

Impact of Vaccination Coverage on the Incidence of Whooping Cough in Jacareí (São Paulo) in the Years 2012 And 2025: An Analysis Focused on Infants Under 1 Year Old

Impacto da Cobertura Vacinal na Incidência de Coqueluche em Jacareí (São Paulo) nos Anos de 2012 e 2025: Análise Focada em Menores de 1 Ano

Impacto de La Cobertura Vacunal en la Incidencia de Tos Ferina en Jacareí (São Paulo) en los Años 2012 y 2025: Análisis Enfocado en Menores de 1 Año

RESUMO

Objetivo: Analisar a correlação entre a cobertura vacinal da vacina pentavalente e a incidência de coqueluche em menores de 1 ano no município de Jacareí-SP entre 2012 e 2025, com ênfase nas implicações para a atuação da Atenção Primária à Saúde (APS). **Métodos:** Estudo descritivo, retrospectivo, baseado em dados secundários do SINAN e do DATASUS. Foram analisados os casos confirmados de coqueluche e a situação vacinal dos menores de um ano, além da cobertura vacinal anual. **Resultados:** Entre 2012 e 2025, 31 casos foram confirmados, sendo 64,5% em menores de 1 ano. Desses, 95% apresentavam esquema vacinal incompleto ou não iniciado. A cobertura vacinal da pentavalente esteve aquém da meta de 95% em diversos anos. **Conclusão:** Observou-se associação entre baixa cobertura vacinal e maior incidência de coqueluche em lactentes. Tal cenário evidencia desafios para a APS no tocante à vigilância epidemiológica, à adesão ao calendário vacinal e ao fortalecimento de ações preventivas nas comunidades.

DESCRIPTORES: Coqueluche; Vacinação; Imunização; Saúde da Família; Atenção Primária à Saúde.

ABSTRACT

Objective: To analyze the correlation between pentavalent vaccine coverage and the incidence of pertussis in children under 1 year of age in Jacareí-SP between 2012 and 2025, with emphasis on implications for Primary Health Care (PHC). **Methods:** Descriptive, retrospective study based on secondary data from SINAN and DATASUS. Confirmed pertussis cases and the vaccination status of children under one year were analyzed, along with annual vaccination coverage rates. **Results:** Between 2012 and 2025, 31 cases were confirmed, 64.5% in children under 1 year. Of these, 95% had incomplete or no vaccination schedules. Pentavalent vaccine coverage fell short of the 95% target in several years. **Conclusion:** An association was observed between low vaccination coverage and higher incidence of pertussis in infants. This scenario highlights challenges for PHC in terms of epidemiological surveillance, adherence to the vaccination schedule, and strengthening preventive actions in communities.

DESCRIPTORS: Whooping Cough; Vaccination; Immunization; Family Health; Primary Health Care.

RESUMEN

Objetivo: Analizar la correlación entre la cobertura de la vacuna pentavalente y la incidencia de tos ferina en menores de 1 año en Jacareí-SP entre 2012 y 2025, con énfasis en las implicaciones para la Atención Primaria de Salud (APS). **Métodos:** Estudio descriptivo y retrospectivo basado en datos secundarios del SINAN y del DATASUS. Se analizaron los casos confirmados de tos ferina y la situación vacunal de los menores de un año, así como la cobertura vacunal anual. **Resultados:** Entre 2012 y 2025 se confirmaron 31 casos, de los cuales el 64,5% correspondió a menores de 1 año. El 95% de ellos tenía el esquema vacunal incompleto o no iniciado. La cobertura de la vacuna pentavalente estuvo por debajo de la meta del 95% en varios años. **Conclusión:** Se observó una asociación entre la baja cobertura vacunal y una mayor incidencia de tos ferina en lactantes. Este escenario evidencia desafíos para la APS en cuanto a vigilancia epidemiológica, adherencia al calendario vacunal y fortalecimiento de acciones preventivas en las comunidades.

DESCRIPTORES: Tos Ferina; Vacunación; Inmunización; Salud de la Familia; Atención Primaria de Salud.

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INTRODUCTION

Whooping cough is a highly contagious respiratory disease caused by the bacterium *Bordetella pertussis*. According to the Centers for Disease Control and Prevention (CDC), a suspected case is characterized by a cough lasting at least two weeks, associated with coughing fits, inspiratory whoop, post-cough vomiting, or apnea, especially in infants. Confirmation can occur through bacterial isolation, a positive PCR test, or epidemiological link to a confirmed case.

The pentavalent vaccine, incorporated into the National Immunization Program (PNI) in 2012, is indicated for children at 2, 4, and 6 months of age, replacing the tetravalent vaccine (DTP/Hib) and now also including protection against hepatitis B. Vaccination coverage is calculated based on the number of doses administered divided by the number of live births in the municipality during the same period, with the third dose considered the main indicator of adherence to the vaccination schedule.

In recent years, the city of Jacareí, located in the interior of São Paulo, has faced an increase in cases of pertussis, especially in children under one year of age. This increase accompanies a significant drop

in vaccination rates in the municipality, a phenomenon also observed in other regions of the country. This situation reinforces the role of Primary Health Care (PHC), especially with regard to active surveillance, monitoring of the vaccination schedule, and the promotion of educational and preventive actions in communities.

This study aims to analyze the correlation between pentavalent vaccine coverage and pertussis cases reported in the municipality of Jacareí-SP between 2012 and 2025, with special attention to the under-one age group, with a view to contributing to the improvement of disease prevention and control strategies within the scope of PHC.

METHOD

This is a descriptive, retrospective, quantitative study based on the analysis of secondary data. All reported cases of pertussis in the municipality of Jacareí (SP) between January 2012 and March 2025 were included, according to records available in the Notifiable Diseases Information System (SINAN), through compulsory notification forms.

Confirmed cases of pertussis, defined according to clinical, laboratory, or epidemiological criteria, were considered for

analysis, with emphasis on those occurring in children under 1 year of age. The vaccination status was analyzed based on the information recorded in the SINAN forms themselves, evaluating the presence or absence of pentavalent vaccine doses administered according to the child's age at the time of diagnosis.

The annual vaccination coverage rates for the pentavalent vaccine were extracted from the SUS Department of Informatics (DATASUS) platform, specifically considering the third dose as the main indicator of adherence to the childhood vaccination schedule. We chose to start the analysis in 2012, the year the pentavalent vaccine was introduced into the national PNI schedule, thus ensuring the homogeneity of the historical series regarding the immunobiological product in use.

The analysis was descriptive, with tabular and graphical organization of the data in Microsoft Excel® spreadsheets. The variables of interest included: year of notification, age at diagnosis, vaccination status (complete, incomplete, or absent), and annual vaccination coverage. No inferential statistical analyses were performed, given the descriptive nature of the investigation.

RESULTS

From January 2012 to March 2025, 170

suspected cases of pertussis were reported in Jacareí (SP), of which 31 (18.2%) were confirmed and 139 (81.8%) were ruled out. A higher number of notifications was

observed among the age group t between 2013 and 2014, with 31 and 35 records, respectively. From 2018 onwards, there was a progressive reduction in the number

of notifications, especially between 2020 and 2023, a period possibly influenced by the health measures adopted during the COVID-19 pandemic (Figure 1).

Figure 1 – Epidemiological profile of suspected pertussis cases, Jacareí (SP), 2012-2025



Source: Jacareí City Hall (SP) – Notifiable Diseases Information System (SINAN)

Among the 31 confirmed cases, 20 (64.5%) occurred in children under 1 year of age. Analysis of the vaccination status of this group showed that

19 (95%) had an incomplete or uninitiated vaccination schedule for the pentavalent vaccine (Table 1).

Table 1 – Vaccination status of children <1 year old with confirmed pertussis. Jacareí-SP, 2012–2025

Age group	No. of children	No. of vaccinated children	Dose administered	No vaccine/Incomplete data
< 2 months	7	1	1st dose	6
2 months	4	2	1st dose	2
3 months	2	1	1st dose	1
4 months	4	3	1st dose (1), 2nd dose (2)	1
6 months	1	1	2nd dose	0
9 months	1	1	3rd dose	0
11 months	1	1	1st dose	0

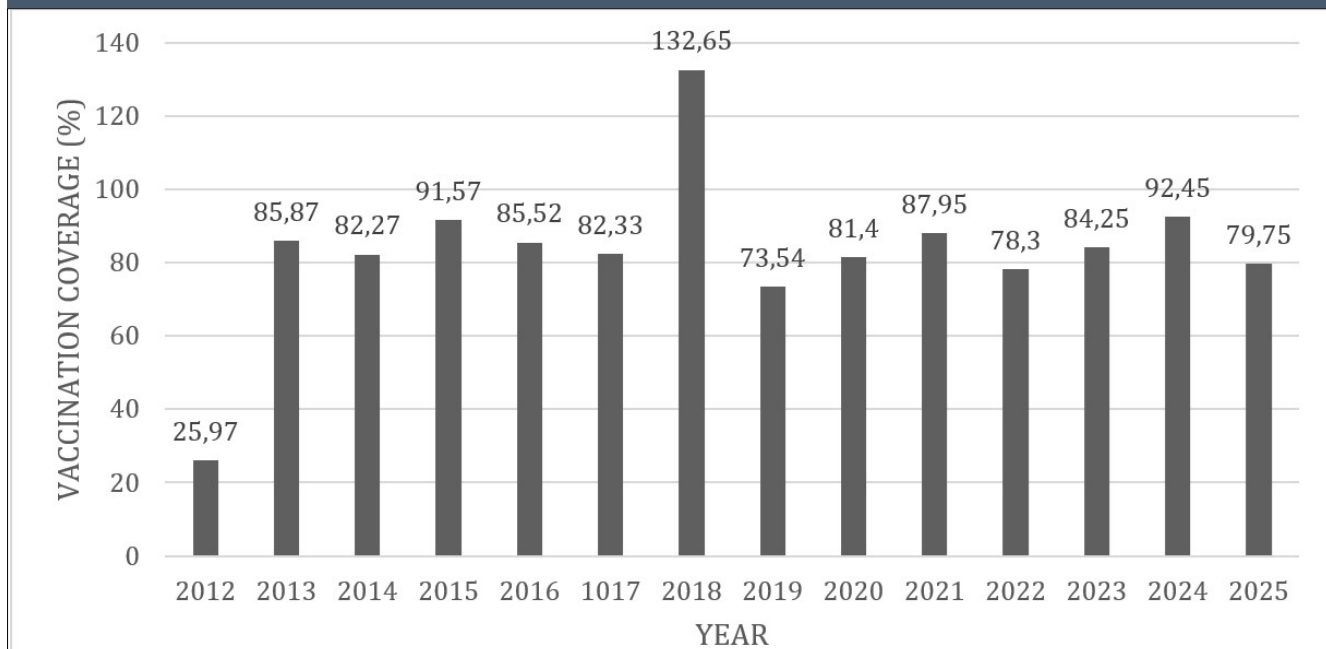
Source: Jacareí City Hall (SP) – Adverse Event Notification Information System (SINAN)

Annual vaccination coverage for the pentavalent vaccine for children under 1 year of age in Jacareí showed significant variations between 2012 and 2025. In 2012, coverage was

only 25.97%, followed by a rapid increase in the following years, peaking in 2018 (132.65%). From 2019 onwards, there was a downward trend, with fluctuations below the 95% tar-

get recommended by the National Immunization Program. In 2023 and 2024, the rates recorded were 84.25% and 92.49%, respectively. In 2025, as of April, coverage was at 79.51%.

Figure 2 – Evolution of pentavalent vaccine coverage (<1 year), Jacareí-SP, 2012–2025.



Source: Ministry of Health - Department for Monitoring, Evaluation, and Dissemination of Strategic Health Information (DEMAS) of the Secretariat for Information and Digital Health (SEIDIGI).

DISCUSSION

Data analysis revealed an association between low pentavalent vaccine coverage and high incidence of pertussis in children under one year of age in the municipality of Jacareí. Most confirmed cases in this age group occurred in children who had not completed the vaccination schedule or had not even started vaccination, highlighting the importance of adherence to the vaccination schedule in the first months of life.

The vulnerability of infants to pertussis is well documented in the literature, especially among those with incomplete vaccination schedules. The protection conferred by vaccination

depends not only on the administration of doses but also on compliance with the recommended interval between them. Delays, refusals, or failures to access health services directly impact the ability to prevent this and other vaccine-preventable diseases.

Longitudinal analysis reveals instability in vaccination rates, with periods of high coverage (such as in 2018) followed by significant declines, demonstrating the need for continuous monitoring by PHC and systematic active search actions.

In the context of Primary Health Care (PHC), childhood vaccination coverage is one of the pillars of epidemiological surveillance and longitudinal care. The present study reinforces the need to strengthen immunization strategies in basic health units, with emphasis on: Active search for unvaccinated individuals, especially by

community health workers (CHWs), early identification of non-compliant individuals through the use of electronic records and vaccination cards, health education for families, combating vaccine hesitancy with clear and reliable information, coordination between ESF teams and health surveillance for continuous monitoring of coverage and rapid response to outbreaks.

Additionally, the impact of the COVID-19 pandemic on vaccination coverage, observed between 2020 and 2023, reflects a national scenario of temporary weakening of routine immunization actions. This reality requires a coordinated effort to actively restore public confidence in vaccines, with reinforced social communication campaigns and extended opening hours for vaccination centers.

CONCLUSION

The analysis of pentavalent vaccine coverage in the municipality of Jacareí between 2012 and 2025 revealed a critical gap in the protection of children under 1 year of age against pertussis. Most confirmed cases in this age group occurred in individuals with incomplete or uninitiated vaccination schedules, pointing to failures

in the reach of immunization strategies.

These findings reinforce the importance of the ongoing work of Primary Health Care in monitoring the vaccination situation, actively surveilling vaccine-preventable diseases, and mobilizing communities to ensure adherence to the vaccination schedule. The coordinated action of family health teams, combined with active

search strategies, health education, and strengthening of registration systems, is essential to reduce the incidence of pertussis and protect vulnerable populations.

Ensuring adequate vaccination coverage in childhood is one of the most effective actions of PHC for promoting health, preventing diseases, and consolidating comprehensive care in the territory.

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