EPIDEMIOLOGICAL TRENDS OF MEASLES AMONG CHILDREN AND EVALUATION OF THE EFFECTIVENESS OF PREVENTIVE MEASURES

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Introduction

Measles remains one of the most contagious and socially significant viral infections of childhood, continuing to pose a serious public health challenge despite the availability of effective vaccines. According to the World Health Organization (WHO), recent years have witnessed a resurgence of measles cases in various regions of the world, including areas that previously maintained stable epidemiological control. The resurgence is largely attributed to declining herd immunity, insufficient vaccination coverage, and delays in the timely implementation of routine immunization and revaccination programs.

The growing incidence of measles among young children who lack post-vaccination immunity, as well as among adolescents whose immunity has waned over time, highlights weaknesses in existing immunization systems. Contributing factors such as population migration, urbanization, high population density, and the spread of anti-vaccination sentiments further exacerbate the risk of outbreaks.

Given these challenges, analyzing the epidemiological trends of measles among children is of paramount importance for understanding current transmission dynamics and assessing the effectiveness of ongoing preventive measures. A comprehensive evaluation of national immunization programs enables the identification of critical gaps in disease control strategies and supports evidence-based recommendations for improving vaccination coverage.

The findings of such research are essential to achieving the strategic goal of complete measles elimination in accordance with the global measles eradication initiatives led by the World Health Organization. This study, therefore, provides a scientifically grounded basis for strengthening public health interventions aimed at sustaining population immunity and ensuring the long-term epidemiological stability of measles among children.

Purpose of the Study

The main purpose of this study is to comprehensively analyze the epidemiological trends of measles among children and to scientifically evaluate the effectiveness of current preventive measures within existing immunization programs. The research aims to identify the key determinants influencing measles incidence in pediatric populations, including vaccination coverage, timeliness of immunization, population mobility, and socio-demographic factors that contribute to the persistence of measles transmission.

Furthermore, the study seeks to assess the level of herd immunity and to determine the relationship between immunization gaps and the occurrence of localized outbreaks. By applying epidemiological and statistical methods, the research intends to evaluate the efficiency of vaccination strategies and their alignment with international standards and WHO recommendations.

The ultimate goal is to develop scientifically grounded recommendations for optimizing national immunization programs, improving vaccination coverage, and enhancing public health surveillance systems. Achieving these objectives will contribute to the sustainable reduction of measles morbidity among children and support global efforts aimed at the complete elimination of measles as a public health threat.

Materials and Methods

This study was conducted using a descriptive and analytical epidemiological design to evaluate the incidence, distribution, and determinants of measles among children. The research was based on retrospective and prospective data collected from pediatric healthcare institutions, regional sanitary-epidemiological centers, and national immunization registries. Statistical data covering a period of the last 5–10 years were analyzed to identify temporal and spatial trends in measles morbidity.

The target population included children aged 0–14 years, stratified into age-specific subgroups to assess differences in susceptibility, vaccination coverage, and immune status. Inclusion criteria comprised all laboratory-confirmed and clinically diagnosed cases of measles within the study period, while exclusion criteria eliminated unverified or incomplete records.

Data sources included official epidemiological surveillance reports, vaccination records, and laboratory confirmation of measles virus infection using enzyme-linked immunosorbent assay (ELISA) and polymerase chain reaction (PCR) methods. Demographic and clinical data were extracted from medical records to assess the relationship between vaccination status, age, and disease severity.

For statistical analysis, descriptive statistics (mean, standard deviation, frequency distribution) and inferential methods (Chi-square test, Student's t-test, and logistic regression analysis) were employed to determine associations between epidemiological factors and measles incidence. The reliability of the results was ensured by applying a 95% confidence interval ($p < 0.05$). Data processing and visualization were performed using **SPSS (version 26.0)** and **Microsoft Excel 2021**.

Ethical approval for this research was obtained from the institutional review board, and all data were anonymized to ensure confidentiality in accordance with international ethical standards for epidemiological research.

Results and Discussion

The analysis of epidemiological data revealed a clear downward trend in measles incidence following the implementation of expanded immunization programs; however, periodic fluctuations were observed due to variations in vaccination coverage and population mobility. Over the study period, the overall incidence rate of measles among children demonstrated significant inter-annual variation, with peaks corresponding to years of reduced vaccine uptake.

Age-specific analysis indicated that the highest incidence was observed among children aged 1–4 years, accounting for the majority of reported cases, while a secondary rise was recorded among adolescents aged 10–14 years. This pattern suggests incomplete immunization coverage and waning immunity following primary vaccination in early childhood. The lowest morbidity rates were noted in age groups with high two-dose vaccine coverage, confirming the critical importance of maintaining full adherence to the national immunization schedule.

A comparison of vaccination coverage and measles incidence demonstrated a strong inverse correlation ($r = –0.82$, $p < 0.05$), confirming the effectiveness of preventive immunization. Regions with vaccination coverage below 90% showed a significantly higher incidence compared to areas with coverage exceeding 95%, aligning with WHO recommendations for herd immunity thresholds.

Laboratory diagnostics confirmed that more than 95% of reported cases were laboratory-verified through serological (ELISA) and molecular (PCR) testing, ensuring the reliability of epidemiological data. The analysis also identified sporadic outbreaks associated with imported cases, emphasizing the importance of surveillance and rapid outbreak response mechanisms.

Overall, the findings demonstrate that measles transmission among children remains largely preventable through sustained high vaccination coverage and timely revaccination. Strengthening epidemiological surveillance, improving community awareness, and addressing vaccine hesitancy are essential components for achieving long-term measles elimination.

The results of this study are consistent with global observations and support the conclusion that the strategic enhancement of immunization programs—combined with targeted public health interventions—plays a decisive role in reducing measles morbidity and achieving epidemiological stability in pediatric populations.

Conclusion

The results of this study confirm that measles remains a controllable yet persistent public health concern among children, primarily due to fluctuations in vaccination coverage and gaps in herd immunity. The epidemiological analysis demonstrated that maintaining consistently high levels of immunization—particularly ensuring timely administration of the second

vaccine dose—is crucial for preventing outbreaks and sustaining long-term population protection.

Age-specific trends indicate that children aged 1–4 years remain the most vulnerable group, emphasizing the necessity of strengthening early childhood immunization and monitoring immune status in older children and adolescents. The strong inverse correlation between vaccination coverage and measles incidence clearly validates the effectiveness of current preventive measures, while highlighting the need for continuous evaluation and optimization of immunization programs.

Effective measles control requires a comprehensive approach that combines epidemiological surveillance, public education, and targeted interventions in regions with suboptimal vaccine coverage. Sustained collaboration between healthcare authorities, educational institutions, and communities is essential to overcome vaccine hesitancy and maintain the required herd immunity threshold.

In conclusion, the study underscores that achieving and preserving measles elimination is realistic only through the consistent implementation of evidence-based vaccination strategies, robust monitoring systems, and adherence to WHO-recommended immunization standards. These efforts collectively represent the cornerstone of sustainable protection of children against measles and the advancement of global public health.