



Forecasting Lice Infestation Trends in Iran: Impact of COVID-19 and Future Projections

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Received: 4 Jul 2025

Accepted: 21 Jul 2025

Citation to this article

Jafarzadeh Esfehani R, Aelami MH. Forecasting Lice Infestation Trends in Iran: Impact of COVID-19 and Future Projections. *J Iran Med Council.* 2026;9(3):776-80.

Abstract

Background: Lice infestation is a global public health issue, particularly among children, with the COVID-19 pandemic potentially altering its trends. This study assessed the pandemic's impact on lice-related search activity in Iran and forecasted future trends using Google Trends data.

Methods: While Google Trends has been used for other health conditions, this is the first study to apply this methodology to lice-related searches in Iran, capturing unique regional pandemic impacts.

Results: Analyzing Persian search terms (2014–2024), a time-series analysis compared unadjusted and seasonally adjusted models. The seasonally adjusted model outperformed the unadjusted one, with higher stationary R-squared (0.846 vs. 0.669), lower MAPE (1.624 vs. 9.189), and reduced BIC (0.032 vs. 3.676). It predicted a 7.7% increase in lice-related searches from November 2024 to November 2026.

Conclusion: These findings support using digital data for lice surveillance and underscore the need for context-specific public health strategies.

Keywords: Lice infestations, Parasitic diseases, SARS-CoV-2

Introduction

Lice infection, or pediculosis, is an ectoparasitic infestation that remains a significant public health concern globally (1). The condition is caused by blood-feeding lice that live on the human scalp, body, or pubic areas. Head lice are most commonly found in children, especially those in environments where close physical contact and shared personal items are common, such as schools and daycare centers (2). The epidemiology of lice infestations varies significantly by region and socioeconomic conditions and the persistence of lice globally highlights the need for ongoing surveillance, effective treatment protocols, and preventive education in high-risk communities.

The prevalence of lice infestations varies widely by region and socioeconomic status, making it essential for communities, particularly high-risk groups, to implement ongoing surveillance, treatment protocols, and educational initiatives (3). In Iran, lice infestation has been a persistent public health issue, with varying prevalence rates across different regions. Additionally, regions with higher population density tend to have higher infestation rates. These regional disparities highlight the need for targeted interventions and ongoing surveillance to address lice infestations effectively (4). It has been reported that head lice affect approximately 7.6% of schoolchildren in Iran (5). In western Iran, the problem is slightly more common, with 10.5% of students affected. Interestingly, nomadic students have the highest rates at 23.8%, compared to 12.4% in rural areas and 6.5% in urban areas (6).

Recent studies have highlighted efforts to monitor and control lice outbreaks, particularly through preventive measures in schools and households (7,8). However, the COVID-19 pandemic led to significant disruptions worldwide, affecting many public health trends, including lice infestations. Factors such as school closures, social distancing, and improved hygiene practices may have reduced the spread of lice. This led the authors to hypothesize that the pandemic could have had a measurable impact on lice infestation trends in Iran (9,10). While the impact of COVID-19 on various public health issues has been widely studied, its effect on lice infestation trends remains under-researched, particularly in the context of Iran. This study aims to fill this gap by analyzing

Google Trends data to evaluate how the pandemic influenced lice-related search activity and to forecast future trends.

Google Trends is one of the online tools that has previously been used to evaluate public reactions to specific medical conditions and it was decided to use this online tool to assess the hypothesis about the effect of pandemic on reducing the lice related search terms.

Materials and Methods

This study is a time-series analysis using Google Trends data to evaluate the impact of the COVID-19 pandemic on lice-related search activity in Iran. The findings presented here are based on the analysis of Google Trends data, reflecting the search behavior of the Iranian population, rather than a literature review. The study started by analyzing the trends in search terms related to lice infestations using Google Trends data from 2014-2024. Specifically, the authors focused on the Persian term for lice infestation and performed a time-series analysis to track search volume over this ten-year period. In order to evaluate the lice infestation trend in Iran, a time-series analysis was utilized to examine trends in lice infestation and forecast future patterns from 2024 to 2026. Data for the analysis was collected over a specified period (2014-2024), tracking the monthly search rate and search results were retrieved similar to the previous reports on using Google trends data (11,12).

Statistical analysis was conducted in SPSS software (version 22) to generate predictive models for infestation trends. In order to evaluate the trend, two models were created: an unadjusted model and a seasonally adjusted model, the latter incorporating seasonal decomposition to account for cyclical variation within each year. The unadjusted and seasonally adjusted models were created using SPSS's Exponential Smoothing feature. The unadjusted model provided a straightforward analysis of the trend component without seasonal adjustments. In contrast, the other model employed seasonal decomposition with a multiplicative error term, capturing both trend and seasonal patterns (Figure 1). Model performance was compared based on stationary R-squared, R-squared, Mean Absolute Percentage Error (MAPE), and Bayesian Information

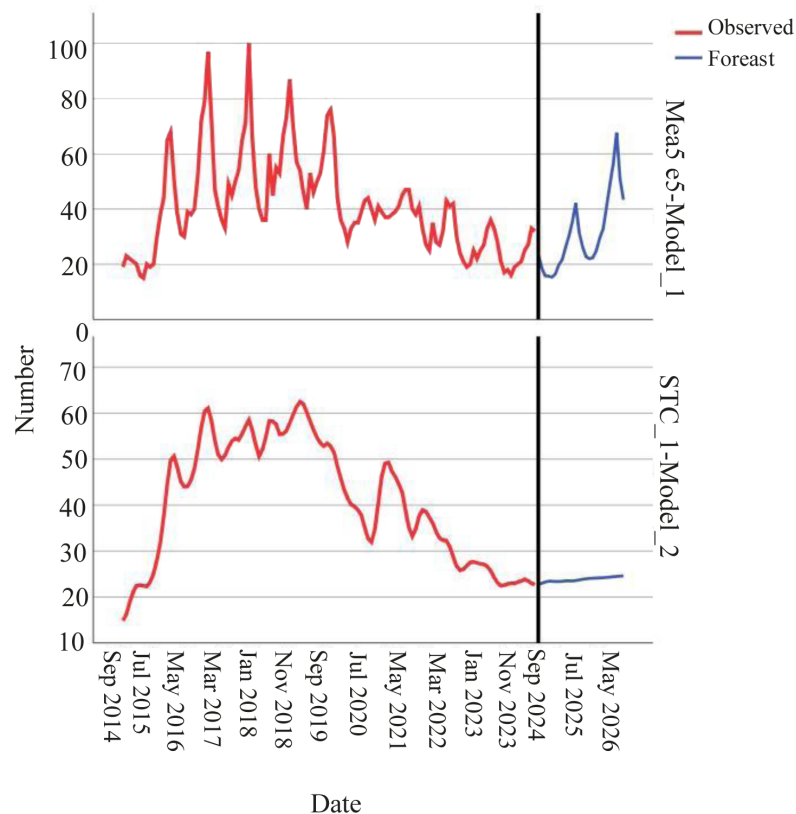


Figure 1. Time trend models.

Top model is unadjusted and the bottom model is adjusted for seasonal changes.

Criterion (BIC), prioritizing the model that showed the highest fit statistics and lowest forecast error.

Results

The seasonally adjusted model proved to be the more reliable of the two, offering better predictive power and a lower error rate. This model showed a significantly higher R-squared value (0.995) compared to the unadjusted model (0.901), and it achieved a far lower MAPE (1.624 vs. 9.189). Furthermore, the adjusted model had a normalized BIC of 0.032, indicating it was the better fit when accounting for model complexity. Despite some residual autocorrelation, seasonally adjusted model was the preferred model for forecasting future lice infestation trends due to its superior fit, predictive power, and lower error values. According to this model, Iran may face 7.7% increase in lice infestation related search terms from November 2024 to November 2026. This forecast reflects projected search activity, not direct infestation rates, serving as an indicator of public health engagement.

Discussion

While studies have used Google Trends for diseases like influenza, this work is the first to analyze lice-related searches in Iran's unique sociocultural context during the pandemic. Google Trends has become a valuable tool in public health research, helping experts track disease patterns and gauge public interest in health-related topics. It has been particularly useful for monitoring outbreaks such as influenza and COVID-19, and even predicting future trends based on what people search for online (13,14). For instance, its effectiveness was previously shown in tracking hepatitis-related searches, providing insights into public awareness and disease trends (12). Similarly, it was demonstrated how Google Trends can be used to monitor public interest in health issues during the COVID-19 pandemic, offering real-time data to support public health responses (15). This study adds to that evidence, showing how Google Trends could also be used to track lice infestations and inform strategies to address public health concerns.

The findings of this study align with observations from other countries, where the COVID-19 pandemic led to a temporary reduction in lice infestations due to school closures, social distancing, and improved hygiene practices. For example, a study in Argentina, reported a significant decrease in head lice infestations during the lockdown period, with a gradual return to pre-pandemic levels as restrictions eased (16). Similarly, in Poland, a study found that the prevalence of head lice among schoolchildren declined during the pandemic but began to rise again as schools reopened (10). Surveys conducted in schools around Cambridge, UK, revealed significantly lower infestation rates during the pandemic, especially in city schools, compared to pre-pandemic levels. Interestingly, since schools resumed normal operations in 2022–23, infestation rates have risen only gradually, contrary to expectations (17). These studies collectively support the current study's findings, which show a slow increase in lice-related search activity in Iran following the resumption of normal school operations, highlighting the global impact of the pandemic on lice infestation trends. The forecast of a 7.7% search activity increase

reflects anticipated information-seeking behavior, not necessarily a proportional rise in infestations.

Conclusion

While search trends correlate with public health engagement, they may be amplified by non-biological factors like media attention or educational campaigns. Future monitoring and improved public health efforts will be the key to managing lice in Iran and ensuring that preventive measures continue to be effective. Moreover, the results highlight the role of digital health data in guiding resource allocation and planning. Search data can supplement traditional surveillance but requires integration with demographic and environmental factors for actionable insights. Future studies could benefit from integrating search data with other variables, such as environmental factors, school attendance rates, and treatment availability, to enhance predictive accuracy and address the underlying causes of infestation trends.

Conflict of Interest

Authors declare no conflict of interest.

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