

Prevalence of Tuberculosis in Workers from the Department of Huila, Colombia

Carlos-Andrés Carmona-Patiño^{1*}, Sergio-Eduardo Díaz-Triana^{1*} and Diana-Marcela Rojas-Arias²

¹Docente Corporación Universitaria minuto de Dios, Colombia

²Profesional de apoyo de tuberculosis de la Secretaria de Salud Huila, Colombia

*Corresponding author: Carlos-Andrés Carmona-Patiño and Sergio-Eduardo Díaz-Triana, Neiva, 410001, Huila, Colombia



ARTICLE INFO

Received:  September 03, 2022

Published:  September 09, 2022

Citation: Carlos-Andrés Carmona-Patiño, Sergio-Eduardo Díaz-Triana and Diana-Marcela Rojas-Arias. Prevalence of Tuberculosis in Workers from the Department of Huila, Colombia. Biomed J Sci & Tech Res 46(1)-2022. BJSTR. MS.ID.007296.

ABSTRACT

Tuberculosis is a public health problem as it is a reemerging infectious which is transmitted from one person to another through small drops. The prevalence of Tuberculosis in workers in the department of Huila between 2012 and 2017 was determined, from a descriptive cross-sectional study, which allowed describing the distribution of sociodemographic variables of people with diagnosis confirmed tuberculosis, referring to age, gender, area residence, ethnicity, social security regime and occupation. Crude rates were calculated and adjusted for sex, age, percentage variation, coefficients and behavior analysis. There was a decrease in the tuberculosis morbidity rate in 2017 (28.81 per 100,000 people over 15 years of age) of 5.6% compared to 2012. 5.4% of the municipalities of the department presented the worst rates of tuberculosis morbidity during the 6 years of study. The tasks most related to the diagnosis of tuberculosis were farmers, agricultural, forestry and fishing workers with 9.9%

Keywords: Cross-Sectional Studies; Epidemiology; Mycobacterium; Occupational Medicine; Public Health

Introduction

Tuberculosis is an infectious disease that usually mainly affects the lungs and is caused by a bacterium (*Mycobacterium tuberculosis*), which is transmitted from patients with active lung disease through the air [1]. Tuberculosis is currently considered a public health problem worldwide, a re-emerging infectious disease [2], attributable to the high burden of disease, due to the costs it has for the health system, and other aspects, including bacterial resistance, the efficient mechanism of airborne transmission from person to person, and their ability to develop a chronic, disabling and lethal disease, especially in vulnerable and immunosuppressed people. In Colombia there is a surveillance system and a legal framework for

the care, prevention, diagnosis, control and treatment of tuberculosis, within the legal framework built by the Ministry of Health and Social Protection is the Comprehensive Health Care Policy (PAIS), for the integral routes of health care, in its risk group of infectious diseases according to resolution 3202 of 2016[3]. The Single Regulatory Decree of the health and social protection sector 780 of 2016 defines the health regimes to which citizens belong in Colombia, dividing them mainly into a contributory and subsidized regime, which implies simply people with the ability to pay (contributory) and people subsidized by the system (subsidized), considers a risk factor for the occurrence of Tuberculosis, implying the determinants of health that generate inequalities by themselves, adversely

affecting the most vulnerable population[4], that is, with greater social fragility, within which their work activity and socioeconomic status are included, recognizing that it is a disease associated with poverty and certain living conditions of the individual.

The World Health Organization defines the healthy work environment as: “one in which workers and managers collaborate in a process of continuous improvement to promote and protect the health, safety and well-being of workers and the sustainability of the work environment”[5] based on health and well-being indicators, related to the physical environment, psychosocial and cultural environment. This definition determines the conception of each of the occupations and implies conditions in which the worker performs, recovering the importance in the characterization and quantification of the prevalence of Tuberculosis, compared to the occupations reported in the workers of the department of Huila, considering that the population most affected by the disease is the economically active [6]. The report of occupations in our country is based on the International Uniform Classification of Occupations (ISCO-08). Given the limited availability of studies related to Tuberculosis in the work environment in the department of Huila, the prevalence of tuberculosis was determined between 2012 and 2017, evidencing the direct relationship of public health in occupational safety and health, participating in the analysis of exposure to agents that may cause tuberculosis in the workplace, with the collection and analysis of data, which generates timely, valid and reliable information, allowing decisions to be made regarding the measures of prevention, control and surveillance of the disease in the different actors of the health and labor system.

Methodology

A descriptive cross-sectional study was carried out, which allowed to determine the prevalence of tuberculosis between 2012 and 2017 and the distribution in each municipality of the department of Huila and the different socioeconomic conditions, such as the variables of age, gender, occupation, area of residence, ethnicity, type of social security regime, selecting those municipalities that had cases at least in a study period, selected from secondary sources (Table 1), obtaining the population of each municipality by age groups from the information available on the DANE website and the data on confirmed cases of tuberculosis reported in SIVIGILA during the period studied. The calculation of the fees, measures and percentage change are described below: - Crude rate: is the division of the number of reported cases of Tuberculosis among the population over 15 years for each corresponding year, multiplying by 100,000. - Adjusted rate: the direct method of rate adjustment was used, taking the Colombian population as the reference population. The specific crude rate of age and sex was multiplied by the Colombian population of the corresponding group (the age groups that were taken are: 15 to 44 years, 45 to 64 years and 65 and over years), the adjusted rates of all age groups in men and women were

added, the result obtained was divided between the population over 15 years of both sexes. Finally, the rates were divided by quartiles being Q4 is the municipality with the worst rate, Q3 worst intermediate rate, Q2 best intermediate rate and Q1 is the best Rate.

Table 1: Description of information collected by secondary sources.

Variable	Source of information	Description
Tuberculosis morbidity	SIVIGILA	The xls files notified by the UPGD to the UND, with their respective adjustments, for the years 2012 to 2017 were obtained.
Population	DANE	The population of each municipality by age groups was obtained from the information available on the website, and following the following route: Statistics by topic, Demography and Population, Estimators and population projections, estimation and projection of the national population of Huila, by municipality, sex, five-year age groups and simple ages

Note: Source: own elaboration

Measures based on ranges: The quotient was calculated:

$$\frac{\text{Rate Initial}}{\text{Rate final}}$$

Difference of extreme adjusted rates by quartiles making the previous ordering of each variable of the worst morbidity rate in the municipalities of the department during the years of study.

$$\text{Initial Rate} - \text{Final Rate}$$

Extreme - Percentage variability of the adjusted rates in the extreme years of tuberculosis morbidity in the municipalities, between the initial and final period analyzed:

$$\frac{\text{Rate 2012} - \text{Rate 2017}}{\text{Rate 2012}} \times 100$$

The analysis of the behavior of health and sociodemographic variables over time was performed with the use of Excel 2010 software, and IBM SPSS Statistics 21. This study was based on the very main ethic of beneficence, non-maleficence, autonomy, and justice, promulgated in the Nuremberg Codes and the Declaration of Hel-

sinki, according to resolution number 8430 of 1993, this research was considered risk-free.

Results

Table 2 shows a decrease in the tuberculosis morbidity rate in 2017 (28.81 per 100,000 people over 15 years of age) of 5.6% compared to 2012. 5.4% of the municipalities of the department, which were with the worst rates (quartile 4) of morbidity due to Tuberculosis during the 6 years of study were Neiva and Campo

Alegre and were present with the worst morbidity rates at least in 5 years of study the municipalities of Agrado and Rivera. As for the municipalities that were with the best rates (quartile 1) at least in 5 years of study were the municipalities of Nátaga and Paicol; and 19% of the municipalities presented the best rates of morbidity due to tuberculosis in 4 years of the analyzed period, such as Altamira, Elías, Hobo, Oporapa, Tarqui, Teruel and Yaguará. In Q2 are the municipalities with the best intermediate rate and in Q3 are the municipalities with the worst intermediate rate.

Table 2: Adjusted rates of tuberculosis morbidity in the department of Huila.

Zone	Municipality	2012	2013	2014	2015	2016	2017
Norte	Neiva	78,37 Q4	94,23 Q4	67,51 Q4	40,63 Q4	82,45 Q4	80,38 Q4
Sur	Acevedo	11,16 Q2	33,69 Q4	21,62 Q3	0,00 Q1	15,86 Q3	17,09 Q3
Centro	Agrado	30,59 Q4	16,47 Q3	34,79 Q4	43,15 Q4	32,82 Q4	31,26 Q4
Norte	Aipe	12,41 Q2	25,90 Q3	15,91 Q3	0,00 Q1	16,75 Q3	22,68 Q3
Norte	Algeciras	5,48 Q1	23,16 Q3	15,60 Q2	15,91 Q4	10,99 Q2	47,23 Q4
Centro	Altamira	0,00 Q1	140,20 Q4	46,73 Q4	0,00 Q1	0,00 Q1	0,00 Q1
Norte	Baraya	14,05 Q2	0,00 Q1	12,32 Q2	37,61 Q4	56,51 Q4	25,92 Q3
Norte	Campoalegre	70,53 Q4	46,13 Q4	52,13 Q4	14,91 Q4	49,33 Q4	43,33 Q4
Norte	Colombia	10,00 Q1	10,81 Q2	9,57 Q2	24,41 Q4	12,08 Q2	47,85 Q4
Sur	Elías	0,00 Q1	38,58 Q4	0,00 Q1	0,00 Q1	49,01 Q4	0,00 Q1
Centro	Garzón	28,28 Q3	22,17 Q3	40,90 Q4	13,14 Q4	17,22 Q3	31,53 Q4
Centro	Gigante	15,58 Q2	9,30 Q2	14,67 Q2	2,71 Q2	3,18 Q2	14,01 Q3
Centro	Guadalupe	21,53 Q3	5,35 Q1	10,31 Q2	9,64 Q3	19,14 Q3	9,30 Q2
Norte	Hobo	26,85 Q3	0,00 Q1	0,00 Q1	0,00 Q1	0,00 Q1	30,77 Q4
Norte	Íquira	31,36 Q4	31,23 Q4	19,36 Q3	0,00 Q1	28,39 Q4	0,00 Q1
Sur	Isnos	11,57 Q2	3,78 Q1	7,65 Q1	3,81 Q2	0,00 Q1	0,00 Q1
Occidente	La Argentina	30,87 Q4	16,97 Q3	14,69 Q2	0,00 Q1	7,02 Q2	0,00 Q1
Occidente	La Plata	21,11 Q3	25,80 Q3	21,72 Q3	14,68	12,59 Q2	9,45 Q2
Occidente	Nátaga	48,01 Q4	0,00 Q1	0,00 Q1	0,00 Q1	0,00 Q1	0,00 Q1
Sur	Oporapa	8,59 Q1	0,00 Q1	29,61 Q4	0,00 Q1	0,00 Q1	0,00 Q1
Occidente	Paicol	40,18 Q4	0,00 Q1	0,00 Q1	0,00 Q1	0,00 Q1	0,00 Q1
Norte	Palermo	21,37 Q3	11,98 Q2	21,82 Q3	11,44 Q4	2,39 Q1	17,40 Q3
Sur	Palestina	19,94 Q3	0,00 Q1	52,36 Q4	8,49 Q3	8,38 Q2	29,32 Q4
Centro	Pital	15,24 Q2	7,61 Q2	22,55 Q3	7,02 Q3	0,00 Q1	0,00 Q1
Sur	Pitalito	16,55 Q2	14,88 Q2	20,53 Q3	7,19 Q3	18,31 Q3	13,67 Q2
Norte	Rivera	22,72 Q3	60,64 Q4	60,98 Q4	5,52 Q2	111,40 Q4	54,34 Q4
Sur	Saladoblanco	0,00 Q1	10,49 Q2	9,46 Q2	10,10 Q3	19,40 Q3	0,00 Q1
Sur	San Agustín	30,49 Q4	14,73 Q2	49,75 Q4	2,68 Q2	8,46 Q2	13,80 Q3
Norte	Santa María	27,61 Q3	9,22 Q2	9,01 Q2	9,53 Q3	27,04 Q4	0,00 Q1
Centro	Suaza	6,11 Q1	23,60 Q3	11,33 Q2	11,13 Q3	20,93 Q3	0,00 Q1
Centro	Tarqui	31,73 Q4	25,19 Q3	0,00 Q1	0,00 Q1	0,00 Q1	0,00 Q1
Occidente	Tesalia	19,70 Q3	33,08 Q4	0,00 Q1	0,00 Q1	9,18 Q2	16,10 Q3
Norte	Tello	6,21 Q1	6,10 Q2	7,85 Q1	7,79 Q3	22,58 Q3	26,68 Q3
Norte	Teruel	12,54 Q2	40,42 Q4	0,00 Q1	0,00 Q1	0,00 Q1	0,00 Q1
Sur	Timaná	5,03 Q1	20,35 Q3	0,00 Q1	0,00 Q1	15,09 Q3	29,39 Q4
Norte	Villavieja	10,55 Q2	0,00 Q1	28,02 Q3	10,27 Q3	50,92 Q4	0,00 Q1

Norte	Yaguará	0,00 Q1	0,00 Q1	30,09 Q4	0,00 Q1	54,66 Q4	0,00 Q1
HUILA		30,52 Q4	32,86 Q4	29,49 Q3	14,04 Q4	28,83 Q4	28,81 Q3

Note: Quartile 1- Q1, quartile 2- Q2, quartile 3- Q3 and Quartile 4- Q4.

Source: own elaboration.

Table 3: Occupations related to Tuberculosis morbidity in the department of Huila.

Occupation	Frequency	Percentage	Cumulative percentage
Farmers, workers and agricultural, forestry and fishing workers	184	9,9	9,9
Craftsmen	1	0,1	9,9
Teaching assistants and instructors of formal, special and vocational education	4	0,2	10,1
Astrologers, fortune tellers, chiro-mantics and the like	5	0,3	10,4
Nurse and Dental Assistants	6	0,3	10,7
Vehicle drivers and mobile heavy equipment operators	23	1,2	12,0
Leaders and administrators	3	0,2	12,1
Office Employees	16	0,9	13,0
Nurse practitioners	4	0,2	13,2
Public force	7	0,4	13,6
Mechanics and adjusters of machines and equipment	5	0,3	13,8
Medical	5	0,3	14,1
Other classifications	165	17,2	31,3
Unclassified	1.281	68,7	100,0
TOTAL	1.865	100,0	100,0

Note: Source: own elaboration.

Table 3 describes the first 10 occupations that were related in the diagnosis of people over 15 years of age with tuberculosis, such as: farmers, agricultural, forestry and fishing workers with 9.9%, in second place other workers of personal services to individuals, not classified under other headings with 4%, in third place other non-university postsecondary technicians and commercial and administrative assistants with 2.8%, in fourth place are unskilled service workers (except domestic and related personnel) with 1.3%, in fifth place vehicle drivers and mobile heavy equipment operators with 1.2%, in sixth place unskilled workers in mining, construction, manufacturing and transport with 1.1%, in seventh place are street vendors with 1%, in the eighth and ninth place are with 0.9% office employees, officers and operators of the extractive industry and the tenth place are home sellers. It should be clarified that 68.7% of the people who presented tuberculosis during the study period were not classified under any occupation code.

In 2012, the municipality with the highest rate of tuberculosis was Neiva (78.4 per 100,000 inhabitants over 15 years of age), where the work carried out by infected people were non-university post-secondary technicians, commercial and administrative assis-

tants, followed by vehicle drivers and mobile heavy equipment operators. In 2013 the municipality with the highest rate of tuberculosis was Altamira, (140.2 per 100,000 inhabitants over 15 years old), highlighting their work as non-university post-secondary technicians, commercial assistants, administrative assistants, and street vendors. In 2014 the municipality with the highest rate of tuberculosis was Neiva (67.5 per 100,000 inhabitants over 15 years of age), the work performed by infected people was that of unskilled workers in mining, construction, manufacturing, and transport, followed by street vendors. In 2015, the municipality with the highest rate of tuberculosis was El Agrado (43.2 per 100,000 inhabitants over 15 years of age), not relating the occupational classification of people diagnosed. In 2016, the municipality with the highest rate of tuberculosis was Rivera (111.4 per 100,000 inhabitants over 15 years of age), where the work carried out by infected people were farmers, workers, agricultural, forestry and fishing workers, followed by vehicle drivers and mobile heavy equipment operators. In 2017 the municipality with the largest, the rate of tuberculosis was Neiva (80.4 per 100,000 inhabitants over the age of 15), where the work performed by infected persons were vehicle drivers, mobile

heavy equipment operators, office workers and unskilled service workers (except domestic and related personnel). The cases of tuberculosis analyzed in the study period were presented in 79.4% in the municipal capital, 7.1% in populated centers and 13.5% in the dispersed rural area; in 2012 the municipality with the highest rate of tuberculosis was Neiva, where 96% of the cases occurred in the capital and 3% in the population center. For 2013 the highest rate was in Altamira, where there is no difference between the municipal seat and the rural area. In 2014 the highest rate was in Neiva, where 96% of the cases occurred in the head and 2% in the rural area. For 2015 the highest rate was in Agrado, where the total of the cases that were presented belong to the municipal capital. In 2016, the highest rate was for Rivera, where 48% of the cases were in the rural area and 43% in the municipal capital.

In 2017, the municipality with the highest rate of tuberculosis was Neiva, where 95% of the cases belong to the municipal seat and 2% to the rural area. 63.6% of the reported cases with tuberculosis belong to the subsidized regime, 24.9% contributory regime, 2.3% special regime, 1.6% exception regime and 7.6% are poor uninsured people. In 2012 the municipality with the highest rate of tuberculosis was Neiva, where 53.3% of cases are insured under the subsidized regime and 31.3% of cases are insured under the contributory regime. For 2013 the highest rate was in Altamira, where all cases were insured to the contributory regime. In 2014 the highest rate was in Neiva, where 57.8% of cases are insured in the subsidized regime and 29.5% in the contributory regime. For 2015 the highest rate was in Agrado, where the total of the cases belonged to the subsidized regime. In 2016, the highest rate was in Rivera, where 43.5% of the cases are in the subsidized regime and 21.7% are uninsured people. In 2017, the municipality with the highest rate of tuberculosis was Neiva, where 57.5% of the cases were in the subsidized regime and 31.9% of the cases were in the contributory regime.

For the department, 0.8% of the cases diagnosed with tuberculosis were indigenous, and 60% were reported to be farmers, agricultural, forestry and fishing workers; 0.2% of the cases in the department were mulattoes and Afro-Colombians, where the type of work they performed was not classified; 0.2% of the cases in the department were ROM and Gitanos, where 33% worked as farmers, workers and agricultural, forestry and fishing workers; 1% of the cases in the department were Raizales and the rest are classified as others. Table 4 presents an analysis of variability of adjusted TB morbidity rates between 2012 – 2017, observing the changes which reflects tuberculosis in the period; the negative value indicates an increase in morbidity in the years analyzed, and the positive values indicate a decrease in morbidity. There was a decrease in tuberculosis morbidity of 9.8%, where 54% of the municipalities positively helped this indicator, and the municipalities that contributed a negative variability increasing their tuberculosis rate above 50% were Algeciras (-761%), Timaná (-483.9%), Colombia (-378.5%), Tello (-329.5%), Rivera (-139.1%), Baraya (-84.4%), Aipe (-82.7%) and Acevedo (-53.1%). Data in NA indicate that no cases occurred in the extreme years 2012 and 2017.

Table 5 presents the measures based on range (ratio and difference of extreme rates) of morbidity rates in the study period, the absolute and relative differences were calculated by the morbidity rates adjusted per 100,000 inhabitants over 15 years of the extreme years of the study period. As can be seen, for every person (1.0) over the age of 15 who fell ill with tuberculosis in 2017, 1.1 person fell ill in 2012; reflecting this increase mainly in the municipalities of Guadalupe (TC: 2.3), La Plata (TC: 2.2) and San Agustín (TC: 2.2), which presented twice as many cases for the respective year. However, in 2012 there were 3.2 more people over 15 years of age infected with tuberculosis, compared to 2017, contributing to this difference in rates, the municipalities of Nátaga (DT: -48), Paicol (DT: -40.2), Argentina (DT: -30.9) and Campoalegre (DT: -27.2) that presented more cases for the year 2012.

Table 4: Variability of the adjusted rates of tuberculosis morbidity in the department of Huila during the years 2012 and 2017.

Zone	Municipality	Variability
Norte	Neiva	-2,565
Sur	Acevedo	-53,136
Centro	Agrado	-2,190
Norte	Aipe	-82,756
Norte	Algeciras	-761,861
Centro	Altamira	NA
Norte	Baraya	-84,484
Norte	Campoalegre	38,565
Norte	Colombia	-378,500
Sur	Elías	NA
Centro	Garzón	-11,499
Centro	Gigante	10,101

Centro	Guadalupe	56,801
Norte	Hobo	-14,602
Norte	Íquira	100,000
Sur	Isnos	100,000
Occidente	La Argentina	100,000
Occidente	La Plata	55,238
Occidente	Nátaga	100,000
Sur	Oporapa	100,000
Occidente	Paicol	100,000
Norte	Palermo	18,575
Sur	Palestina	-47,072
Centro	Pital	100,000
Sur	Pitalito	17,398
Norte	Rivera	-139,126
Sur	Saladoblanco	NA
Sur	San Agustín	54,739
Norte	Santa María	100,000
Centro	Suaza	100,000
Centro	Tarqui	100,000
Occidente	Tesalia	18,282
Norte	Tello	-329,541
Norte	Teruel	100,000
Sur	Timaná	-483,980
Norte	Villavieja	100,000
Norte	Yaguará	NA
HUILA		9,884

Note: Source: own elaboration.

Table 5: Ratios and differences of adjusted rates of Tuberculosis in the years 2012 and 2017 of the department of Huila.

Municipality	CT	DT
Neiva	1,0	2,0
Acevedo	0,7	5,9
Agrado	1,0	0,7
Aipe	0,5	10,3
Algeciras	0,1	41,8
Altamira	0,0	0,0
Baraya	0,5	11,9
Campoalegre	1,6	-27,2
Colombia	0,2	37,9
Elías	0,0	0,0
Garzón	0,9	3,3
Gigante	1,1	-1,6
Guadalupe	2,3	-12,2
Hobo	0,9	3,9
Íquira	0,0	-31,4
Isnos	0,0	-11,6
La Argentina	0,0	-30,9

La Plata	2,2	-11,7
Nátaga	0,0	-48,0
Oporapa	0,0	-8,6
Paicol	0,0	-40,2
Palermo	1,2	-4,0
Palestina	0,7	9,4
Pital	0,0	-15,2
Pitalito	1,2	-2,9
Rivera	0,4	31,6
Saladoblanco	0,0	0,0
San Agustín	2,2	-16,7
Santa María	0,0	-27,6
Suaza	0,0	-6,1
Tarqui	0,0	-31,7
Tesalia	1,2	-3,6
Tello	0,2	20,5
Teruel	0,0	-12,5
Timaná	0,2	24,4
Villavieja	0,0	-10,5
Yaguará	0,0	0,0
HUILA	1,1	-3,2

Note: (CT) Extreme Rate Ratio (2012/2017 Rate); DT: Difference of extreme rates (Rate 2017 – Rate 2012).

Source: own elaboration.

Discussion

The Prevalence of Tuberculosis during 2012 reported 3.2 more cases than in 2017 for each inhabitant over 15 years of age; observing a decrease, reporting a decrease in tuberculosis morbidity of 9.8%, with a positive variability between the years of study (2012-2017). This result may be related to positive changes in social determinants and to public policy interventions. Due to the characteristic of the descriptive study, we cannot determine if the prevalence of tuberculosis is related to occupation or if there are confounding variables; it is also pertinent to comment that data were obtained from all the inhabitants of the department of Huila from the sources consulted, allowing to incur in information biases, due to incomplete or untrue data in the capture of SIVIGILA, which is why the idea raised by Álvarez and Delgado was taken as a reference in front of the cross-sectional descriptive studies, who indicate that: “Since the exposure and the result are examined at the same time, there is a temporal ambiguity in their relationship, which prevents establishing cause-effect inferences” [7]. The prevalence for the years evaluated ranged from 28.8 cases to 32.9 cases per 100,000 inhabitants in people over 15 years of age, indicating that it remains a relevant health problem in our department despite the decrease found. This shows the need to intervene in health related to the purposes of WHO, PAHO and the ten-year public health plan, which seek to eliminate this infectious disease currently classified as one of the main re-emerging diseases. In relation to these facts, it is ex-

remely important to refer: “the global strategy to end Tuberculosis”, which has the “strategic plan: towards the end of Tuberculosis, 2016 – 2025”, a strategy included in the Sustainable Development Goals, which aims to end the epidemics of tuberculosis, malaria and HIV by 2030 [8].

It should be remembered that the mortality rate at the beginning of the twentieth century (1935) was 45.2 per hundred thousand inhabitants [9], allowing to evidence the great impact existing in the last century of Tuberculosis in Colombia, advancing in its control, without reaching the goal of eradication and being classified as a reemerging disease. The results show that 54% of the municipalities present positive changes in the face of the decrease in the prevalence of Tuberculosis in the department, but others a significant negative variation. Public policy must be strengthened throughout the geography of the Department of Huila, but especially in various areas with greater predominance, such as the northern area of Huila, of which approximately 70% of the municipalities with the highest prevalence are. The municipality of Neiva (northern zone), which contributes the highest percentage of cases, this being the capital of the department reports a high prevalence without distinction against sex; unlike the national behavior where the male sex has 64.3%. The areas least affected by Tuberculosis were the central and western areas of the department, which would be valuable to address from the strategic processes of public health management, within the framework of the comprehensive health care

policy in these areas. According to Fontalvo, et al. [10], the lack of tuberculosis control in Colombia is due to structural failures related to the health management model that is adopted in the country.

In the geographical analysis of the cases against the area of origin (rural or urban) it was reported that in 2013, the highest rate of tuberculosis occurred in the municipality of Altamira, it was the only municipality where there is no difference in cases of tuberculosis between the municipal capital and the rural area; it should be clarified that this result should not divert attention from the trend shown by the current study in greater prevalence in the northern zone, Altamira is a municipality in the central area and is one of the smallest populations of the department, without undervaluing the activities to be carried out in this municipality, there is a marked inequality between the number of inhabitants of rural areas and dispersed areas. It is also observed in 2015 where the municipality with the highest rate of tuberculosis was Agrado. In 2016 the municipality with the highest rate of tuberculosis was Rivera, where 48% of the cases belong to the rural area and 43% belong to the municipal capital; with a high number of visitors, it could be a municipality where it merits a deeper study against the determinants of health and other factors. Finally, it can be concluded that in the department of Huila in the years analyzed the highest concentration of cases occurs in the urban area during the study period, with 79.4% of tuberculosis cases. This behavior found is clearly in line with the behavior of this pathology recorded within history and as reported by the 2017 tuberculosis report of SIVIGILA: where 83.4% of cases occur in urban areas [2]. It is necessary to take into account the existence of prejudices that affect people with the disease [11], which may be more accentuated in rural areas.

The gender assessment of morbidity rates shows similar behavior at the national level based on the report of the epidemiological bulletin 2017 [12], which reports that 64.3% of the cases were male. The municipality of Saladoblanco had no cases of tuberculosis in men (southern area of Huila). On the other hand, the municipality of Neiva presented the worst rates of tuberculosis morbidity in women during the 6 years of study. These results invite us to propose studies on biological and physiological factors related to gender, occupation and interaction with the environment in the department of Huila. Reports of the disease indicate the greater vulnerability of men [13], which may be related to social habits [14], although there is a higher risk for women who are health workers [15]. The Health Insurance Regime shows us a marked inequity in socioeconomic strata in the municipalities of the department, where 63.6% of the diagnosed cases of tuberculosis are affiliated to the subsidized regime, a regime in which the population is classified as vulnerable since they do not have the capacity to pay or do not have formal jobs, which also reflects the reality at the national level (epidemiological bulletin 201712) where 53.4% of the cases correspond to the subsidized regime. The doctors of the 1930s and 1940s agreed that tuberculosis was an economic-social problem of

great importance for the progress of the country [9]. The situation in Colombia was considered to be extremely serious, that it defended the permanent state protection of tuberculosis, composed of workers and mainly those who earned the least money [16].

In the ethnic differential populations, 0.8% of the cases diagnosed with tuberculosis in the department correspond to indigenous people who are engaged in agriculture, forestry and fishing activities, well below the national reality reported for the year by the epidemiological bulletin 2017 [12] 5.4% of cases occur in the indigenous population. Regarding the relationship of Tuberculosis with work activities in the department of Huila during the study period, of the first 10 occupations that were related to the diagnosis in people are farmers, workers, agricultural, forestry and fishing workers with 9.9%. Farmers represent the most frequent employment in people in the department who are related to the diagnosis of tuberculosis. The above leads to an inference and is that, the department of Huila being a department with eminently agricultural vocation where its main tasks are developed in the field, are carried out by men in greater proportion who reside mainly in the urban area, which in its great majority belong to the subsidized regime, suggesting that agriculture, informality and socioeconomic status related to the health regime could be directly or indirectly related to the high prevalence rate of Tuberculosis. According to the results, formal jobs such as drivers, university professionals, office employees and machinery operators would also be an object population, which should guide any intervention from public policy with a focus on environments. Jobs held by people over 15 years of age in the department, such as unskilled, informal and low-paid labor, would have a risk of acquiring tb disease because of its transmission mechanism for the work they do and for its social determinants.

The literature reports an increased risk of the disease in professions such as veterinarians, slaughterers, miners, prison staff; of public transport and funeral homes and especially health workers [17], due to the accumulated exposure in hospitals, a lack of control plans and inadequate natural ventilation [18,19]. Tuberculosis in Colombia begins to be classified as an occupational disease from Decree 841 of 1946 that regulated article 12 of Law 6 of 1945, by means of which it was legislated for the first time to protect workers in case of occupational diseases, only in certain trades such as hospital and amphitheater personnel, blowtorches, miners, firemen and boilermakers [16]; In 2012, the municipality with the highest rate of tuberculosis was Neiva, where the work performed by infected people were non-university post-secondary technicians and commercial and administrative assistants, followed by vehicle drivers and mobile heavy equipment operators. In a study from Mexico [20], 83.8% of the interviewees are located in the low socioeconomic level, unskilled workers in the informal sector of agriculture and the economy, with incomplete primary education and the other 16.2% of the interviewees are located in the middle socioeconomic level, skilled workers.

Among the main known risk factors for Tuberculosis, hiv infection is the strongest; malnutrition, indoor air pollution, type 2 diabetes mellitus, excessive alcohol consumption and smoking [1]. In the last two years of the study for municipalities with the highest rates of tuberculosis, people who worked as vehicle drivers, mobile heavy equipment operators were more likely to get sick, which may be related to their habits, exposure to toxic agents or their environments. There is consistent epidemiological evidence that independently associates chronic inhalation of biofuel smoke with the development of pulmonary tuberculosis. The pathophysiological mechanisms underlying this association are partially known; biofuel smoke has various effects at the level of the pulmonary parenchyma and the innate immune system which, together, could increase susceptibility to various infections including Mycobacterium tuberculosis [21]. 68.7% of the people who developed tuberculosis during the study period were not classified under any occupation code; this result leads to suggest that most of the occupations in the department of Huila are informal and outside the classification of occupations and as mentioned in previous paragraphs this would determine a great risk for the population and their vulnerability to Tuberculosis; however, it can also be considered problems of underreporting or difficulties in the instruments that collect information on the pathology under study and the occupations of the population in Huila and Colombia. Mining is carried out in some municipalities, being within the top 10 causes in the years studied, therefore, it is important that in this trade all the necessary measures are increased to reduce the prevalence of tuberculosis in this occupation. The relationship of tuberculosis with mining is known, which establishes that silicosis or anthracosiliosis predisposes to pulmonary tuberculosis [22].

Conclusion

The tasks performed by people over 15 years of age related to the diagnosis of tuberculosis are farmers, agricultural, forestry and fishing workers, unskilled, informal and poorly paid labor, in which their risk of acquiring the tuberculosis disease may be in their transmission mechanism or because of the work they perform. In municipalities with high rates of tuberculosis, work is considered at greater risk of developing tuberculosis. such as: technicians, non-university post-secondary, commercial and administrative assistants. It may be indicated that it is necessary to invite health and labor authorities to strengthen the registration and reporting of diseases such as Tuberculosis, especially of diagnosed cases that correspond to workers within a work environment, as well as to strengthen the reporting of occupations which should be adequately coded and monitored, as well as the urgent strengthening of public policies in Huila and in the municipalities where the highest number of tuberculosis cases was found. In the department of Huila, progress has been made in the control of Tuberculosis, however, health policies must be strengthened in the urban area of the

department, as well as intervention should be made mainly in the population of the subsidized regime.

References

1. Madhukar Pai, Marcel A Behr, David Dowdy, Keertan Dheda, Maziar Divangahi, et al. (2016) Tuberculosis. *Nat Rev Dis Primers* 2: 16076.
2. Gaudiano Javier, Botta Cecilia, Graña Diego, Silveira Gonzalo, Goñi Mabel (2017) Enfermedades autoinmunes sistémicas y tuberculosis: una mala asociación. *Rev Urug Med Int* 2(1): 32-38.
3. Pérez MPL (2017) Informe de evento tuberculosis, Colombia (03): 21.
4. Montalvo CA, Carmona CA, Cardona- D (2017) Desigualdades en mortalidad relacionadas con características socioeconómicas en el departamento del Huila, Colombia 2009-2013. *Rev. Fac. Nac. Salud Pública* 35(3): 343-357.
5. (2014) Organización Mundial de la Salud - OMS. OMS: Ambientes de trabajo saludables.
6. Zabaleta A, Llerena C (2019) Serie de casos: tuberculosis extremadamente resistente a drogas en Colombia, 2006-2016. *Biomédica* 39: 707-714.
7. Álvarez G, Delgado J (2015) Diseño de estudios epidemiológicos. I. El estudio transversal: Tomando una fotografía de la salud y la enfermedad. *Bol Clín Hosp Infant Edo Son* 32(1): 26-34.
8. (2016) Ministerio de Salud y Protección Social, Organización Panamericana de la Salud. Plan estratégico "Hacia el fin de la tuberculosis", Colombia, 2016-2025. Bogotá.
9. Estrada V, Gallo O, Márquez J (2016) Retórica de la cuantificación: tuberculosis, estadística y mundo laboral en Colombia, 1916-1946. *Hist cienc saude-Manguinhos* 23(2): 277-299.
10. Fontalvo, D, Gómez D, Gómez-R (2014) Análisis de la política para el control de la tuberculosis en Colombia. *Rev perú med exp salud publica* 31(4): 775-780.
11. Braga SKM, Oliveira TS, Flavio FF, Vêras GCB, Silva BN, et al. (2020) Estigma, preconceito e adesão ao tratamento: representações sociais de pessoas com tuberculose. *Rev Cuid* 11(1): e785.
12. (2017) Instituto nacional de salud. Boletín epidemiológico semanal: Semana epidemiológica 52.
13. Yates TA, Atkinson SH (2017) Ironing out sex differences in tuberculosis prevalence. *Int J Tuberc Lung Dis* 21: 483-484.
14. Vincens MI, Delgado JC, Espinoza MA, Espín JA, Álvarez GM, et al. (2018) Control frente la prevalencia de la tuberculosis. *Recimundo* 2(4): 239-269.
15. Vargas F (2019) Tuberculosis activa en trabajadores de salud en Colombia 2011 - 2017. [Tesis] Colombia. Universidad de Antioquia, pp. 130.
16. Gallo O, Márquez J (2016) Tuberculosis en el mundo laboral colombiano 1934-1946. *Nuevo Mundo Mundos Nuevos*.
17. Mendoza A (2012) Tuberculosis como enfermedad ocupacional. *Rev Peru Med Exp Salud Publica* 29(2): 232-236.
18. Ochoa J, Leon AL, Ramirez IC, Lopera CM, Bernal E, et al. (2017) Prevalence of tuberculosis infection in healthcare workers of the public hospital network in Medellin, Colombia: A Bayesian approach. *Epidemiol Infect* 145: 1095-1106.
19. Agüero LV (2016) Probables causas para enfermar de tuberculosis relacionada a las medidas del control ambiental, trabajadores, centro de salud Lauriama, 2015. [Tesis] Perú. Universidad San Pedro.
20. Heredia MR, Puc M, Caamal Á, Vargas A (2012) Determinantes sociales relacionados con el tratamiento de tuberculosis en Yucatán, México. *Rev Biomed* 23(3): 113-120.

21. Sada I, Ocaña R, Torre L (2015) Humo de biomasa, inmunidad innata y Mycobacterium tuberculosis. Neumol Cir Tórax 74(2): 118-126.

22. López M, Santos J, Quezada C, Segura M, Pérez J (2016) Actividad minera y su impacto en la salud humana. Ciencia UNEMI 9(17): 92-100.

ISSN: 2574-1241

DOI: 10.26717/BJSTR.2022.46.007296

Carlos-Andrés Carmona-Patiño. Biomed J Sci & Tech Res



This work is licensed under Creative Commons Attribution 4.0 License

Submission Link: <https://biomedres.us/submit-manuscript.php>



Assets of Publishing with us

- Global archiving of articles
- Immediate, unrestricted online access
- Rigorous Peer Review Process
- Authors Retain Copyrights
- Unique DOI for all articles

<https://biomedres.us/>