

Full Length Research Paper

Factors associated with tuberculosis among people who inject drugs (IDUs) in Senegal in 2022

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Drug use is a major public health issue. It can promote the transmission of infectious diseases. The aim of this study was to determine the factors associated with tuberculosis among injecting drug users supervised at the addiction treatment center in Dakar. This was a cross-sectional, descriptive and analytical study in injecting drug users supervised at the Addictology Unit of Fann Hospital from January 1st, 2015 to September 30th, 2022. These data were collected using a form from patients' records. Multivariate modelling was basic ally carried out on about tuberculosis in drug users and the Hosmer Lemeshow test was used to check the appropriateness of the model using the R 4.2.2 software. A total of 300 patients were involved. The average age was 53.4 ± 10.6 . The male sex was 92.33%, the most common level of education was the elementary one (38.33%). Heroin was the most commonly used injection drug (99.7%), followed by tobacco (96.7%). The prevalence of tuberculosis was 24.7% among IDUs. Factors associated with TB were illiteracy (AOR = 1.96 [1.03-3.70]), unemployment 2.32 (AOR [1.33-4.00]) and imprisonment (AOR = 1.88 [1.02-3.55]). The coverage of permanent contracts is no longer limited to the addictology aspect. The nidification of factors associated with TB infection would allow effective policies for the effective management of these diseases.

Key words: Prevalence, tuberculosis, inject drugs (IDU), drugs, Senegal.

INTRODUCTION

Drug use is on the rise worldwide and has become a public health issue. It increased from 4.8% in 2009 to 5.3% in 2018 among the population aged 15 to 64 (United Nations Office on Drugs and Crime UNODC, 2021). In 2021, more than 296 million people used at least one drug, a 23% increase from 2011. And by 2030, according to the United Nations Office on Drugs and

Crime (UNODC, 2020), the number of users will have increased by 40%.

In addition to addiction, using drugs by injection can promote the transmission of infectious diseases, including tuberculosis, which is a communicable infectious disease caused by *Mycobacterium tuberculosis* (Koch's bacillus or BK). In Canada, Aho et al. (2017) reported 35 cases

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of tuberculosis in people who use drugs over a 10-year period. According to World Health Organization (WHO) estimates, tuberculosis is the thirteenth leading cause of death and the second leading cause of infectious disease, behind HIV and COVID-19. In 2021, 10.6 million people developed the disease and 1.6 million deaths have been recorded (UNODC, 2022).

In Senegal, in 2015, the number of tuberculosis cases was estimated at 21,000, that is, an incidence of 139 new cases per 100,000 inhabitants for the same year. These data collected through the information system of the National Tuberculosis Control Program (NTP) show an increase in cases from 6,181 in 1991 to 13,060 in 2015, an increase of 289 new cases per year (+3.4% per year). This increase was observed for all forms of tuberculosis (Ministry of the Interior and Public Safety, 2009) despite the responses provided to combat this scourge. In 2020, due to the pandemic, the incidence of the disease is estimated at 117 per 100,000 inhabitants (Perras, 2022). Regarding the factors associated with the disease, Leye (2017) in his study, looked for those related to delayed diagnosis. This study is the first to examine factors mainly associated with tuberculosis among people who inject drugs. The aim is to provide decision-makers and programs for scientific information for the management of tuberculosis in a key population. It would also help facilitate access to care for a segment of the population that is prone to stigma. The objective of this study is to investigate factors associated with TB use among people who inject drugs.

METHODS

Research design and study population

This was a retrospective, descriptive and analytical cross-sectional study of people who inject drugs (IDUs) followed at CIAM level from 1st January 2015 to 30th September, 2022.

Study framework

This study took place at the Centre for Integrated Addiction Management (CIAM), the first addiction treatment center in West Africa, inaugurated in December 2014. It is a unit of the psychiatry department, housed within the University Hospital Center (UHC) of Fann in Dakar, Senegal. It is a structure dedicated to consultations and the delivery of methadone; hospitalizations are not carried out there due to the lack of adequate logistics. Apart from the medical services, the center has a large social, friendliness user box, a small dining room for community meals, a playground and garden (Ba et al, 2015)

Sampling

The selection of IDUs was exhaustive, covering all IDUs followed at CIAM during the study period. Included in this study were all people who injected drugs (IDUs) from CIAM from January 2015 to September, 2022. IDUs for which the files were incomplete were not included; TB infection was not sought.

Data collection

Data were collected using a form developed according to the CIAM patient record template and included: Socio-demographic characteristics, lifestyle determinants, environmental determinants, care-related determinants and tuberculosis. The form was filled in by analyzing patient files and was loaded onto a digital tablet using the Open Data Kit (ODK) software, which allowed instant collection and sending to an online server.

As for the collection procedure, three investigators have been trained. Files were arranged according to the year and each investigator received a batch. At the end of each day, a debriefing is carried out to decide on any challenges encountered in order to take them up. The supervisor ensured completeness and checked the entries before sending them to the server.

Data analysis

The data were extracted, cleaned before being analyzed with R 4.2.2 software. The description was made through the parameters of position and dispersion. Qualitative variables were described in absolute and relative frequencies and quantitative variables were summarized by mean with standard deviation and extremes. For the analytical part, cross-referencing of variables was carried out to reflect some of the challenges mentioned.

In the objectives, and related to the search for factors associated with TB infection, the Chi-2 test and the Fisher test were used with an alpha risk of 5%. To account for confounding factors, a multivariate analysis was conducted. The latter used a simple logistic regression model, taking into account in the initial model the set of variables whose p is less than 0.25 in the bivariate analysis. The comparison of the models is performed by testing the likelihood ratio with a top-down procedure. The relevance of the model is studied by the Hosmer and Lemeshow test (Fagerland and Hosmer, 2012). The measure of association was the adjusted odds ratio and its confidence interval was 95% (SPSS Statistics, 2022).

RESULTS

Sociodemographic characteristics

The mean age was 53.4 years with a standard deviation of 10.6. The age group [55-65[years was the most represented (34.3%). Male sex predominated 92.33% (N=277) of the sample. The highest level of education among permanent employees was elementary with 38.33%, followed by medium with 21%. One hundred and fourteen (114) individuals, or 38% of the permanent contracts, were divorced, while single people represented 28%.

The majority of respondents (56%) of this cohort were patients with formal employment. One hundred and fifty-three (153) individuals, or 51%, were unemployed during the last 6 months, as shown in Table 1.

Background

The medical history found in permanent contracts were overdose (7%), suicide attempt (8.67%), psychiatric hospitalization (11.67%), STI (6.33%) and family addiction (15%). A medical history was also reported in 64.7% of

Table 1. Distribution of IDUs according to their personal and biological characteristics.

Variable	Absolute frequency (n)	Relative frequency (%)
Age group (in year)		
[Lower 35[	16	5.33
[35-45[	50	16.60
[45-55[	90	30.00
[55-65[	103	34.30
[Upper 65[	41	13.70
Sex		
Feminine	23	7.67
Masculine	277	92.30
Level of education		
Not in school	20	6.67
Elementary	115	38.33
Medium	63	21.00
Secondary	54	18.00
Upper	48	16.00
Marital status		
Bachelor	78	26.00
Divorced	114	38.00
Married	98	32.67
Widower	10	3.33
Employment		
Formal employment	168	56.00
Informal employment	108	36.00
No profession	24	8.00
Employment status last 6 months		
Unemployed	153	51.00
In operation	147	49.00

consumers, as shown in Table 2.

Environmental factors

Two hundred and twenty-two, or 74% of the permanent contracts, lived with their parents and 79% of them lived with their relatives. Only 10.7% had parents who lived together. An addiction in the family was reported by 15% of permanent contracts. A stay and drug use abroad were noted by 66 and 43% of permanent contracts, respectively. Only 11% of the sample had medical coverage as mentioned in Table 3.

Lifestyle factors

Heroin was the most commonly used injection drug (99.7%), followed by tobacco (96.7%), cocaine (80%) and

crack cocaine (19%) as shown in Figure 1.

Of the IDCs, 56% used heroin in addition to other substances. Heroin, cocaine and other drugs were also associated in 18% of cases, as shown in Table 4. The prevalence of TB infection was 24.7% (n=74).

Factors associated with tuberculosis

In the bivariate and multivariate analysis, housing and HIV infection were not statistically related to tuberculosis as described in Table 5.

Factors associated with TB in bivariate and non-multivariate analysis were being unmarried 2.06 [1.11-3.82], unemployment 2.33 [1.33-4.00], low educational attainment 2.04 [1.09-3.70], and the presence of an addiction in the family 2.11 [1.08-4.12].

The factors associated with tuberculosis found in multivariate analysis were illiteracy or a level of education

Table 2. Distribution of CDIs according to their history (N=300).

Background	Absolute frequency (n)	Relative frequency (%)
History of overdose	23	7.67
History of suicide attempt	26	8.67
History of hospitalization, psychiatry	35	11.70
STI history	19	6.33
Addiction in the family	45	15.00
Incarceration	194	64.70

Table 3. Distribution of individuals by environmental factors (N=300).

Variable	Absolute frequency (n)	Relative frequency (%)
Entourage		
Lives with spouse and children	32	10.70
Lives with spouse only	9	3.00
Lives with friends	7	2.33
Lives with children	6	2.00
Lives with parents	222	74.0
Lives with parents, spouse and children	2	0.67
Lives with parents and children	3	1.00
Lives alone	19	6.33
Housing		
Sustainable with close family	237	79.0
Independent Sustainable	27	9.00
Provisional Other	18	6.00
Temporary at the home of relatives	15	5.00
Temporary rental	1	0.33
Homeless	2	0.67
Marital status of parents		
Another situation	243	81.00
Divorce	25	8.33
living together	32	10.70
Voyage		
Stay abroad	198	66.00
Drug use abroad	129	43.00

of 1.96 [1.03-3.70] times the risk of contracting tuberculosis; 2.32 [1.33-4.00] unemployed; and incarceration 1.88 [1.02-3.55] times this risk (Table 5).

DISCUSSION

At the end of the study, the aim is to report on the weaknesses that have been found in order to improve any further research. These were the inadequacy in data management. Some files were incomplete. However, the

results allowed us to make some comments. The mean age of respondents was 53.4 years with a standard deviation of 10.6. A slightly lower average age of 40.1 years was found by Tarasuk et al. (2020) in Canada. These results were superimposed on those of Diallo et al (2017), in Senegal, with an average age of 44 years. The age group [55-65] years was the most common in this study. In Mexico, a younger age group [15-19] years accounted for 43.1% of the population (Mendoza et al., 2019).

Men were in the majority (92.33%), surveys carried out

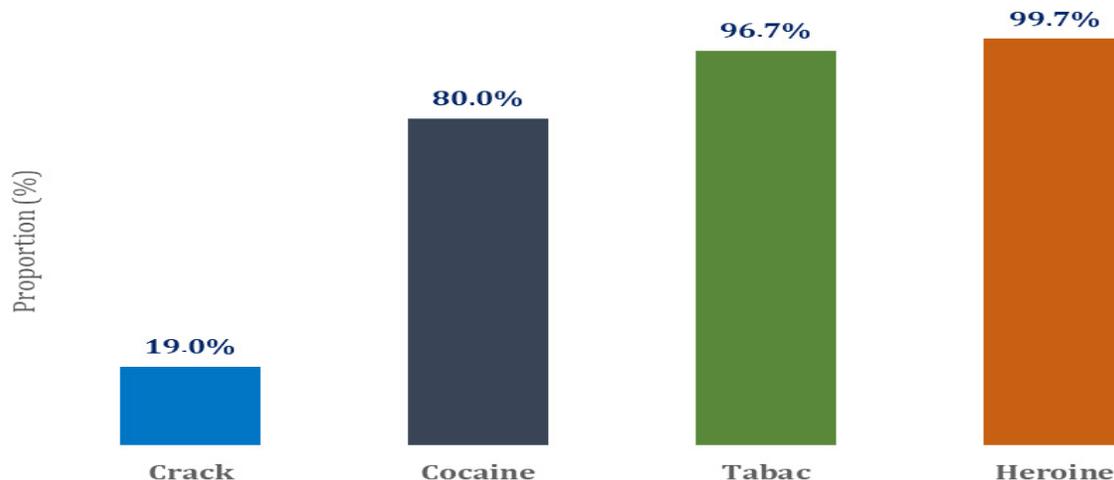


Figure 1. Type of drugs consumed.

Table 4. Bivariate analysis.

Variable	Yes (N = 74)	Not (N = 226)	p Value
	N (%)	N (%)	
Sex			
Female	5 (21.7)	18 (78.3)	0,735
Male	69 (24.9)	208 (75.1)	
Marital status			
Married	16 (16.3)	82 (83.7)	0,020
Single	58 (28.7)	144 (71.3)	
Class age			
[< 45 years old]	16 (24.2)	50 (75.8)	0,928
[45 and over]	58 (24.8)	176 (75.2)	
Employment situation last 6 months			
Unemployment	49 (32.0)	104 (68.0)	0,003
In operation	25 (17.0)	122 (83.0)	
Socio-professional category			
Profession	64 (23.2)	212 (76.8)	0,044
No profession	10 (41.7)	14 (58.3)	
Secondary or higher education			
Not	57 (28.8)	141 (71.2)	0,021
Yes	17 (16.7)	85 (83.3)	
Incarceration			
Not	18 (17.0)	88 (83.0)	0,022
Yes	56 (28.9)	138 (71.1)	
Family addiction			
Not	57 (22.4)	198 (77.6)	0,027
Yes	17 (37.8)	28 (62.2)	
HIV			
Positive	8 (42.1)	11 (57.9)	0,095
Negative	66 (23.5)	215 (76.5)	

Table 5. Factors associated with tuberculosis.

Variable	Tuberculosis		
	Adjusted GOLD	[CI at 95%]	p-value
Marital status			
Married		Ref	0.056
Single	1.81	[0.95-3.45]	
Employment status last 6 months			
In operation		Ref	0.006
Unemployment	2.32	[1.33-4.00]	
Secondary or Higher Education			
Yes			0.035
Not	1.96	[1.03-3.70]	
Incarceration			
Not		Ref	0.041
Yes	1.88	[1.02-3.55]	
Addiction in the family			
Not		Ref	0.116
Yes	1.77	[0.88-3.56]	
Housing			
Temporary		Ref	0.120
Durable	1.78	[0.69-4.76]	
HIV			
Not		Ref	0.152
Yes	2.13	[0.78-5.86]	

in Senegal in 2011 and in 2019 in Mexico reported prevalence of 86.4 and 83.6% respectively (ANRS, 2014) (Mendoza et al., 2019). The results can also be superimposed on those of Khoshnood et al. (2021) where male sex predominated with a prevalence of 95.5%. Tarasuk et al. (2020) reported that 65.6% of his study population were cisgender men, and 1% were transfeminine people. They have a female gender identity, but they are male at birth. This study found only the masculine and feminine genders because of the cultural and religious context.

Most (38.33%) of the permanent employees had an elementary level of education, followed by intermediate education with 21%. The UDSEN Survey (ANRS, 2014) reported that 51.2% had attended only primary and Quranic school; in Lebanon 41.7% were in elementary school (Khoshnood et al., 2021).

Most of the respondents were divorced (38%), while 28% were single. Mendoza et al. (2019) in Mexico had identified the majority of married couples (91.8%). More than half of the permanent employees worked in the

formal sector (56%) and were unemployed in the last 6 months (51%). According to Mendoza et al. (2019), 41.2% had no non-professional occupation.

This study did not find a statistically significant link between tuberculosis and marital status. On the other hand, Leye et al. (2019) in his study in Senegal, showed that brides and grooms had more knowledge about tuberculosis. They tend to do more research for their own protection and that of their families. Most of CIAM's IDUs were unmarried. Drugs are a way for young people to escape social realities by putting them in a daze that pushes them to get married late (Tine, 2021). It is a safe haven for them.

In addition, the existence of a family addiction was inclined to lead to subsequent drug use, although we did not find a statistically significant link in multivariate use. In Mexico, CDIs reported that a family member had been using the drugs prior to initiation (Stewart et al., 2021). Exposed at an early age, young people are prone to low attendance or dropping out of school, which increases the risk of drug use, which leads to dropout. In addition,

this leads to a lack of knowledge of the risks involved (Leye et al., 2019; Ganapathi et al., 2021). This confirms the fact that no or average level of schooling increases the risk of TB infection by 1.96 [1.03-3.70] times. Having a high level of education allowed you to have more knowledge (Leye et al., 2019) and also to reduce delays in TB diagnosis (Cantoreggi, 2010).

In California, Koslik et al. (2020) reported that 61.8% of permanent contracts were homeless. With 51% of permanent employees unemployed in the last 6 months, the results can also be correlated with those of Spaulding et al. (2022), in the United States, which found a higher prevalence of tuberculosis among the homeless people. There is a link between improved residential conditions and decreased injection frequency (Fortier, 2021). According to Ganapathi et al (2021), unemployment promotes consumption because it is a source of discontent and can lead to depression. It is also the cause of family problems and failure in romantic relationships. A vicious circle is thus formed with unemployment, disappointment, consumption and the risk of contamination.

Faced with a precarious economic situation, professional inactivity and the irreplaceable or craving desire to consume drugs, permanent employees are involved in theft and receiving stolen goods. They are incarcerated for these acts and find themselves in a high-risk environment for the transmission of the virus. Behaviors such as injecting risky drugs, risky tattooing and unprotected sex, overcrowding and limited or no access to appropriate diagnosis, care and treatment are objectified. HIV and tuberculosis co-infection are also favored (Stöver et al., 2021).

Despite the magnitude of TB, TB screening estimates were only available in 7 countries, in Europe, in 2021, with incomplete data. With regard to prisons, 19 countries report providing treatment (Stöver et al., 2021).

Ethical considerations

Confidentiality was maintained by investigators and records were consulted on-site (in the library). Anonymity was preserved.

Conclusion

Drug use and tuberculosis are major public health issues. In addition to addiction, drug users are prone to tuberculosis. Factors associated with the disease include lack of schooling or average level of education and incarceration. The establishment of a drug control program will enable holistic care for drug users.

DECLARATION OF INTERESTS

The authors do not declare any conflicts of interest in

relation to this article.

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