

Research Article

PREVALENCE OF TREPONEMA PALLIDUM IN THE POPULATION STUDENT OF THE INSTITUTE SUPERIOR OF TECHNOLOGY OF MAMOU

^{1,2} * Alpha Arsida BARRY, ¹Siba SAGNO, ²Taliby Dos CAMARA, ¹Mamadou Lamarana SOUARE, ¹Oumar KEITA, ¹Mamadou SY, ¹Amadou SYLLA, ¹Ibrahima DOUMBOUYA, ²Roger KOLAMOU, ¹Boubacar Hawa DIALLO, ¹Thierno Amadou SOW

¹Biology Laboratory of the Laboratory Techniques Department of the Higher Institute of Technology of Mamou (IST-Mamou), Republic of Guinea Conakry.

²Microbiology laboratory of the Department of Biology of the Gamal Abdel Nasser University of Conakry. BP: 1147 – Republic of Guinea.

Received 03th October 2023; Accepted 04th November 2023; Published online 24th December 2023

ABSTRACT

Introduction: Syphilis is a sexually transmitted disease caused by a bacterium of the genus *Treponema pallidum* of which humans are the natural host. **Objective:** carry out the voluntary screening campaign with a view to protecting the health of Mamou IST students. Method: this is a prospective and descriptive cross-sectional study which took place from January 10 to February 13, 2023. **Results:** the diagnosis of syphilis among the 245 student volunteers gave 11 positive cases, or 4.49%. The socio-demographic parameters revealed that of the 11 students with syphilis, the male gender was the most represented with a prevalence of 81.82% compared to 18.18% for the female gender. The age group of 26-33 was the most represented with 54.55% followed by that of 17-25 with 36.36%. Single people were the most represented in this study with 8 positive cases, i.e. 72.73% compared to 27.27% among Married people. The high prevalence of *Treponema pallidum* among single people could be explained not only by their greater representativeness within the student population but also their large number among the volunteers surveyed. Students from the Technical Departments of Laboratory and Technology of the Equipment Biomedical were the most represented with 36.36 and 27.27% respectively. They are followed by students from the Energy and Mechanical Design and Manufacturing Departments with each 18.18%. **Conclusion:** Syphilis is a major public health problem because it could cause serious consequences in humans ranging from sterility to damage to the nervous system and capable of leading to the death of the sick subject. The introduction of studies on sexually transmitted infections (STIs) into school curricula could promote a better level of knowledge among students about the disease syphilis.

Keywords: Syphilis, Epidemiology, Students, STIs and Mamou.

INTRODUCTION

Syphilis is a sexually transmitted disease caused by a bacterium of the genus *Treponema pallidum* of which humans are the natural host [1;2]. Syphilis can also be transmitted when sharing equipment for preparing, injecting and inhaling drugs or through blood transfusion [3]. In 2020, the World Health Organization (WHO) estimated that 7.1 million adults aged 15 to 49 contracted syphilis worldwide. In some countries where syphilis is routinely monitored, there has been a significant increase in the number of cases among homosexuals and in the number of cases of congenital syphilis [4]. By 2030, the WHO has set itself the objective of a 90% reduction in the global incidence of syphilis [5]. In the United States, between 2000 and 2018, the incidence rate of syphilis increased threefold (86% of patients were men, more than half of them homosexual, and 42% infected with HIV). A similar type of increase has been noted in Europe and China [6]. Between 2010 and 2019, rates of syphilis among women saw the largest increase compared to chlamydia and gonorrhoea in Canada [7]. In France, syphilis was a notifiable disease until July 2000, when it was removed from the list due to its near disappearance. But, according to a survey by the Institute for Health Surveillance (InVS) showed that syphilis is on the rise because, almost 1,000 new cases in 2014 [8]. Like China, Russia virtually eliminated syphilis by the 1960s, although there was a slight increase between 1978 and 1979,

with the number of cases estimated at 28 per 100,000 population. The rate decreased slightly and then increased in 1988, when there were four patients per 100,000 inhabitants and 263 patients per 100,000 in 1996, i.e. 62 times more cases [9]. In Africa, the number of people infected with syphilis is currently estimated at 19 million, or more than half of the global population [10]. In Algeria, syphilis is a notifiable disease. It is the most widespread with 31% compared to other sexually transmitted diseases [11]. According to the WHO, syphilis has become rare in the Republic of Guinea, but it remains a significant cause of morbidity and mortality in the country. In 2012, the general mortality rate recorded in this country was 10.19 per 1000 inhabitants, and maternal deaths represented 28% of all deaths among women aged 15-49 years [12]. The objective of this study is to actively participate in the fight against syphilis in Guinean universities through the sexually active layer that constitutes young students.

MATERIALS AND WORKING METHOD

Study environment and setting: this study was carried out in the urban commune of Mamou. THE laboratory of Biology of the Institute Superior of Technology of Mamou has served of framework for this study. The Mamou Higher Institute of Technology is a public professional institution, reporting to the Ministry of Higher Education, Scientific Research and Innovation. It was created by decree No. 2004/9245/MESRS/CAB of August 25, 2004 as part of the decentralization of Higher Education Institutions (IES) of the Republic of Guinea. Since its creation, it has had six (6) departments including that of Laboratory Techniques.

Work materials: to carry out this work, we used the following

*Corresponding Author: Alpha Arsida BARRY,

¹Biology Laboratory of the Laboratory Techniques Department of the Higher Institute of Technology of Mamou (IST-Mamou), Republic of Guinea Conakry.

²Microbiology laboratory of the Department of Biology of the Gamal Abdel Nasser University of Conakry. BP: 1147 – Republic of Guinea.

equipment: chromatographic immune test strip (Syphilis TPHA liquid Human, Reference 50101), electric centrifuge, stopwatch, Pasteur pipettes, hydrophilic cotton, latex gloves, syringes 5cc, hemolysis tubes, boxes of security and trash cans.

Working method: This is a prospective and descriptive cross-sectional study which took place from January 10 to February 13, 2023. students of the Institute Superior of Technology of Mamou have constituted our target population. Were included in this study, all regularly registered students who have accepted off to submit to our investigation. Sampling has summer simple random and sample size $n = 245$ students.

Biomaterial: It was made of students' blood

Parameters studied

A panel of Biologists (epidemiologists, microbiologists and public health specialists) established a set of items relating to *Treponema pallidum* in the form of a questionnaire validated with a sample of 70 students regarding their understanding. This self-administered questionnaire by students focused on socio-demographic data and knowledge of *Treponema pallidum*.

The socio-demographic data were: age, gender, Department of affiliation, sources of information (radio, television, social networks, newspapers). Knowledge focused on the existence of *Treponema pallidum*, sources of information, routes of contamination, risk factors for infection and means of prevention.

Variables subject to study:

- **Variables biological:** RPR and TPHA;
- **Variables sociodemographic:** age, sex, Department belonging, sources of information, routes of contamination, risky practices And situation matrimonial.

Methods of collection And computer analysis of data

For data collection, we used the register laboratory and pre-established survey sheets. The information collected was analyzed manually, entered using Microsoft Word and Excel software under Windows 2016 and the analyzes were carried out using Epi Data software. For the analysis, we used SPSS version 21 software. This analysis initially consisted of a descriptive analysis (means and frequencies) of sociodemographic parameters and knowledge of *Treponema pallidum*. Secondly, we studied the relationship between knowledge of the existence of *Treponema pallidum* and sociodemographic and academic factors in multivariate analysis by logistic regression. This relationship was expressed as an Odds ratio with its 95% confidence interval and in degree of significance p (5% significance level).

Method diagnosis of syphilis

We used the immunochroma to graphic test technique of the Syphilis TPHA and RPR liquid type, this method allows qualitative and quantitative detection of anti- *Treponema pallidum* antibodies in human serum.

Treponemal tests (TT): TPHA

These tests detect antibodies against treponemal antigens. These antibodies persist even after the treponema disappears. These tests have the characteristic of most often remaining positive after treatment and therefore do not make it possible to distinguish active syphilis from cured syphilis. They have no interest in follow-up after treatment.

Treponemal tests: They are specific and are used in first-line diagnosis. They measure TPP-specific immunoglobulin M (IgM) and immunoglobulin G (IgG). The sensitivity of immunoenzymatic TT is in fact close to 100% during primary and secondary syphilis and is greater than 95% during tertiary syphilis. The same goes for their specificity (between 95 and 100%). There is no prozone effect for TT.

Non-treponemal tests (NTT): RPR

These tests detect antibodies directed against cardiolipid antigens. They are therefore less specific than the TT. However, they have the characteristic of being negative most often after treatment (serum concentration of these Ags decreasing) and are then only positive for active syphilis. A quantitative TNT result can therefore be useful to distinguish between active and cured syphilis and therefore to monitor the effectiveness of the treatment.

Ethical considerations

Before carrying out the study, we obtained agreement and consent from each student, confidentiality was respected throughout the data collection procedure and the results were used for strictly therapeutic and scientific purposes. Our study complied with the Helsinki Declaration on Ethical Principles for Medical Research Involving Humans of 1975 as amended in 2008.

RESULTS AND DISCUSSION

Application of the methodology research has leads to the following results in the form of tables interpreted, commented and discussed according to the data available from the literature.

Table 1: Sociodemographic characteristics of the 245 students subject to the study

Settings	Effective	Percentage
Sex		
Male	188	76.73
Feminine	57	23.26
Age groups		
17 – 25 years old	178	72.65
26 – 33 years old	44	17.95
34 – 41 years old	19	7.75
42 years and over	4	1.63
Knowledge of <i>Treponema pallidum</i>		
Yes	84	34.28
No	161	65.71
Source of information		
Radio	73	29.79
Television	147	60.00
Newspapers	4	1.63
Social networks	3	1.22
Schools	18	7.34
Transmission routes		
Sanguine	46	18.77
Sexual	183	74.69
Salivary	16	6.53
Risky practices		
Prostitution	182	74.28
Acupuncture	4	1.63

Piercing	35	14.28
Tattoo	24	7.79
Total	245	100

In this table, we see that male students are the most represented in this study with 188 students (76.73%) compared to 57 female students (35.71%) for a M/F sex ratio of 3.29 in favor of the male sex. This very high number of males compared to females reflects the representation of females in technical training institutions in the Republic of Guinea. Compared to the age groups of students, those between 17-25 years old are the most represented in this series with 178 students (72.65%) followed by 26 – 33 years old with 44 students (17.95%), 34-41 years old with 19 students (7.75%) and students aged 42 and over with 4 representatives (0.5%). In relation to knowledge of the bacteria (*Treponema pallidum* (Tp)), 84 students claimed to have knowledge of the bacteria, i.e. 34.28% compared to 161 students who claimed to have almost no knowledge of the bacteria (65.71%).

In relation to the sources of information, the majority of students surveyed claimed to have received information on Tp through television with 147 students (60%), followed by radio with 73 students (29.79%), at 'School with 18 students (7.34%), in newspapers with 4 students (1.63%) and social networks represented only 3 students with 1.22% in this study. Regarding the routes of transmission, the vast majority of students affirmed that it is the sexual route with 183 students, or 74.69%, by blood with 46 students (18.77%) and by saliva with 16 students (6.53%).

In relation to risky practices, the majority of students indexed Prostitution with 182 students, or 74.28%, followed by Piercing with 35 students (14.28%), Tattoo followed with 24 students (7.79%) and Acupuncture with 4 students (3.5%). Regarding knowledge of the hepatitis B vaccine, the majority of students claimed to have no knowledge of the hepatitis B virus vaccine with 135 students (67.5%) compared to 65 students who claimed to have knowledge of the hepatitis B vaccine. vaccine (1.63%).

Table 2: Results of syphilis diagnostic examinations among 245 students

Exams	Results				Total
	Positives	Percentage	Negatives	Percentage	
TPHA	11	4.49	234	95.51	245
RPR	9	3.67	236	96.33	245

The results of this table show that the TPHA treponemal test among the 245 students was positive in 11 students, or 4.49%. TPHA is more sensitive than RPR, but it can give false positive results in people with other diseases such as autoimmune ones. The RPR test (confirmatory test) was positive in 9 students compared to 11 cases for the TPHA test, or 3.67%.

Table 3: Distribution of students with syphilis according to sociodemographic parameters

Settings	Effective	Percentage
Sex		
Male	9	81.82
Feminine	2	18.18
Age groups		
17 – 25 years old	4	36.36
26 – 33 years old	6	54.55

34 – 41 years old	-	-
42 years and over	1	9.09
Marital status		
Married	3	27.27
Singles	8	72.73
Departments of belonging		
Techniques of Laboratory	4	36.36
Energy	2	18.18
Technology of the Equipment Biomedical	3	27.27
Design And Manufacturing Mechanical	2	18.18
Total	11	100

It appears from this table that of the 11 students suffering from syphilis, the male gender was the most represented with 9 cases, i.e. a prevalence of 81.82% compared to 2 cases for the female gender, i.e. 18.18% in this study. The high prevalence of males is random because both sexes are exposed in the same way to contamination by *Treponema pallidum*.

The age group of 26-33 years is the most represented with 6 cases, or 54.55%, followed by that of 17-25 with 4 cases, or 36.36% and that of 42 years and over with 1 case, or 9.09%. No cases were recorded in the 34-41 age group. The age groups of 34-41 years and those of 42 years and over represent the recycled students who are the least numerous at the Mamou Higher Institute of Technology. Singles are the most represented in this study with 8 cases, or 72.73% compared to 3 cases among Married people with 27.27%. The high prevalence of *Treponema pallidum* among single people could be explained not only by their greater representativeness within the student population but also their large number among the volunteers during the surveys. Students from the Technical Laboratory Departments and Technology of the Equipment Biomedical were the most represented with 36.36 and 27.27% respectively. They are followed by students from the Energy and Mechanical Design and Manufacturing Departments with each 18.18%.

It is important to emphasize that the majority of students enrolled in training programs are male, with approximately 80% representation. In general, few female students opt for Technical Sciences.

DISCUSSION

Our survey covered 245 students from all Departments of the Institute Superior of Technology of Mamou. The TPHA treponemal test recorded 11 student carriers, or 4.49% (Table 2).

The male gender was the most represented with a prevalence of 81.82% compared to 18.18% for the female gender (table 3). The age group of 26-33 is the most represented with 54.55% followed by that of 17-25 with 36.36% and that of 42 years and over with 9.09%. No cases were recorded in the 34-41 year age group (table 3).

Singles are the most represented in this study with 72.73% compared to 27.27% for Married people (table 3). Students from the Technical Laboratory Departments and Technology of the Equipment Biomedical were the most represented with 36.36 and 27.27% respectively. They are followed by students from the Energy and Mechanical Design and Manufacturing Departments with each 18.18% (table 3).

Our results are comparable to those of certain authors. On the knowledge of syphilis by Lallet DA students, in 2006 [13], in a study on syphilis among young people in schools in five localities in Mali, he reported that among the subjects questioned, only 14% knew about syphilis and are able to classify it as an STI. The modes of

transmission most cited by the latter are, in order of decreasing frequency: sexual (96.2%); injury by soiled object (87.9%); blood transfusion (83.4%); vertical (72.2%) and parenteral (22.5%).

The condom constitutes the most often cited method of prevention, known to 79.6% of subjects; followed by fidelity: 13.5% and abstinence: 6.7%. CISSE H [14] (2) in a study on the knowledge and attitudes of young people in school regarding STIs/AIDS found that 44.8% knew at least one STI. This rate, which is higher than the one we found, is explained by the fact that it takes into account all schoolchildren capable of mentioning at least one STI. Here too, the most cited mode of transmission is sexual transmission, known by 99.5%, which is similar to the result we found. On the other hand, at CAMARA M [15], sexual transmission is only cited by 77.3% of subjects, and only 31.8% cite the condom as a method of prevention. Lallet's studies, in 2006 [13], the age group of 19 to 22 was the one in which the prevalence of syphilis was the highest, i.e. 0.90%. Schoolchildren in this age group represented 50% (4/8) of all positive cases found during this study. On the other hand, among those who were aged < 19 or > 22 years, we found a lower prevalence, i.e. 0.57% in each of the two groups. This predominance of subjects aged 19 to 22 was explained by the fact that they constituted among young schoolchildren, the most sexually active age group. The difference thus observed compared to the BW results was highly significant within its population, with a value of $p=10^{-6}$. IDRISSE M [16] in his study found a fairly similar result, with 21.3% of subjects suffering from syphilis aged 15 to 20 years. According to data published by the WHO, syphilis is more common in the age group of 15 to 29 years [17].

CONCLUSION

At the end of this study on the prevalence of *Treponema pallidum* within the population student of the Institute Superior of Technology of Mamou, the results showed that out of a total of 245 students sampled, 11 were positive for TPHA or 4.49% against 234 negative for TPHA or 95.51%.

The age group of 26-33 is the most affected with 6 positive cases, or 54.55%. Singles were not only the most represented but also the most affected by *Treponema pallidum* with a prevalence of 72.73%. The low level of knowledge of students on *Treponema pallidum*, particularly on prevention, routes of contamination and risky practices, reflects the situation of knowledge of *Treponema pallidum* in all Higher Education Institutions in the Republic of Guinea. Syphilis could cause serious consequences in humans ranging from sterility to damage to the nervous system and can lead to the death of the sick subject. The introduction of studies on sexually transmitted infections (STIs) into school curricula could promote a better level of knowledge among students about the disease syphilis. In short, this study on the epidemiology and prevalence of *Treponema pallidum* within the student population of the Mamou Higher Institute of Technology is part of the awareness campaign and voluntary screening for syphilis in training structures. in the Republic of Guinea.

Conflicts of interest : none.

AUTHOR CONTRIBUTIONS

All authors contributed to the completion of this study. They read and approved the final version of the manuscript.

Thanks: The authors thank the managers and technicians of the Biology laboratories of the ISTM and those of Microbiology of the Gamal Abdel Nasser University of Conakry, for their support in carrying out this study.

REFERENCES

- Berrayah, S and Berrezak, H. (2016). Prevalence of Syphilis among applicants for syphilitic serology at the Tlemcen University Hospital laboratory. Final dissertation: Pharmacy. Tlemcen: Abou Bekr University Belkaid, 73 p. (Page consulted on) URL: <http://dspace.univ-tlemcen.dz/bitstream/112/9279/1/Prevalence-de-la-Syphilis-chez-les-demandeurs-de-la-serologie-syphilitique-au-laboratoire-du-CHU-Tlemcen.pdf>;
- Lahmar, N and Boudefa, A. (2021). Chlamydia trachomatis and mycoplasmas in genital infections and their implication in couple infertility. Retrospective study carried out based on data taken from the Ibn-Sina laboratory in Constantine. Final dissertation: General Microbiology and Molecular Biology of Microorganisms. Constantine: University of the Mentouri Brothers Constantine, 34p (Page consulted on) URL: <file:///C:/Users/acer/Downloads/lahmer%20et%20boudafa.pdf>;
- Zeroual, W. (2014). Epidemiological profile of serological markers of syphilis in cases diagnosed at the Ibn Sina University Hospital in Rabat. Doctoral thesis : Medicine and Pharmacy. Rabat: University of Mohamed V, 74 p. URL: <file:///C:/Users/hamza/Downloads/P%2023%202014.pdf> ;
- Tsuboi M, Evans J, Davies EP, Rowley J, Korenromp EL, Clayton T, Taylor MM, Mabey D, Chico RM. Prevalence of syphilis among men who have sex with men: a global systematic review and meta-analysis from 2000-20. Lancet Global Health. 2021 Aug;9(8):e1110-e1118. doi : 10.1016/S2214-109X(21)00221-7. Epub 2021 Jul 8. PMID: 34246332; : PMC9150735 ;
- Nizard J, Benoist G. Syphilis and pregnancy. Journal of Gynecology Obstetrics and Reproductive Biology. 2008;37:29-33 ;
- Khalil G. Ghanem, " The Modern Epidemic of Syphilis ," The New England Journal of Medicine , vol. 382, no . 9, February 27, 2020, p. 845-854;
- Public Health Agency of Canada. Report on Surveillance of Sexually Transmitted Infections in Canada, 2019. Government of Canada. 2021;
- News [archive]", on santepubliquefrance.fr (accessed November 1, 2021);
- Epidemiology of syphilis <https://reef recovery.org/fr/epid%3%a9miologie-de-la-syphilis/> December 10, 2021 ;
- Andriamahenina R., Ravelojaona B., Rarivoharilala C., Andriamiadana J., Andriamahefazy B., May J., Behets F., Rasamindrakotroka A., 2015. AIDS In Madagascar; 3 P;
- Janier M. Diagnostic and therapeutic recommendations for sexually transmitted diseases. Annals of Dermatology and Venereology. 2016; 143: 701-2;
- WHO, 2020. Syphilis in Guinea: <https://www.worldlifeexpectancy.com/fr/guinea-syphilis/> ;
- Dédé André Lallet (2006): Syphilis among young people in schools in five localities in Mali. Medicine thesis;
- CISSE H. Comparative study of the practical knowledge and attitudes of school and non-school adolescents regarding STIs/AIDS and their sexual behavior in the commune of Sikasso. Medical thesis Bamako 2002;
- CAMARA M. Young schoolchildren facing sexuality. Medicine thesis Bamako 1999 no. 90;
- IDRISSE M. Contribution to the study of the prevalence of syphilis among populations attending health structures in Bamako. Pharmacy thesis Bamako 1989 no. 23;
- TRAORE T. Prevalence of syphilis in the psychiatry department of Point G hospital. Pharmacy thesis Bamako, 1983 no. 4.