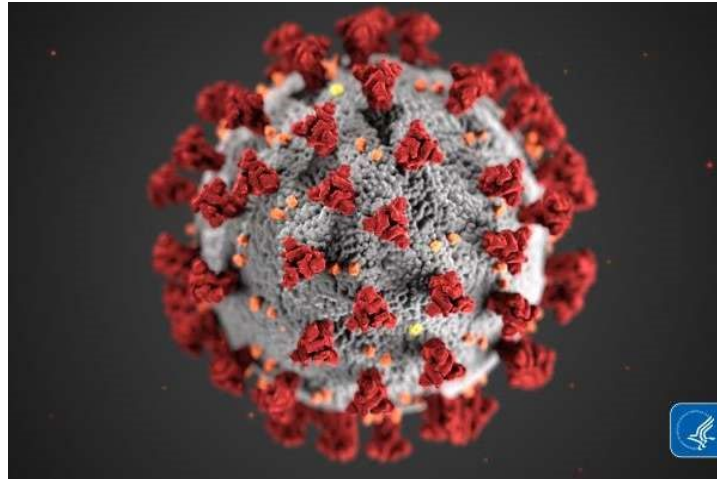


FIGURE 1: Emerging Pathogens

Result and Descriptions

Table 1: Results of Bayesian Estimates of Coefficients

Parameter	Bayesian Estimates of Coefficients			95% Credible Interval	
	Mode	Mean	Variance	Lower Bound	Upper Bound
Emerging Pathogens = Strongly Agree	1.521	1.521	.015	1.281	1.760
Emerging Pathogens = Agree	1.658	1.658	.019	1.389	1.927
Emerging Pathogens = Neutral	1.167	1.167	.118	.490	1.844

a. Dependent Variable: Clinical
b. Model: Emerging Pathogens
c. Regression Weight Variable: Laboratory Identification
d. Assume standard reference priors.

The above result of table 1 demonstrates that Bayesian estimates related to the coefficient analysis result describe that mode values, the mean values, and variance, and have a 95% credible interval analysis between them. The first parameter is emerging pathogens =strongly agree result describes that its mode value is 1.521, the mean rate is 1.521, and that variance value is 0.015, showing a 15% variance analysis between them. the 95% credible interval represents that the

lower bound is 1.281 and the upper bound is 1.760, respectively. Similarly, the emerging pathogens= agree level presents a positive mean value and mode value related to them. The variance rate is 0.019, the lower bound level is 1.389, and the, and the upper bound level is 1.927, respectively, showing, which positive parameters with each other. Similarly, the emerging pathogens=neutral level presents that variance rate of 0.118, shows 11% variance level with them.

Table 2: Results of Correlations

		Correlations		
		Emerging Pathogens	Laboratory Identification	Clinical
Emerging Pathogens	Pearson Correlation	1	-.057	-.051
	Sig. (2-tailed)	0.000	.689	.721
	N	52	52	52
Laboratory Identification	Pearson Correlation	-.057	1	.154
	Sig. (2-tailed)	.689		.276
	N	52	52	52
Clinical	Pearson Correlation	-.051	.154	1
	Sig. (2-tailed)	.721	.276	
	N	52	52	52

The above result of table 2 describes that correlation analysis results demonstrate the Pearson correlation value, the significant value, and the number of observation rates. The emerging pathogens present that 0.000 means 100% significant relation with them. The

laboratory identification describes that negative, but there is a 68% significant level between them. The clinical results show that 72% of the positive and significant values of each other factors. Its shows some positive and some negative relation between them.

Table 3: Results of Paired Samples Test

		Paired Samples Test					T	Df	Sig. (2-Tailed)
		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Emerging Pathogens - Laboratory Identification	-.21154	.97692	.13547	-.48351	.06044	-1.561	51	.125
Pair 2	Laboratory Identification - Clinical	.25000	.83725	.11611	.01691	.48309	2.153	51	.036
Pair 3	Emerging Pathogens - Clinical	.03846	.92803	.12869	-.21990	.29683	.299	51	.766

The result of table 3 shows that the paired sample test analysis results demonstrate the mean values, standard deviation rate, and standard error of the mean value. The 95% confidence interval is related to the lower and upper bounds. The result describes the t statistic value and significant value of each pair. The emerging pathogens and laboratory identification describe that the mean value is -0.21154, the standard deviation rate is 97%, and the interval level present is 48% and 6%, respectively. The result also describes that the t statistic value its rate is -1.561, which shows negative, but there is a

12% significant relation between them. Similarly, the second pair is laboratory identification and clinical describes that t statistic value is 2.153, and the significant rate is 0.036, showing a positive and 3% significant relation with them. The pair is related to the emerging pathogens, and the clinical result shows that the mean value is 0.0384, and the standard deviation value is 12%, deviating from the mean. The t statistic rate is 0.299, and the significant level is 0.766 it describes a 29% positive and 76% significant relation between emerging pathogens and clinical.

Table 4: Results of Paired Samples Statistics

		Paired Samples Statistics			
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Emerging Pathogens	1.5577	52	.66902	.09278
	Laboratory Identification	1.7692	52	.67491	.09359
Pair 2	Laboratory Identification	1.7692	52	.67491	.09359
	Clinical	1.5192	52	.61006	.08460
Pair 3	Emerging Pathogens	1.5577	52	.66902	.09278
	Clinical	1.5192	52	.61006	.08460

The above result of table 4 describes that paired sample statistical analysis result describes that mean values, the standard deviation rate, and the standard error of the mean value of each pair included independent and dependent variables. The first pair are emerging pathogens, and the laboratory identification results show that its mean value is 1.5577, and 1.769a positive average mean value. The standard deviation rate is 66%, and 67% deviates from the mean value. The standard error of the mean value is 9%, and the 93% error of the estimated level between them. Similarly, the second pair is laboratory identification, and clinical results describe that its standard deviation rate is 67% and 61% deviate from the mean value. The mean values are 1.7692 and 1.5192, respectively. Pair 3 is emerging pathogens, and clinical levels results describe that the mean value is 1.5577 and 1.5192 sho, which is the positive average value of the mean. The result also describes that the standard deviation rate is 66%, and 61% deviates from the mean value. The result presents that 9% and 8% error rate between them.

Methicillin-Resistant *S. aureus* (MRSA)

About twenty percent of nosocomial primary bloodstream infections (BSIs) are caused by *S. aureus*, which also happens to be the most common pathogen causing skin and soft-tissue infections. In a recent multicenter investigation, *S. aureus* was found to be the second most often isolated pathogen from patients suffering from lower respiratory tract infections. The hospital-acquired MRSA strain known as the Brazilian endemic clone (BEC) is one of the five major worldwide clones; isolates from this strain are generally resistant to many drugs. Of these MRSA isolates, ciprofloxacin, gentamycin, sulfamethoxazole-trimethoprim, and clindamycin are effective

against less than 10%. In comparison to sensitive isolates, MRSA-BEC strains also show decreased neutrophil and monocyte phagocytosis and killing. 2009 data from the University of São Paulo's Hospital das Clínicas, one of the nation's largest university hospitals with 2000 beds, revealed that MRSA made up 60% of the cultured organisms and that *S. aureus* BSI was responsible for 15% of the positive blood culture results (counting only one isolate per patient). MRSA infection rates are generally even higher in the intensive care unit. In other Brazilian hospitals, MRSA infection rates range from 30% to 60%. In the last several years, Hospital das Clínicas of the University of São Paulo has shown an increase in the percentage of MRSA strains that cause BSI unrelated to BEC-MRSA. These isolates were identified as non-multidrug-resistant and oxacillin-resistant *S. aureus* because they were sensitive to non- β -lactam antibiotics and particularly susceptible to sulfamethoxazole- trimethoprim. Hospitalized individuals harboured non-multidrug-resistant and oxacillin-resistant *S. aureus* that caused bloodstream infections (BSI). These isolates included a SCCmec type IV, a prevalent clone; however, in contrast to studies from other nations, these isolates were not community-sourced. While MRSA clones with SCCmec type IV have been found in Brazil for some time, their spread pattern is still unknown. Rarely do community-acquired MRSA isolates result in infection, and they are not thought to be a common etiological agent in the area. Despite a few instances of vancomycin-intermediate *S. aureus* isolates recovered from severe infections, glycopeptides remain very effective against *S. aureus*. The identification of hetero vancomycin-intermediate *S. aureus* and vancomycin MIC (minimum inhibitory concentration) creep may be obscured by limitations in local microbiology methods (Figure 2).

**Figure 2:** Investigation of Emerging Pathogens in Brazil Laboratory**Table 5:** Results of Coefficients

		Coefficients			T	Sig.
Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta		
1	(Constant)	1.592	.346		4.601	.000
	Emerging Pathogens	-.050	.142	-.049	-.348	.729
	Clinical	.167	.156	.151	1.072	.289

a. Dependent Variable: Laboratory Identification

The above result of Table 5 demonstrates that linear regression analysis presents the beta values, standard error values, and standardized coefficient analysis, and explains the t statistic value of independent variables. The emerging pathogens show that the beta rate is -0.049, the t-statistic value is -0.348, and the significant value is 0.729, showing a negative and 72% significant rate with laboratory identification. The clinical performance was positive and had a 28% significant relation with laboratory identification.

Conclusion

After an overview of these aspects and the important implications of studying emerging pathogens in Brazil, we may conclude that some factors in Brazil are causing pathetic health conditions in that area of the world. In conclusion, identifying and managing antibiotic resistance presents significant problems for Brazil. The early and accurate reporting of microbiological data is essential to the effectiveness of our efforts to address this issue. The combination of pan-resistant microbes and the steadily declining supply of novel substances is concerning and calls for local solutions without losing

sight of the global scope because this menace knows no bounds. To lessen the current scenario, interdisciplinary efforts, new policies, and political involvement will be crucial. If the transmission through these vectors is controlled, the overall disease spread can be controlled effectively. So, there is a need for campaigns related to awareness of these vectors. When people become aware of these vectors, they will try to prevent such aspects that will cause the transmission of emerging pathogens in Brazil. In this regard, it is pertinent to mention that the study of emerging pathogens in Brazil also helps to arrange vector-controlling programs in Brazil to prevent contact with These pathogens. The other important implication of the study of emerging pathogens in Brazil is the aspect of epidemiological Studies. As we know, some diseases are more common in some areas than in other areas of the earth. So, it is very important to study the factors that cause diseases in that particular area. Sometimes, climate has a role in the growth of these pathogens that will cause disease in that specific area. In other cases, there is some genetic factor in that population that may cause the impact of a particular pathogen on them. Epidemiological studies can easily understand all of these factors. So, it is an important implication of studying emerging pathogens in Brazil.

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