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Coronavirus Pandemic

Ten-year retrospective cross-sectional trends in syphilis serology in a tertiary care hospital, Türkiye: impact of the COVID-19 pandemic

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Abstract

Introduction: Syphilis remains an important public health concern worldwide. This study aimed to evaluate ten-year trends in syphilis serology test requests and seropositivity rates at Muğla Training and Research Hospital, with particular emphasis on the impact of the COVID-19 pandemic.

Methodology: This retrospective study included all patients tested for syphilis between 2014 and 2023. Extracted data comprised age, requesting department, anti-Treponema pallidum antibody results, and Venereal Disease Research Laboratory (VDRL) or Rapid Plasma Reagin (RPR) findings. Analyses were performed at the patient level, and repeated test requests from the same individual were excluded. A case was considered positive when both treponemal and non-treponemal assays were reactive.

Results: Annual test requests varied over the decade, ranging from 1,334 in 2018 to 3,331 in 2023. Testing declined sharply during the COVID-19 pandemic, then increased substantially. Most test requests originated from obstetrics/gynecology and infectious diseases; however, positivity rates were highest in infectious diseases and dermatology. Overall seropositivity ranged from 0.2–1.4 percent before the pandemic and increased to 3–4.3 percent in the post-pandemic period.

Conclusions: Positivity remained low among obstetric patients despite high test volumes, whereas infectious diseases and dermatology services demonstrated a clear rise in syphilis positivity after the pandemic. These findings highlight a resurgence of syphilis and underscore the need for continued surveillance, targeted screening strategies, and strengthened sexual health services.

Key words: COVID-19; epidemiology; rapid plasma reagin; RPR; serologic tests; syphilis; venereal disease research laboratory test; VDRL.

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Introduction

Syphilis, caused by *Treponema pallidum*, is a sexually transmitted infection with diverse clinical manifestations depending on disease stage. While early stages may present with genital ulcers or rash, latent infection is typically asymptomatic, and late-stage disease can result in severe cardiovascular and neurological complications [1].

Diagnosis is based on the combined use of treponemal and non-treponemal tests, such as the Venereal Disease Research Laboratory (VDRL) and Rapid Plasma Reagin (RPR) assays, which are essential for disease staging and treatment monitoring [2]. In recent years, a resurgence of syphilis has been reported worldwide, potentially associated with changes in sexual behavior, reduced condom use, and gaps in access to healthcare and screening services [3]. The COVID-19 pandemic further influenced these trends by reducing access to healthcare services, leading to temporary declines in testing and subsequent increases in positivity rates in many settings [4-6].

Recent studies from Türkiye have emphasized the diagnostic value of using both traditional and reverse algorithms in parallel [7]. Furthermore, global burden analyses predict that, unless prevention and screening strategies are reinforced, the incidence and prevalence of syphilis will continue to rise [8,9].

This study aimed to retrospectively evaluate syphilis serology test results performed at Muğla Training and Research Hospital over the past decade, focusing on annual testing trends, departmental distributions, and the impact of the COVID-19 pandemic.

Methodology

Study Design

This retrospective study evaluated all syphilis serology tests performed at a tertiary training and research hospital between January 1, 2014, and December 31, 2023. Data were retrieved from the hospital laboratory information system. Test results included treponemal (anti-*Treponema pallidum* antibody) and non-treponemal assays [Venereal Disease Research Laboratory (VDRL) and Rapid

Plasma Reagin (RPR)]. Syphilis diagnosis was based on the combined interpretation of treponemal and non-treponemal test results, in accordance with standard diagnostic algorithms. Results were categorized by year and by the requesting clinical department.

Test requests were initially identified using predefined keywords. Subsequently, patient-level records were generated, and individuals with multiple test requests were reviewed. Repeated test requests from the same individual were treated as follow-up tests and excluded from the analysis to ensure that each patient was represented only once in the dataset. Serological evaluation was performed according to standard diagnostic criteria. Active infection was defined by laboratory findings as concurrent reactivity to both treponemal and non-treponemal tests. Cases without serological positivity were excluded from the study. Accordingly, non-treponemal tests performed solely for follow-up purposes were excluded from the analysis to avoid potential misclassification. Apart from age, sex, and the requesting department, no additional demographic or clinical data (such as MSM status or HIV infection) were available. Confirmatory molecular analyses (e.g., PCR) were not routinely performed and were therefore not included in the study.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 25 (IBM Corp., Armonk, NY, USA). Categorical variables were summarized as frequencies and percentages. Temporal trends in test requests, newly diagnosed cases, and seropositivity rates were descriptively evaluated using Spearman's rank correlation to assess monotonic changes over time. Linear regression analysis was additionally applied for exploratory purposes to support the description of temporal patterns. Correlation strength was interpreted according to Spearman's ρ values, and statistical significance was set at a two-tailed $p < 0.05$. The analyses were primarily descriptive, and findings related to changes across pre-pandemic, pandemic, and post-pandemic periods were interpreted with caution.

Ethics Approval

This study was approved by the Muğla Sıtkı Koçman University Ethics Committee for Medical Sciences (Protocol No: 240112; Decision No: 61; Date: May 27, 2024). The committee confirmed that the study was ethically appropriate, provided that the declared data forms are not used beyond their stated scope. All procedures were conducted in accordance with the principles of the Declaration of Helsinki.

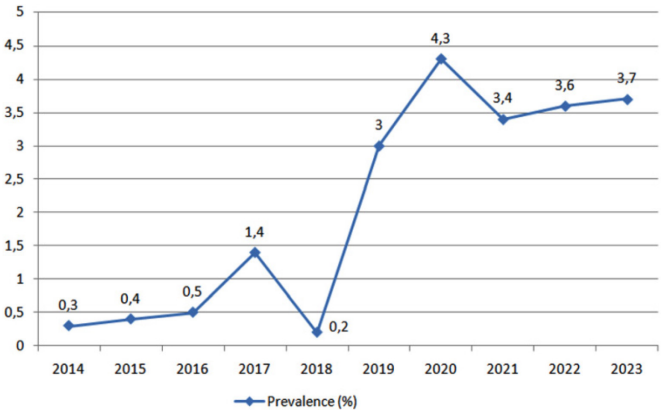
Results

Between 2014 and 2023, syphilis serology testing at Muğla Training and Research Hospital showed notable variations in testing frequency, patient demographics, seropositivity rates, and departmental distribution (Figures 1–4).

The annual mean age of patients who underwent syphilis serology testing showed a gradual increase with minor fluctuations. The mean age rose from 36.8 years in 2014 to 45.0 years in 2019, then declined to 41.0 years in 2021. In subsequent years, values ranged between 40.0 and 44.0 years, suggesting a gradual shift toward testing in older age groups. Statistical analysis revealed a significant positive correlation between year and mean age (Spearman $\rho = 0.82$, $p = 0.003$; linear regression $R^2 = 0.63$, $p = 0.01$), suggesting a consistent upward trend in the mean age of tested patients throughout the decade. The annual number of syphilis serology test requests fluctuated markedly, with a slight upward trend toward the end of the study period. Requests increased from 1,663 in 2014 to 2,318 in 2017, followed by a temporary decline in 2018 (1,334). Between 2019 and 2022, values remained relatively stable, ranging from 1,346 to 1,830 per year. A sharp increase was observed in 2023, reaching 3,331 requests—the highest annual figure recorded. Although the correlation between year and the number of test requests was not statistically significant (Spearman $\rho = 0.07$, $p = 0.855$; linear regression $R^2 = 0.06$, $p = 0.507$), the overall pattern suggested a gradual rise in testing activity over time.

The syphilis seropositivity increased markedly, particularly after 2018. The seropositivity remained below 1% between 2014 and 2016, then rose to 1.4% in 2017 (n = 34). A temporary decline occurred in 2018 (0.2%), followed by a sharp increase to 3.0% in 2019 (n = 50) and a peak of 4.3% in 2020 (n = 59). In the

Figure 1. Annual prevalence of patients diagnosed with syphilis from 2014 to 2023.

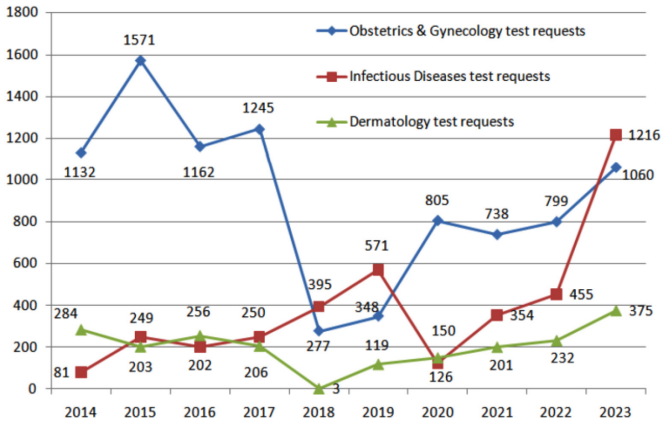


following years, rates stabilized around 3–4%, reaching 3.7% in 2023 (n = 124). Statistical analysis demonstrated a strong and significant positive correlation between year and seropositivity (Spearman $\rho = 0.93$, $p < 0.001$; linear regression $R^2 = 0.80$, $p < 0.001$), suggesting an increase in seropositivity during the study period (Figure 1).

Syphilis serology test requests originated mainly from the Departments of Obstetrics & Gynecology, Infectious Diseases, and Dermatology, with notable temporal shifts in their relative contributions. Obstetrics & Gynecology dominated the early years, accounting for most requests until 2018, after which requests declined sharply (from 1,245 in 2017 to 277 in 2018). In contrast, requests from Infectious Diseases increased significantly over time, rising from 395 in 2018 to 1,216 in 2023 (Spearman $\rho = 0.71$, $p = 0.022$; $R^2 = 0.47$). Dermatology exhibited minor, non-significant fluctuations (Spearman $\rho = -0.03$, $p = 0.934$; $R^2 = 0.02$), whereas Obstetrics & Gynecology showed a gradual but non-significant decrease (Spearman $\rho = -0.53$, $p = 0.117$; $R^2 = 0.19$). Overall, these findings suggest a shift in testing demand from obstetric to infectious disease services, reflecting evolving clinical testing priorities and referral dynamics (Figure 2). These patterns may also be influenced by variations in testing volume across departments.

In the Infectious Diseases Department, seropositivity values increased markedly after 2018, rising from 0.75% to a peak of 12.6% in 2020 (n = 56). Thereafter, the rates remained relatively stable around 10%, reaching 7.31% in 2023. Statistical analysis revealed a significant positive correlation between year and seropositivity (Spearman $\rho = 0.64$, $p = 0.048$; linear regression $R^2 = 0.55$), suggesting an upward trend throughout the study period. In the Dermatology

Figure 2. Annual distribution of syphilis serology test requests by clinical departments (Obstetrics and Gynecology, Infectious Diseases, and Dermatology) from 2014 to 2023.



Department, seropositivity rates also rose substantially over time. The seropositivity remained below 2% until 2019, then increased sharply to 11.33% in 2020 and 8.95% in 2021 (n = 18), before stabilizing between 3.4% and 4.8% in subsequent years. A strong positive correlation was found between year and prevalence (Spearman $\rho = 0.78$, $p = 0.008$; $R^2 = 0.40$), suggesting a long-term increase in syphilis positivity among dermatology patients (Figure 3).

In the Obstetrics & Gynecology Department, the prevalence of syphilis seropositivity remained consistently low throughout the decade. Positivity rates ranged between 0.09% and 0.48% during 2014–2017, with no positive cases detected from 2018 to 2021**(**n = 0**)**, followed by minimal increases in 2022 (0.37%) and 2023 (0.18%). Statistical analysis revealed no significant correlation between year and seropositivity (Spearman $\rho = -0.12$, $p = 0.744$; linear regression $R^2 = 0.01$), suggesting consistently low seropositivity rates throughout the study period (Figure 4).

Figure 3. Annual number of syphilis prevalence (%) by clinical departments (Infectious Diseases and Dermatology), 2014 to 2023.

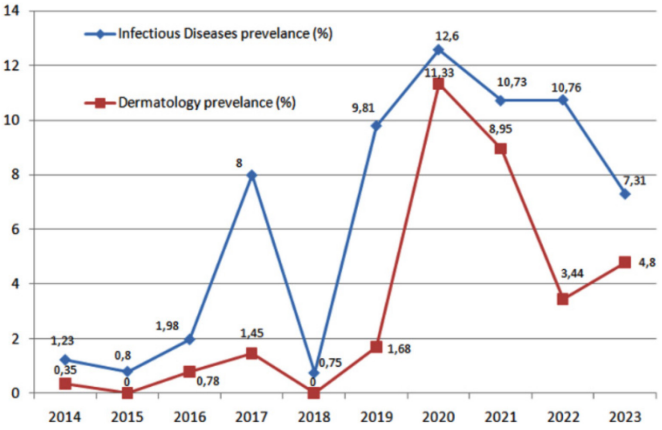
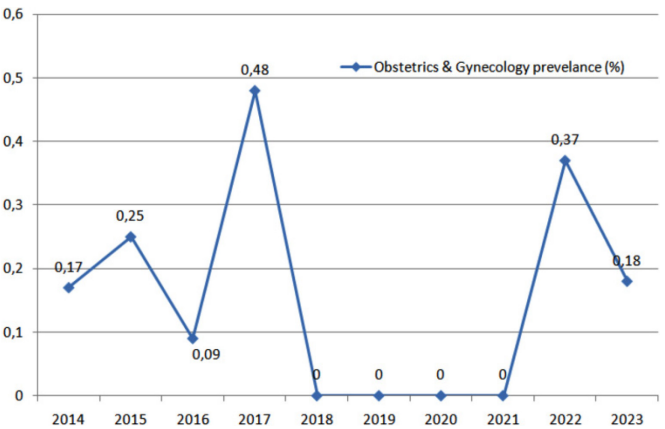


Figure 4. Annual number of syphilis prevalence (%) Obstetrics and Gynecology, 2014 to 2023.



Discussion

The mean age of patients tested for syphilis in our study gradually increased from 36.8 years in 2014 to 45.0 years in 2019, stabilizing around 40–44 years thereafter. During the same decade, the number of test requests fluctuated but rose sharply in 2023, while the distribution of departmental requests shifted notably from predominance in Obstetrics & Gynecology to a growing share from Infectious Diseases after 2018. These patterns appear to be similar to European surveillance data, which show that syphilis notification rates doubled between 2014 and 2023, increased by 13% from 2022 to 2023, and are now largely concentrated among men aged 25–34 years (43 per 100,000) [10]. The gradual shift toward older test recipients and the rising contribution from Infectious Diseases services in our center may therefore reflect broader screening coverage among middle-aged adults and changing referral practices rather than true alterations in transmission dynamics.

Hospital-wide syphilis seropositivity increased notably after 2018, peaking at 4.3% in 2020 and stabilizing around 3–4% thereafter. Globally, the World Health Organization estimated 8 million new adult infections in 2022 and reported that maternal and congenital syphilis continue to rise, particularly in low- and middle-income regions [11]. Similarly, the Pan American Health Organization documented a 30% increase in new infections across the Americas between 2020 and 2022 [12]. These findings indicate that the increase observed in our cohort may reflects a broader global resurgence of syphilis, likely driven by post-pandemic behavioral and healthcare access changes. These findings should be interpreted with consideration of testing volume, as variations in the number of test requests across departments may influence overall seropositivity rates. Therefore, changes in positivity rates may partially reflect shifts in testing patterns rather than true changes in disease prevalence.

A clear shift in testing demand from Obstetrics & Gynecology to Infectious Diseases was evident throughout the decade. This mirrors the changing epidemiology observed in Europe, where most new cases occur among men who have sex with men (MSM), and the male-to-female ratio remains approximately 7:1 [10]. Recent multicenter data show that MSM with syphilis frequently present with HIV co-infection, reaching 26% in European cohorts [13]. According to the CDC *Sexually Transmitted Infections Surveillance, 2024 (Provisional)* report (published September 24, 2025), men who have sex with men (MSM) accounted for approximately one-third of all primary and secondary syphilis cases in the United States, consistent with previous years [14]. In Türkiye, Merdan *et al.* (2025) found a 33.4% syphilis seropositivity rate among people living with HIV (PLWH), confirming the elevated burden in this group [15]. These findings may suggest that the increased number of Infectious Diseases requests in our center likely reflects focused screening efforts among high-risk populations, particularly MSM and PLWH, as well as the closer integration of HIV and STI services in recent years.

In the Dermatology department, the prevalence of syphilis positivity increased sharply during 2020–2021 before stabilizing at 3–5%. This pattern appears to be consistent with recent reports highlighting the re-emergence of syphilis in dermatology clinics and emphasizing dermatologists' role in recognizing atypical cutaneous, ocular, and neurologic manifestations [16,17]. Such fluctuations may also reflect diagnostic delays during the COVID-19 pandemic, followed by compensatory increases in post-pandemic testing.

The seropositivity in the Infectious Diseases department followed a similar trajectory, rising from below 1% before 2018 to over 10% in recent years. This trend appears to be consistent with the global resurgence of syphilis among MSM, where pooled prevalence rates have reached approximately 10% in meta-analyses [18], and with Turkish cohorts of PLWH reporting seropositivity rates between 19% and 25% [15,19]. The sustained increase in our center may be associated with intensified testing in high-risk clinical populations, rather than a true expansion of the epidemic into the general population.

Conversely, seropositivity among obstetric patients remained consistently low throughout the study period. Although this may indicate effective antenatal screening, it does not eliminate the risk of adverse pregnancy outcomes. European and global surveillance data continue to document congenital syphilis despite established screening programs [11,20]. Recent studies confirmed that untreated maternal syphilis remains associated with high rates of fetal loss, stillbirth, and neonatal complications, underscoring the importance of maintaining universal antenatal testing and timely treatment [21,22]. These findings should be interpreted with consideration that the purpose of syphilis testing may vary across clinical departments. In obstetrics, testing is primarily performed as part of routine antenatal screening, whereas in dermatology and infectious diseases clinics, testing is more often guided by clinical evaluation. This may suggest that

differences in seropositivity rates between departments could, at least in part, be related to variations in testing indications rather than solely reflecting differences in underlying disease burden.

In summary, our findings suggest that syphilis testing and seropositivity have increased over the past decade, consistent with global and regional data. Departmental variations mirror underlying epidemiologic and behavioral patterns, with infections increasingly concentrated among MSM and PLWH, and diagnostic rebounds following the COVID-19 pandemic. Continuous surveillance, targeted prevention, and integration of sexual health and antenatal care remain essential to curb the ongoing resurgence of syphilis [10,14].

Conclusions

In conclusion, syphilis testing and seropositivity at our center have increased substantially over the past decade, mirroring global and regional surveillance trends. The observed departmental shifts, particularly the growing contribution from Infectious Diseases and Dermatology, may reflect targeted screening among high-risk populations such as MSM and people living with HIV, as well as improved integration of HIV and STI services. While seropositivity among obstetric patients remains low, the persistent occurrence of congenital syphilis worldwide underscores the need to maintain universal antenatal screening and timely treatment. Together, these findings highlight the importance of sustained national surveillance, strengthened sexual health programs, and the reinforcement of preventive strategies to curb the ongoing resurgence of syphilis.

Strengths and Limitations

This study provides one of the most comprehensive overviews of syphilis testing and seropositivity trends from a large tertiary hospital in Türkiye, covering an entire decade (2014–2023). The inclusion of all clinical departments enabled identification of departmental shifts in testing demand and seropositivity, providing insight into changing epidemiological and referral patterns. By linking institutional data to international surveillance reports from the ECDC, WHO, PAHO, and CDC, the study places local trends within a robust global context.

However, the retrospective design limits the ability to infer causal relationships between behavioral changes and observed trends. Data were obtained from laboratory records without detailed demographic, behavioral, or clinical variables, preventing stratification by risk group or confirmation of reinfections.

Additionally, quantitative titer data for non-treponemal tests were unavailable, limiting the ability to assess disease activity and treatment response. Although efforts were made to exclude repeated test requests from the same individual, residual duplication cannot be entirely ruled out. Furthermore, as the study was conducted in a single center, the findings may not fully represent regional or national dynamics. In addition**,** variations in testing volume across departments may have influenced observed seropositivity rates. Despite these limitations, the long observation period and comprehensive departmental coverage support the overall consistency of the findings.

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Data Availability Statement

The datasets generated and analyzed during the current study are not publicly available due to institutional restrictions but are available from the corresponding author on reasonable request.

Authors contributions

Conceptualization: Veysel Akca, Turhan Togan; Methodology: Veysel Akca; Data curation: Veysel Akca; Formal analysis: Veysel Akca; Writing – original draft preparation: Veysel Akca; Writing – review and editing: Veysel Akca, Turhan Togan.

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Conflict of interest

No conflict of interest is declared.

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