DETERMINANTS OF SECOND-DOSE MEASLES IMMUNIZATION ACCEPTANCE AMONG TODDLERS: A SYSTEMATIC LITERATURE REVIEW

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ABSTRACT
Background: Measles is a contagious disease with high morbidity and mortality rates. Globally, measles immunization coverage has reached 81% for the first dose and 71% for the second dose. In Southeast Asia, the coverage is 91% for the first dose and 85% for the second dose; however, these figures remain below the measles elimination target.
Purpose: identify the factors influencing second-dose measles immunization coverage.
Methods: The method used is a Systematic Literature Review with keywords formulated based on the PICO framework: Population: "children," Exposure: "second-dose measles vaccine," and Outcome: "associated factors," "predictors," or "determinants."
Results: From a total of 1,159 articles identified, eleven studies met the inclusion criteria and were analyzed further. The results show that second-dose measles immunization coverage is influenced by several factors, including maternal age, education level, knowledge, utilization of maternal health services, and accessibility to healthcare facilities. Maternal health service utilization, such as antenatal care visits, delivery at health facilities, and postnatal checkups, significantly increases the likelihood of children receiving the second dose. Conversely, barriers such as long distances, limited transportation, and long waiting times remain major challenges.
Conclusion: Therefore, strengthening education, integrating maternal health services with immunization programs, and expanding access in remote areas are essential to improving measles immunization coverage. These efforts provide an important foundation for formulating more effective policies to support both global and national measles elimination strategies.

Keywords: Determinant, Immunization, Measles, Second dose

Received: February 17th, 2026; Revised: June 26th, 2026; Accepted: July 3rd, 2026
DOI:https://doi.org/ 10.36720/nhjk.v15i1.883

BACKGROUND

Measles, also known as morbilli, is a highly contagious disease with high morbidity and mortality rates. The number of measles cases increased globally to 395,521 in 2024. In Southeast Asian countries, measles cases also surged to 40.9 per million population, up from 16.2 per million in 2023 (Do & Mulholland, 2025). Meanwhile, Indonesia reported a dramatic rise in suspected measles cases in 2023, with 10,308 cases (26.2% of suspected cases) distributed across all provinces (WHO, 2023).

Measles is caused by a virus from the genus Morbillivirus, which belongs to the Paramyxovirus family. Transmission occurs through the air via droplets from the nose, mouth, or throat of an infected person. Untreated measles can lead to serious complications, including severe diarrhea, blindness, encephalitis, pneumonia, and death. Although there is no specific treatment for measles, the disease can be prevented through safe and effective measles immunization (Olufadewa et al., 2024)

Measles immunization is the most effective effort to control the spread of the measles virus and saves millions of lives each year. Researchers estimate that measles vaccination prevented 28 million deaths between 2010 and 2018 (Patel et al., 2019). The World Health Organization recommends that the first dose of measles vaccine be given at the age of 9 months, followed by a second dose at 15–18 months. Despite the effectiveness of immunization, measles remains a major cause of mortality and morbidity worldwide. Most measles-related deaths occur in children under five years of age, particularly in areas with low or inconsistent immunization coverage (Bello et al., 2024).

Globally, measles immunization coverage has reached only 81% for the first dose and 71% for the second dose. In Southeast Asia, coverage is 91% for the first dose and 85% for the second dose, indicating a decline. In Indonesia, measles immunization coverage dropped from 98.4% to 76.8% in 2022 (Kemenkes RI, 2024). Coverage for the second dose in Indonesia has been reported at around 54% (Maulida et al., 2019), far below the WHO target of at least 95% coverage with two doses (World Health Organization, 2019). Protection from two doses of the measles vaccine is more effective than a single dose in preventing the disease. High immunization coverage is expected to reduce the risk of transmission in communities and improve children's overall health (Yitbarek et al., 2025)

Several studies report that the decline in measles immunization coverage may be influenced by factors such as antenatal care visits, maternal education, place of delivery, access to information about measles, distance to immunization services, knowledge about immunization, postnatal care, waiting time, and proximity to health facilities (Alemu et al., 2024; Goshu Muluneh et al., 2022). However, studies examining the determinants of second-dose measles immunization coverage remain limited.

OBJECTIVE

Therefore, the present study aims to identify relevant research and summarize the key determinants of second-dose measles immunization coverage. The findings of this review are expected to inform policymakers in developing effective strategies to improve second-dose coverage and ultimately eliminate recurrent measles outbreaks.

METHODS

This study employed a Systematic Literature Review approach. We conducted the review using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guideline as a reporting framework to ensure that each step was performed rigorously (Page et al., 2021). The review aimed to identify factors influencing second-dose measles immunization coverage among children. The search for data sources covered publications from 2015 to 2025. Literature searches were performed in three databases: PubMed, Springer, and ProQuest.

Search terms were developed using the PICO framework and selected based on their relevance to the background and existing literature. The Population included "children" and the "pediatric population"; the Exposure was the "second-dose measles vaccine"; and the Outcomes were "associated factors," "predictors," or "determinants." These terms were applied individually and then combined using Boolean operators, including "OR" and "AND." The keywords used in the search strategy were: ("second-dose measles vaccine" OR "two doses of measles vaccine") AND ("children" OR "pediatrics") AND ("uptake" OR "utilization" OR "coverage" OR "acceptance" OR "adherence") AND ("associated factors" OR "predictors" OR "determinants" OR "influencers").

The inclusion criteria for this review were: (1) articles published between 2015 and 2025; (2) studies published in English; (3) full-text articles available for retrieval; (4) observational study designs, including cross-sectional, case-control, or cohort studies; (5) studies involving children as the target population; and (6) studies reporting factors associated with second-dose measles immunization coverage or uptake. The exclusion criteria included review articles, studies that did not specifically assess second-dose measles immunization, studies without original data, studies with unclear outcome variables, studies involving populations outside the target age group, duplicate publications, and articles with inaccessible full texts.All articles identified from the database searches were imported into Mendeley reference manager to detect duplicates and to facilitate title and abstract screening. Articles were independently assessed by two authors based on titles and abstracts.

Study information was extracted into a spreadsheet, including author names, year of publication, study period, design, setting, sample size, age group, and factors influencing measles outbreaks. Disagreements regarding article eligibility were resolved through discussion with a third author. The methodological quality of the selected studies was independently appraised by reviewers using the Joanna Briggs Institute (JBI) Critical Appraisal Tool (2017). Finally, a narrative synthesis was conducted to summarize the findings of the included studies, and this synthesis was used to reflect the overall results of the analysis.

RESULTS

A total of 1,159 articles were identified from the databases. After removing 658 duplicate records, 501 articles remained for title and abstract screening. Of these, 447 articles were excluded because they did not meet the inclusion criteria. Fifty-four full-text articles were assessed for eligibility. After full-text review, 43 articles were excluded for predefined reasons. Finally, 11 studies met all inclusion criteria and were included in the final analysis (Figure 1).

The included studies were conducted in several countries, including Ethiopia (eastern, northwestern, and central regions), Africa, Kenya, Indonesia, and Japan. Most of them used cross-sectional and case–control designs. Altogether, the studies involved 39,205 children under five years of age.

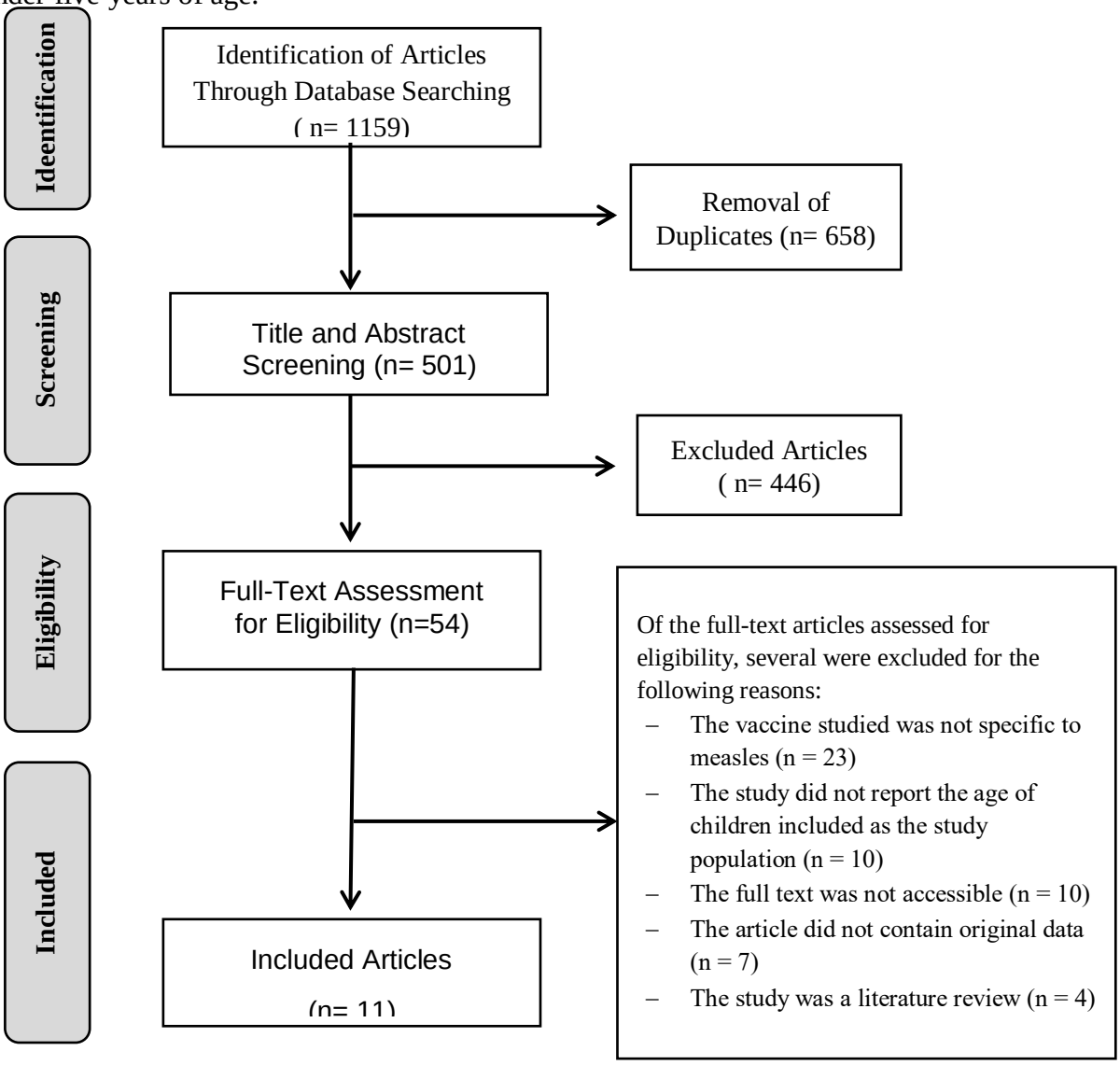

Figure 1. Article Selection Process Using PRISMA

Several factors were reported to influence the uptake of measles immunization among children, including maternal age (n = 4); maternal education (n = 8); antenatal care (ANC) visits (n = 2); postnatal care (PNC) visits (n = 5); delivery at a health facility (n = 2); children's status regarding other scheduled vaccines (n = 2); and lack of care at health facilities (n = 1). Accessibility to health services also played an important role, including travel time to health facilities (n = 2), distance to immunization sites (n = 4), and waiting time for immunization (n = 2). Additional determinants included knowledge about childhood immunization (n = 4) and awareness of the measles vaccine (n = 3).

This review found that 8 out of the 11 studies showed that second-dose measles immunization coverage was lower than that of the first dose, while three studies did not report the prevalence of the second dose. The highest second-dose coverage was reported in Japan at 93.9%, whereas the lowest was observed in eastern Ethiopia at 21.4% (Table 1).

Table 1. Data Extraction for Included Studies

No	Author (Year)	Location	Design	Sample Size	Prevalence First-Dose Measles Immunization	Prevalensi Second-Dose Measles Immunization	Factors Associated with Second-Dose Measles Immunization (p < 0.05)
1	Ibrahim et al (2024)	Eastern Ethiopia	Cross sectional	429 sample	59,0%	21,4%	– Maternal education – Delivery at a health facility – Maternal postnatal care visits – Travel time to the health facility – Knowledge of childhood immunization.
2	Taffie et al (2024)	Northwest Ethiopia	Cross sectional	418 sample	70,8%	41,39%	– Postnatal care visits – Child's status regarding other scheduled vaccines – Awareness of the second-dose measles vaccine and its schedule – Distance to the immunization site
3	Tadesse et al (2022)	Central Ethiopia	cross-sectional	410 sample	88,7%	42,5%	– Maternal age – Waiting time for immunization at the health facility – Awareness of immunization
4	Chilot et al (2022)	Sub-Saharan Africa	Secondary data analysis (Demographic and Health Survey)	15.090 sample	83,07%	44,77%	– Maternal age – Maternal education – Access to health facilities – ANC visits – PNC visits – Delivery at a health facility
5	Mamuti et al (2022)	Kenya	Cross-sectional	536 sample	96,6%	56,2%	– Household income – Status of other scheduled immunizations – Caregiver education level – Knowledge about measles immunization
6	Kanyiru et al (2019)	Kenya	Cross sectional	186 sample	85,5%	32,5%	– Maternal education – Awareness of the measles vaccine – Lack of care at health facilities

7	Maulida et al (2019)	Indonesia	cross-sectional	129 sample	84%	54%	– Experience in obtaining health services
8	Adugna et al (2024)	Ethiopia	case-control	351 sample	-	Case group 38 (32.5%), and control 75 (32.1%)	– Maternal illiteracy – PNC visits – Inadequate maternal knowledge – Poor counseling – Long distance to health facilities – Long waiting time at immunization site
9	Demewoz et al (2023)	Northwest Ethiopia	cross-sectional	845 sample	-	48,1%	– Maternal education – Information about the second-dose measles vaccine – Distance to the immunization site – Knowledge of immunization – Positive attitude toward immunization
10	Hermawan et al (2025)	Indonesia	cross-sectional	19.425 sample	-	73,46%	– Frequency of postnatal care – Maternal education – Maternal age – Travel time to health facilities – Household expenditure
11	Hu et al (2018)	Jepang	cross-sectional	1386 sample	96,9%	93,9%	– Maternal age – Maternal education – Delivery at a health facility – Maternal employment status – Household income

DISCUSSION

Acceptance of the second dose of the measles vaccine refers to the administration of the second measles immunization following the first dose. This study found that the prevalence of the second-dose measles immunization was lower than that of the first dose. The highest prevalence of second-dose measles immunization was reported in Japan at 96.9%, while the lowest prevalence was observed in Eastern Ethiopia at 21.4%. Measles immunization coverage remains far below the target, particularly for the second dose. The World Health Organization (WHO) recommends a 95% measles immunization coverage with two doses (World Health Organization, 2019). The protective effectiveness of two doses of the measles vaccine has been proven to be superior in preventing measles compared to a single dose. High immunization coverage is expected to reduce the risk of infectious disease transmission in the community and improve overall child health (Yitbarek et al., 2025). Conversely, failure to achieve the target immunization coverage may lead to the re-emergence of measles outbreaks. Several factors may influence the acceptance of the second dose of measles immunization among children.

Children born to mothers aged 25–34 years and >35 years are more likely to receive

measles immunization compared to those born to mothers aged 15–24 years. This may be because older mothers have a better understanding of disease prevention through immunization, more experience with vaccination, and lower levels of vaccine hesitancy (Chilot et al., 2022). However, these findings differ from Tadesse et al., who reported that younger mothers were more likely to immunize their children than older mothers. These differences may be attributed to variations in study settings (nationwide), study design (secondary data analysis), and sociocultural contexts (Tadesse et al., 2022).

Maternal education is a strong predictor influencing second-dose measles immunization. Children of mothers with secondary or higher education are more likely to complete measles immunization. Educated mothers tend to have better health literacy and greater access to information regarding the benefits of immunization, resulting in higher measles vaccination rates among their children. Education serves as a pathway to empowerment, leading to greater acceptance of public health information. Empowerment enhances health-seeking behavior through changes in attitudes, traditions, and beliefs, increases autonomy and decision-making capacity, and helps build social networks that provide information about healthy behaviors and available health services (Mamuti et al., 2022; Zenbaba et al., 2021). Among the identified determinants, maternal education emerged as the most dominant factor influencing second-dose measles immunization uptake, as it was reported in eight of the eleven included studies. Mothers with higher educational attainment tend to possess better health literacy, improved access to health information, and greater decision-making capacity regarding their children's healthcare. Therefore, improving maternal education and health literacy may substantially increase second-dose measles immunization coverage.

Knowledge about measles immunization significantly influences immunization uptake. Children whose mothers or caregivers have good knowledge are more likely to receive measles immunization compared to those with limited knowledge. Knowledge fosters awareness and encourages appropriate practices. Informed mothers or caregivers are more likely to understand the recommended schedule, benefits, consequences of delayed or missed doses, and adverse events following immunization (AEFI). They are also better prepared to make appropriate decisions regarding their children's health. Mothers actively seek information, ask questions, and consult healthcare providers. Empowered mothers advocate for their children’s needs and overcome barriers that may hinder vaccine uptake. Conversely, failure of healthcare providers to deliver adequate information may reduce healthcare-seeking behavior (Sugishita et al., 2019)

Maternal healthcare visits are among the most influential predictors of measles immunization utilization. Children born to mothers who attend maternal healthcare services—such as antenatal care (ANC), delivery services, and postnatal care (PNC)—are more likely to receive measles immunization compared to those whose mothers do not attend such services. Women who seek maternal healthcare are more likely to seek care for their children as well. Frequent access to healthcare services provides opportunities for communication, counseling, and health education from healthcare providers regarding the importance of measles immunization (Kantner et al., 2021) Healthcare visits also involve scheduling follow-up appointments for both mother and child, serving as reminders for measles immunization. This highlights the important role of healthcare workers in integrating maternal healthcare services (ANC, delivery, and PNC) with health education to improve adherence to immunization schedules (Taffie et al., 2024).

Accessibility to healthcare services is a key indicator of health system efficiency and equity. It reflects an individual's ability to obtain appropriate healthcare services effectively, efficiently, and in a timely manner (Zahidi et al., 2024) Healthcare accessibility influences measles immunization uptake among children. It refers to the distance between a household and an immunization facility, commonly categorized as walking time <30 minutes or ≥30 minutes. Mothers who require more than 30 minutes to reach an immunization site are less likely to vaccinate their children against measles compared to those who live within 30 minutes. This may occur because previous long waiting times discourage children and reduce motivation to complete the second dose. Accessibility challenges extend beyond distance and include travel time, inability to afford transportation, lack of available transport, poor road conditions, limited health infrastructure, travel anxiety, and motion sickness, all of which may hinder access to routine immunization services. Therefore, strengthening strategies to improve healthcare accessibility is essential to increase measles immunization coverage (Adugna et al., 2024; Chilot et al., 2022; Hermawan et al., 2025; Ibrahim et al., 2024; Kanyiru et al., 2019; Taffie et al., 2024).

In addition, waiting times exceeding 30 minutes for immunization services are significantly associated with dropout from the second dose of measles immunization (Adugna et al., 2024; Tadesse et al., 2022). Long waiting times may disrupt service utilization and contribute to immunization dropout. These findings highlight an important dimension of healthcare access, where health services fail to respond effectively and promptly to patients' needs. Healthcare providers and facilities should reassess service delivery processes to reduce waiting times and improve second-dose measles immunization coverage (Levesque et al., 2013).

This study contributes to the global understanding of determinants shaping measles immunization coverage and provides a foundation for more targeted interventions in maternal and child health services. Strengthening maternal education and expanding access to postnatal care services, particularly in underserved and remote areas, should be prioritized as part of policy efforts aimed at improving routine childhood immunization coverage.

This review has several limitations. First, most included studies used cross-sectional designs, limiting the ability to establish causal relationships. Second, variations in study settings, sample sizes, and measurement methods may have contributed to heterogeneity among the findings. Finally, the literature search was limited to three databases, which may have resulted in the omission of relevant studies published elsewhere.

CONCLUSION

Coverage of the second dose of measles immunization among children is influenced by maternal age, education, knowledge, women's empowerment, utilization of maternal health services, and the accessibility of health facilities. Maternal education was identified as the most dominant determinant of second-dose measles immunization coverage, followed by maternal knowledge, utilization of maternal healthcare services, and accessibility to health facilities. Efforts to improve coverage can be achieved by strengthening maternal education and empowerment, integrating maternal health services with immunization programs, expanding access to remote and underserved areas, and promoting cross-sector collaboration to address geographic and sociocultural barriers. Through these strategies, the measles elimination target

can be achieved more equitably across populations.

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