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Coinfection by tuberculosis and human immunodeficiency virus in the homeless population: reality of a state in Northeast Brazil

Tuberculosis (TB) is a bacterial infection caused by Mycobacterium tuberculosis, which mainly affects the lungs and has a long latency period, whereas the Human Immunodeficiency Virus (HIV) affects mainly CD4+ T lymphocytes. These two conditions are often found acting on the same organism. The high prevalence of HIV and TB co-infection makes the relevance of this study possible and corroborates the construction of a need for care for homeless people. Due to their difficulties regarding access to government resources, the scope of public policies and adequate care, they are often far from the attention of the health system. The objective of this study was to collect and analyze information about the co-infection of TB and HIV in homeless people (PSR) in the state of Pernambuco, Brazil. This is a qualitative-quantitative and ecological observational study, based on the analysis of data available on the website of the Notification Disease System, from 2015 to 2019. It was found, regarding PSR in Pernambuco, that the total number of cases of TB and HIV co-infection was 138 (26.85% of PSR with tuberculosis in PE) between 2015 and 2020, with 82 (59.42%) male and 56 (40.58%) female. women. Thus, it is evident that the state of Pernambuco showed a percentage increase in cases of co-infection between the years presented, which was not followed by the rest of Brazil. In addition, given that males represent about 80% of PSR, the number of women with HIV and TB co-infection is, proportionally, very expressive. This population is highly susceptible to the presence of HIV and TB co-infection, especially in males, and part of these numbers can be attributed to a marginalization in access to health services. It is considered that TB and HIV co-infection is more frequent in PSR in Pernambuco to the detriment of the general population. Co-infection by diseases is prevalent in men, but females have shown a great rise in this co-infection in the state.

Keywords: Coinfection; Tuberculosis; HIV; Public Health.

Coinfecção por tuberculose e vírus da imunodeficiência humana na população em situação de rua: realidade de um estado do Nordeste do Brasil

A tuberculose (TB) é uma infecção bacteriana causada pelo Mycobacterium tuberculosis, que atinge, principalmente, os pulmões e possui grande período de latência, já o Vírus da Imunodeficiência Humana (HIV) atinge, majoritariamente, linfócitos T CD4+. Essas duas afecções são frequentemente encontradas agindo no mesmo organismo. A alta prevalência da coinfecção por HIV e TB viabiliza a relevância deste estudo e corrobora com a construção de uma necessidade de atenção às pessoas em situação de rua. Devido as suas dificuldades quanto ao acesso a recursos governamentais, abrangência de políticas públicas e cuidados adequados, elas, muitas vezes, estão distantes da atenção do sistema de saúde. O objetivo deste trabalho foi levantar e analisar as informações acerca do quadro de coinfecção de TB e o HIV nas pessoas em situação de rua (PSR) no estado de Pernambuco, Brasil. Trata-se de um estudo quali-quantitativo e observacional ecológico, feito a partir da análise de dados disponíveis no site do Sistema de Agravos de Notificação, de 2015 a 2019. Constatou-se, quanto às PSR em Pernambuco, que o número total de casos de coinfecção por TB e HIV foi de 138 (26,85% da PSR com tuberculose em PE) entre os anos de 2015 e 2020, sendo 82 (59,42%) do sexo masculino e 56 (40,58%) do sexo feminino. Assim, é evidente que o estado de Pernambuco apresentou um aumento percentual dos casos de coinfecção entre os anos apresentados, o que não foi acompanhado pelo restante do Brasil. Além disso, tendo em vista que o sexo masculino representa cerca de 80% das PSR, o número de mulheres portadoras da coinfecção por HIV e TB é, proporcionalmente, muito expressivo. Essa população possui elevada suscetibilidade a presença de coinfecção por HIV e TB, principalmente no sexo masculino, podendo-se atribuir parte desses números à uma marginalização no acesso aos serviços de saúde. Considera-se que a coinfecção por TB e HIV é mais frequente nas PSR pernambucanas em detrimento da população em geral. A coinfecção por doenças é prevalente em homens, mas o sexo feminino tem apresentado grande ascensão dessa coinfecção no estado.

Palavras-chave: Coinfecção; Tuberculose; HIV; Saúde pública.

Topic: **Infectologia**

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INTRODUCTION

Tuberculosis is a bacterial infection caused by Mycobacterium tuberculosis, which mainly affects the lungs and has a long latency period, with often long time intervals before clinical manifestations (SIA et al., 2019; MASHABELA et al., 2019; ORGEUR et al., 2018; CHAI et al., 2020; KHAN et al., 2019). Unlike most pathogens, M. tuberculosis evolved and developed in humans, who are both hosts and reservoirs (EHRT et al., 2018). The interaction between the two factors is extremely complex and is affected by the anatomical, physiological and immunological diversity in the cellular environments, often leading to the phenotypic diversity of the pathogen (DHAR et al., 2016).

This disease is often present together with the human immunodeficiency virus (HIV); This is a retrovirus that mainly affects CD4+ T lymphocytes (BARREIRA, 2018). In general, people living with HIV are more likely to develop tuberculosis when compared to the general population (HUANG et al., 2019).

Tuberculosis (TB) is the leading cause of death due to a single infectious agent (ROSETTO et al., 2019; TORNHEIM et al., 2018; KOCH et al., 2018), with a contingent of 1.7 million lives in 2016. 22% of deaths attributable to TB in 2016 occurred in people co-infected with HIV. Thus, the two diseases are often found acting on the same organism (KOCH et al., 2018).

In addition, co-infection between Mycobacterium tuberculosis and HIV is the leading cause of death in HIV-1-infected individuals (AMELIO et al., 2019; SAMPERIO, 2017; SCOTT et al., 2017; BELL et al., 2018). It has long been known that HIV-1 infection alters the course of M. tuberculosis infection and substantially increases the risk of TB (KOCH et al., 2017; BARHAM et al., 2019). It has also become clear that TB increases the levels of HIV-1 replication, spread and genetic diversity (BARHAM et al., 2019). Therefore, coinfection offers great advantages for both pathogens (BELL et al., 2018).

Globally, around 36.7 million people were living with HIV infection at the end of 2015 (ESMAIL et al., 2018). Global diagnostic accounting also proves that the most frequent infection that co-occurs with HIV-1 is M. tuberculosis (374,000 deaths per year) (ESMAIL et al., 2018).

In addition, the Estimate of the Homeless Population in Brazil (September 2012 to March 2020) by the Institute of Applied Economic Research (IPEA), estimated that there were more than 206,000 homeless people (PSR) in September 2019 in Brazil; of this number, more than 17.1% (35,396) is in the northeast region (IPEA, 2020; DATASUS-PE, 2021). Also, when it comes to vulnerabilities suffered by this population, about 15% (5,286) of the number of PSR in the Northeast were diagnosed with TB and, related to this percentage, 10.8% (570) have HIV coinfection (DATASUS-BR, 2021).

This high prevalence of HIV and TB co-infection makes the relevance of this study possible and corroborates the construction of a need for attention to PSR. Due to their difficulties in accessing government resources, the scope of public policies and adequate care, they are often on the sidelines of the health system's attention (CADORIN et al., 2016). Still, vulnerability goes far beyond that, social risk is not only related to economic conditions, but also to conditions related to this and life conditions, as these people are generally excluded or exclude themselves from family relationships (CADORIN et al., 2016).

Thus, this work seeks to analyze the notifications of cases of co-infection with TB and HIV in the homeless population of Pernambuco (PE), Brazil, from 2015 to 2019. Also, it aims to highlight, when appropriate, the decreases, increases and possible explanations for this co-infection.

METODOLOGY

This is an ecological observational study, with a quali-quantitative character, based on data obtained through the Information System on Diseases and Notification (SINAN), on the DATASUS platform, in the Epidemiological and Morbidity category. The work will take into account the sexual variables, general population and homeless population, co-infected with HIV and TB registered in Brazil and Pernambuco, between 2015 and 2019.

Also, because it is a research that uses publicly accessible information, under the terms of Law No. 12,527, of November 18, 2011, it does not need prior authorization from any ethics committee, supported by the sole paragraph of Art 1 of the resolution 510/2016, resolved by the National Research Ethics Committee (CONEP), of the National Health Council (CNS) (CNS, 2016).

RESULTS

Therefore, after analyzing the data available on the SINAN website, it was found, with regard to PSR in Pernambuco, that the total number of cases of TB and HIV co-infection was 138 (26.85% of PSR with tuberculosis in PE) among the years 2015 and 2020, 82 (59.42%) were male and 56 (40.58%) were female (Table 2). Still, these values are very different when it comes to a national analysis, in which a total of 3,891 cases were obtained (24.31% of PSR with tuberculosis in Brazil); comprising 2,737 males (70.34%) and 1,154 (29.66%) females. Thus, the difference in percentage of co-infection between these two diseases is 2.54% between PE and Brazil, and the percentage difference between men is less than 10.92% between those coinfected from PE and Brazil, and between women is over 10.92%. The difference between the sexes changed from 40.68% in Brazil to 18.84% in PE. Thus, despite the great disparity between the sexes on this issue, the state of Pernambuco presents itself in the opposite direction.

Table 1: Tuberculosis and HIV co-infection in the general population and in PSR in Pernambuco and Brazil between 2015 and 2019.

Tuberculosis and HIV co-infection				
Variable	**N (PE)**	**% of the total population with tuberculosis (PE)**	**N (Br)**	**% of the total population with tuberculosis (Br)**
General population				
2015	649	11,5	9.863	11,5
2016	691	12,5	9.407	11,1
2017	679	11,4	9.813	10,9
2018	677	11,4	9.736	10,3
2019	682	11,2	9.497	9,9
Total	**3.378**	**11,55**	**48.316**	**10,72**
PSR				
2015	18	27,7	738	24,9
2016	20	25	686	23,4
2017	26	22,4	771	24,4
2018	31	27	842	24,9

2019	43	31,2	854	23,9
Total	**138** absolute number	**26,85** percentage	**3.891** absolute number	**24,31** percentage

Source: Sistema de Informação de Agravos de Notificação (SINAN) (DATASUS-PE, 2021; DATASUS-BR, 2021).

Still, looking at the difference per year, it is clear that the rate of notifications of cases of PSR coinfection in PE was higher in 2019 (31.2%) and lower in 2017 (22.4%), showing a growth of 8 .8% between the two years (Table 1). When comparing the value of the same years in the Brazilian population, there is a difference of more than 2%, in 2017, and less than 7.3%, in 2019, in the Brazilian index. Thus, it is evident that the state of Pernambuco presented a percentage increase in cases of co-infection between the years presented, which was not followed by the rest of Brazil, which had a decrease of 0.5% in relation to the aforementioned period.

Table 2: Sex-related tuberculosis and HIV co-infection in the general population and in PSR in Pernambuco and Brazil between 2015 and 2019.

Tuberculosis and sex-related HIV coinfection				
Variable	**N (PE)**	**% of total (PE)**	**N (Br)**	**% of total (Br)**
General population				
Masculine	2.405	71,2	34.725	71,87
Feminine	971	28,8	13.586	28,13
Total	**3.378**	**100**	**48.316**	**100**
PSR				
Masculine	82	59,42	2.737	70,34
Feminine	56	40,58	1.154	29,66
Total	**138**	**100**	**3.891**	**100**
	absolute number	percentage	absolute number	percentage

Source: Sistema de Informação de Agravos de Notificação (SINAN) (DATASUS-PE, 2021; DATASUS-BR, 2021).

DISCUSSION

In view of the above, it was found that the homeless population of PE has a high susceptibility to the presence of HIV and TB co-infection, especially in males; part of these numbers can be attributed to a marginalization in the access to health services (CADORIN et al., 2016). Over the years, there has been an increase in the number of cases, which may indicate growth in the area of coverage of the health system and in the monitoring of PSR. Still, this growth may be a mark of the underreporting present in the surveys of HIV and TB cases of these people (CADORIN et al., 2016; GALLO, 2016). In addition, given that males represent about 80% of PSR (BARBOSA, 2018), the number of women with HIV and TB co-infection is, proportionally, very expressive. This may be due to the fact that homeless women generally use their bodies as a bargaining chip, both for survival and for sustaining addictions (VERNAGLIA et al., 2015).

It is also important to note that HIV contamination is eight times higher among crack users, both through unprotected sex in most relationships and through sharing materials for drug use (FIOCRUZ, 2013). Another explanation for the growth in cases of co-infection may be the frequent practice of unprotected sex, especially when driven by alcohol and drugs (JACQUES, 2016).

Furthermore, this research corroborates the findings of the literature insofar as it presents high rates of HIV and TB coinfection in PSR, demonstrating the intimacy between these two diseases (HUANG et al., 2019; ESMAIL et al., 2018). And explaining the increase in cases of co-infection in PE in the analyzed period

demonstrates the fragility of PSR (CADORIN et al., 2016).

There is a program called *Consultório na Rua* that was instituted by the National Policy of Primary Care, in 2011, and aims to expand the access of the homeless population to health services, offering, in a more timely manner, comprehensive health care for this group. Population, which is in conditions of vulnerability and with broken or weakened family ties. The program is formed by multidisciplinary teams, including psychologists, nurses, social workers and other professionals, who develop comprehensive health actions in response to the needs of this population. The agents must carry out their activities on an itinerant basis and, when necessary, develop actions in partnership with the teams of the Basic Health Units in the territory. Despite serving this needy population, this program has a lack of correct government investment for its operation, in addition it is necessary to highlight that it ran the risk of being cut by the federal government in 2021 (BRASIL, 2021).

This study was limited to analyzing TB and HIV coinfection data in PSR in Pernambuco, and relating them to the value of the same variables in Brazil, using data with public and unrestricted access, available on the SINAN website. Thus, some of this information presented the ignored/blank variables that did not apply, as well as a large number of HIV tests not performed in PSR with TB, impairing a more secure analysis of the data and a reliable survey between them and the reality.

Therefore, further research should be carried out to update data on tuberculosis and HIV co-infection in PSR in the state of Pernambuco, in order to manage public policies to face both diseases in this already so marginalized population. Still, studies that relate updated information with possible causes for the results should be made.

CONCLUSIONS

Thus, according to the results obtained, we consider that TB and HIV co-infection is more frequent in PSR in Pernambuco than in the general population. Co-infection by diseases is prevalent in men, but females have shown a great rise in this co-infection in the state. In addition, its percentage increase is higher in Pernambuco, both for the general population and for the PSR, and for the latter group the difference was very accentuated in 2019.

That said, we emphasize that it is necessary to pay close attention to these data, given that they may present a relative rate of underreporting. Still, this information has a relative lag in relation to testing for both diseases. Finally, the data collected reinforce, due to its high incidence, the close relationship already established between HIV infection and TB, especially in this population that is subject to various vulnerabilities.

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