

Determinants of Vaccine Hesitancy and Its Impact on Immunization Coverage in Pakistan: A Narrative Review

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ABSTRACT

Background: Vaccine hesitancy has emerged as a major barrier to immunization performance worldwide and remains particularly concerning in Pakistan, where incomplete vaccine uptake continues to compromise disease control and public-health protection. The problem is shaped not only by individual reluctance, but also by misinformation, sociocultural influences, distrust in vaccination programmes, and persistent health-system weaknesses. **Objective:** To narratively review the principal determinants of vaccine hesitancy in Pakistan and examine their impact on immunization coverage. **Methods:** A narrative review was conducted using literature from PubMed/MEDLINE, Google Scholar, BMC-indexed sources, national survey materials, and public-health reports published between 1998 and 2025. Sources were selected for relevance to vaccine acceptance, refusal, delayed uptake, immunization barriers, and vaccine-related public trust in Pakistan. Findings were synthesized thematically using an interpretive socio-ecological framework. **Results:** The evidence identified four dominant and overlapping drivers of vaccine hesitancy: inadequate vaccine knowledge, misinformation and culturally reinforced myths, weak trust in health and government vaccination initiatives, and structural barriers within the healthcare system. Reported indicators in the reviewed literature included inadequate vaccine knowledge among 90% of participants in one cited study, lack of access to trained vaccinators among 87% of respondents, vaccine shortages reported by 24.5%, and parental refusal reaching up to 22% in selected regions. Full immunization remained incomplete, with approximately two-thirds of children who initiated vaccination reported as fully immunized. Mobile-based awareness interventions were associated with up to 30% improvement in preventive behaviour. **Conclusion:** Vaccine hesitancy in Pakistan is a multifactorial and context-sensitive challenge that significantly disrupts immunization coverage. Effective response requires integrated strategies combining community engagement, myth-correction, reliable vaccine delivery, strengthened frontline services, and restoration of public trust. **Keywords:** Vaccine hesitancy; Immunization coverage; Pakistan; Public health; Vaccine confidence; Health communication; Preventive healthcare.

INTRODUCTION

Immunization remains one of the most effective and cost-efficient public health interventions, substantially reducing childhood morbidity and mortality from vaccine-preventable diseases worldwide. Despite these gains, vaccine hesitancy has emerged as a major threat to global immunization efforts and

was recognized among the leading threats to public health because of its potential to reverse progress in disease control and eradication (1-3). Vaccine hesitancy refers to delay in acceptance or refusal of vaccination despite the availability of vaccination services, and it is shaped by a complex interaction of confidence, complacency, and convenience-related factors that vary across settings, populations, and vaccines (3-5). In low- and middle-income countries, these determinants are often further intensified by structural inequalities, health-system weaknesses, misinformation, and sociocultural influences, making the phenomenon both context-specific and operationally challenging.

Pakistan presents a particularly important setting in which to examine vaccine hesitancy because it continues to face substantial barriers to achieving and sustaining optimal immunization coverage. The persistence of vaccine-preventable diseases, including polio and measles, reflects not only gaps in service delivery but also persistent mistrust, misinformation, and inequitable access to vaccination services (6-9). Previous literature from Pakistan has shown that parental education, household income, geographic disadvantage, weak health infrastructure, and exposure to false or misleading vaccine narratives all influence vaccine decision-making (6,8-10). These factors do not operate in isolation; rather, they interact in ways that reinforce delayed vaccination, incomplete immunization, and refusal, especially among rural and underserved communities. Such patterns have important implications for herd immunity, outbreak control, and the overall resilience of the national immunization programme.

Although several individual studies and reports have explored selected aspects of vaccine refusal, parental attitudes, or barriers to vaccine uptake in Pakistan, the available evidence remains fragmented across geographic regions, population groups, and disease-specific vaccination contexts. Much of the literature focuses on isolated determinants, such as religious misconceptions, maternal literacy, or distrust of public campaigns, without sufficiently integrating how informational, cultural, socio-demographic, and health-system factors collectively affect immunization coverage at the national level (6-11). In addition, the evolving media environment, recurrent misinformation, and continuing public concern around vaccination programmes have increased the need for an updated synthesis that is interpretive, context-sensitive, and relevant for policy and service planning (11-13).

A narrative review is therefore appropriate to consolidate and critically interpret the available literature on vaccine hesitancy in Pakistan, particularly where the evidence base includes heterogeneous study designs, national reports, and policy-relevant public health sources. By synthesizing findings across epidemiological, behavioral, and health-system domains, this review seeks to provide a broader understanding of why vaccine hesitancy persists and how it undermines immunization coverage in the Pakistani context. The objective of this review is to examine the principal determinants of vaccine hesitancy in Pakistan and to evaluate their impact on immunization coverage, with a particular focus on socio-demographic disadvantage, knowledge and misinformation gaps, cultural and religious influences, health-system barriers, and public trust in vaccination services.

MATERIAL AND METHODS

This study was conducted as a narrative review to synthesize and interpret the available evidence on the determinants of vaccine hesitancy and their implications for immunization coverage in Pakistan. A narrative approach was selected because the relevant literature spans diverse study designs, public health reports, and policy-oriented sources, making an interpretive thematic synthesis more suitable than a formal quantitative aggregation. The review was designed to consolidate evidence related to behavioral, informational, sociocultural, and structural contributors to vaccine hesitancy, while also examining how these determinants influence vaccine uptake, continuity of immunization, and vulnerability to vaccine-preventable disease outbreaks within the Pakistani population.

The literature search was undertaken using major electronic and public health information sources, including PubMed/MEDLINE, Google Scholar, BMC-indexed literature, national survey materials, and reports from international health agencies. The search focused on publications and reports issued

between 1998 and 2025 in order to capture both the historical development and contemporary profile of vaccine hesitancy in Pakistan. Search terms were developed around combinations of core concepts, including “vaccine hesitancy,” “immunization coverage,” “Pakistan,” “vaccination refusal,” “public health,” “parental attitudes,” “misinformation,” and “polio vaccination.” Reference lists of relevant articles were also reviewed to identify additional pertinent sources. The review prioritized peer-reviewed literature, demographic and health survey data, and institutional reports with direct relevance to vaccination behavior and immunization performance in Pakistan.

Sources were considered eligible when they addressed vaccine acceptance, refusal, delay, confidence, access, or related determinants within Pakistani populations, or when they reported immunization coverage trends linked to behavioral or structural barriers. Studies and reports were included when they provided information on socio-demographic characteristics, cultural or religious influences, misinformation, healthcare access, service delivery barriers, trust in vaccination programmed, or consequences for vaccine uptake and disease prevention. Non-relevant geographic literature, non-scholarly commentary without evidentiary basis, and informal social media opinion pieces were excluded. Because this was a narrative review, article selection was guided by relevance, contribution to thematic understanding, and applicability to the Pakistani context rather than by formal systematic screening procedures.

Data were extracted manually from the included sources and organized into thematic domains before synthesis. The primary variables of interest included maternal and parental education, urban-rural disparities, vaccine-related knowledge, misinformation and conspiracy beliefs, healthcare infrastructure limitations, access to trained vaccinators, vaccine supply constraints, and indicators of immunization completion or refusal. The extracted findings were then synthesized using a socio-ecological interpretive framework to examine how individual-level beliefs, interpersonal and community influences, and system-level barriers interact to shape vaccine hesitancy and reduce immunization coverage. This approach enabled the review to integrate epidemiologic observations with behavioral and service-delivery evidence in a way that was directly relevant to public health planning.

As a narrative review, the synthesis was intended to identify recurring patterns, dominant determinants, and public health implications rather than to generate pooled effect estimates or formal comparative risk measures. The findings were therefore presented as a thematic integration of the evidence, with emphasis on the interrelationship between knowledge deficits, misinformation, sociocultural influences, and healthcare access barriers. This method also allowed incorporation of national and international public health reports alongside empirical studies, thereby supporting a broader understanding of how vaccine hesitancy contributes to suboptimal immunization coverage in Pakistan. The interpretive nature of this review was considered appropriate for informing policy dialogue, community-level interventions, and future analytical research on vaccination behavior in resource-variable settings.

RESULTS / SYNTHESIS

The narrative synthesis identified four dominant domains contributing to vaccine hesitancy in Pakistan: informational deficits, sociocultural and religious influences, structural healthcare barriers, and declining trust in immunization programmed. Across the included literature and public-health reports, these domains were consistently linked with delayed vaccine acceptance, incomplete childhood immunization, and ongoing vulnerability to outbreaks of vaccine-preventable diseases, particularly in underserved and rural communities. The evidence further indicated that the consequences of vaccine hesitancy extend beyond individual refusal behavior and are embedded within broader inequities in education, service delivery, and healthcare accessibility.

Table 1. Thematic evidence on determinants of vaccine hesitancy and immunization impact in Pakistan

Domain	Reported determinant	Summary of evidence	Reported quantitative indicator
Information and awareness	Inadequate knowledge regarding vaccines and immunization	Limited understanding of vaccine benefit, schedule, and safety contributed substantially to delayed acceptance and refusal	90% of participants in a cited study reported inadequate knowledge as a contributor to hesitancy
Healthcare delivery	Lack of trained vaccinators	Deficient access to adequately trained immunization personnel reduced confidence in service quality and continuity	87% of respondents reported lack of trained vaccinators as a barrier
Supply-side access	Vaccine shortages	Interruption in vaccine availability undermined both trust and timely completion of immunization schedules	24.5% of respondents reported vaccine shortages
Behavioural refusal	Parental refusal linked to specific beliefs	Refusal behavior persisted in selected areas because of culturally reinforced fear, mistrust, and misinformation	Up to 22% parental refusal reported in certain regions
Digital and behavioural intervention	Mobile-based awareness strategies	Technology-enabled awareness approaches were associated with improved preventive behavior and vaccine-related compliance	Up to 30% improvement reported with mobile awareness campaigns
Immunization completion	Full immunization among those initiating vaccination	Coverage remained suboptimal, indicating leakage between initiation and full completion of recommended schedules	Approximately 66.6% fully immunized among those who started vaccination

The evidence also suggested that these determinants were not isolated exposures but interacted cumulatively. Low health literacy amplified susceptibility to misinformation, weak service delivery reinforced distrust, and limited access in rural settings made missed or delayed vaccination more likely. Consequently, vaccine hesitancy appeared to function as both a behavioural phenomenon and a systems-level outcome shaped by public confidence, social narratives, and operational reliability of immunization services.

Table 2. Synthesized interpretation of determinant pathways and their public-health consequences

Determinant pathway	Intermediate effect	Consequence for immunization coverage	Broader public-health implication
Poor vaccine knowledge and awareness	Misunderstanding of necessity, safety, and schedule	Delay in acceptance and incomplete immunization	Increased susceptibility to preventable infections
Cultural myths and religious misinformation	Reinforced fear of adverse or hidden effects	Refusal or selective non-adherence	Community resistance to public-health campaigns
Lack of trained vaccinators and weak infrastructure	Reduced confidence in service quality and vaccine delivery	Reduced uptake, especially in underserved areas	Persistent geographic inequity in immunization
Vaccine stock-outs and access constraints	Missed opportunities for scheduled vaccination	Interruption of continuity and lower completion rates	Failure to sustain population-level coverage
Distrust in government-led initiatives	Reduced acceptance of public campaigns	Lower responsiveness to routine and supplementary programmed	Continued circulation of polio and measles
Weak communication and rumor amplification	Greater influence of informal narratives and media misinformation	Erosion of vaccine confidence	Threat to herd immunity and outbreak control

The reviewed evidence indicated that vaccine hesitancy in Pakistan is driven by a convergence of informational, behavioral, and structural barriers rather than by a single isolated cause. The most prominent factor reported in the available literature was inadequate vaccine-related knowledge, with one cited study noting that 90% of participants considered insufficient knowledge a contributor to hesitancy. This finding suggests that uncertainty regarding vaccine effectiveness, safety, and necessity remains a major impediment to timely vaccine acceptance. Closely related to this, misinformation and conspiracy-based narratives appeared to exert a substantial effect on parental and community attitudes, particularly where health literacy was limited and formal communication channels were weak. These patterns were reinforced by cultural and religious misperceptions, which were described as important mechanisms through which anti-vaccination beliefs circulated and became normalized across local networks.

Structural barriers within the health system emerged as a second major theme and appeared to convert attitudinal hesitancy into practical non-uptake. Approximately 87% of respondents in one cited source reported lack of access to adequately trained vaccinators, while 24.5% reported vaccine shortages. These findings indicate that service-side deficiencies are not peripheral but central to the persistence of incomplete immunization. Where communities encounter stock-outs, poorly staffed centers, or long travel burdens, confidence in immunization services may deteriorate further, even among those without strong ideological resistance to vaccination. In this way, healthcare-system weaknesses contribute both directly and indirectly to falling immunization coverage.

The synthesis also identified measurable consequences for vaccine uptake and continuity. The manuscript reports that only about two-thirds, or 66.6%, of children who initiated vaccination were fully immunized, indicating a substantial drop-off between access and completion. In some areas, parental refusal reportedly reached up to 22%, further demonstrating that pockets of resistance continue to compromise coverage. These gaps are epidemiologically important because incomplete uptake weakens herd protection and enables continued transmission of vaccine-preventable diseases. This is particularly relevant in the Pakistani context, where polio persistence and recurrent measles vulnerability have repeatedly highlighted the cost of suboptimal coverage.

Evidence related to intervention strategies suggested that communication-based approaches may be effective when delivered in accessible and context-sensitive formats. Mobile-based awareness campaigns were reported to improve preventive behavior by as much as 30%, indicating that behavioral interventions may offer meaningful support when integrated with wider community engagement and health-system strengthening. Overall, the findings support the interpretation that vaccine hesitancy in Pakistan is not merely a problem of individual choice; rather, it reflects a layered interaction between poor knowledge, misinformation, weak service delivery, and public distrust, all of which collectively reduce immunization coverage and sustain preventable disease risk.

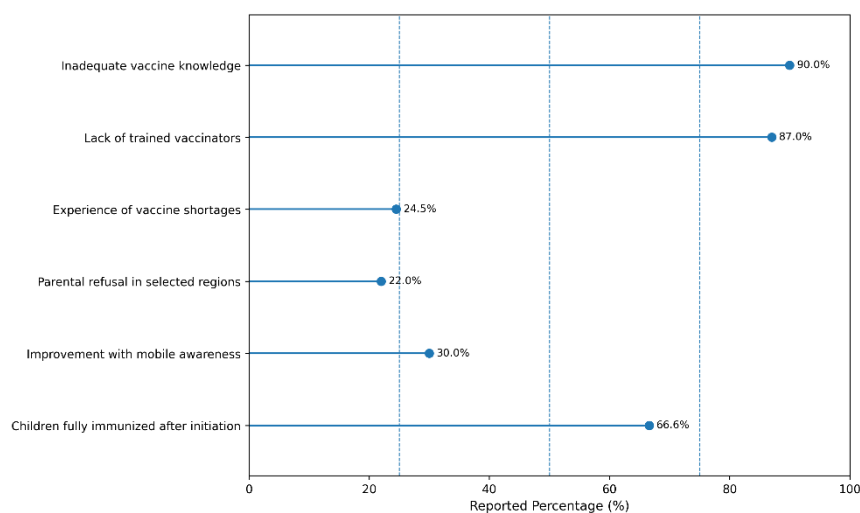


Figure 1 determinants and immunization outcomes in Pakistan

This figure demonstrates a marked clustering of the highest reported proportions around informational and service-delivery barriers, with inadequate vaccine knowledge reported at 90.0% and lack of trained vaccinators at 87.0%, substantially exceeding the levels reported for vaccine shortages (24.5%) and parental refusal in selected regions (22.0%). The figure also shows that full immunization after vaccine initiation remained limited at 66.6%, underscoring a significant completion gap, while mobile-based awareness interventions were associated with a reported 30.0% improvement in preventive behaviour. Taken together, these patterns indicate that the strongest signals in the evidence base are concentrated in deficits of knowledge and healthcare capacity rather than in refusal alone, supporting the interpretation that hesitancy in Pakistan is deeply intertwined with communication failure and health-system weakness rather than being solely an attitudinal phenomenon.

DISCUSSION

This narrative review synthesized the available literature on vaccine hesitancy in Pakistan and found that suboptimal immunization coverage is shaped by a multidimensional interaction among poor vaccine-related knowledge, misinformation, sociocultural influences, health-system weaknesses, and declining trust in public immunization programmes. The principal finding is that hesitancy in Pakistan should not be interpreted as a purely individual or belief-based phenomenon; rather, it is sustained by structural and communicative failures that reduce both confidence in vaccines and the practical continuity of

vaccine access. The prominence of knowledge deficits and lack of trained vaccinators in the reviewed evidence suggests that the strongest barriers may lie not only in public attitudes, but also in the limited capacity of health systems to provide reliable, trusted, and comprehensible vaccination services.

These findings are broadly consistent with the wider literature on vaccine hesitancy, which describes the phenomenon as a context-dependent outcome influenced by confidence, convenience, and complacency rather than a single fixed behaviour (3-5). In the Pakistani setting, however, these global determinants appear to be intensified by recurring public mistrust, misinformation surrounding vaccination campaigns, and geographic inequities in healthcare delivery. Earlier work has shown that immunization efforts in Pakistan have been undermined by both operational failures and public suspicion, particularly in relation to polio eradication activities and government-led outreach programmes (6,7). The present synthesis extends that understanding by integrating service-related barriers, such as vaccine shortages and inadequate access to trained vaccinators, with informational and cultural influences, thereby showing how demand-side and supply-side problems reinforce one another. This layered interpretation is important because it helps explain why immunization gaps persist even when vaccines are formally available.

The review also indicates that vaccine hesitancy has direct implications for disease control and population-level protection. Persistent refusal, delayed uptake, and incomplete immunization weaken herd immunity and allow continued circulation of vaccine-preventable diseases, particularly in communities already affected by poverty, low literacy, and constrained access to healthcare (14,15). In this respect, the consequences of hesitancy extend beyond individual households and become a broader public-health threat, especially in a country where polio remains a critical marker of immunization-system fragility. The evidence further suggests that rural and underserved populations are likely to experience a disproportionate burden of these consequences because structural barriers and distrust tend to cluster in precisely those settings where routine preventive services are already least resilient.

At the same time, the findings imply that improvement is possible when communication and delivery strategies are approached together rather than in isolation. The reported benefit of mobile-based awareness interventions, although limited in the available evidence base, supports the broader view that tailored communication, community engagement, and behavioural nudges may enhance vaccine acceptance when aligned with local needs and supported by trustworthy service delivery. This is especially relevant in environments where false information spreads rapidly through informal networks and digital platforms. Media discourse and propaganda surrounding vaccination have already been shown to shape vaccine narratives in Pakistan, suggesting that communication strategies must move beyond one-directional health messaging and instead focus on trust restoration, local credibility, and active community participation (13,16). However, communication alone is unlikely to succeed if families continue to encounter stock-outs, absent vaccinators, or inaccessible facilities. For this reason, the most credible policy response is one that combines public education with dependable vaccine availability, trained staff, and visible improvements in frontline service quality.

Several limitations of this review should be acknowledged. First, as a narrative review, the synthesis is interpretive and does not provide pooled effect estimates, formal comparative weighting of studies, or meta-analytic precision. Second, the included evidence is heterogeneous in design, scope, and reporting style, which limits direct comparability across studies and prevents firm conclusions about the magnitude of each determinant. Third, because the review integrates empirical studies with public-health reports and policy-oriented sources, the overall conclusions are best understood as thematic and explanatory rather than causally definitive. Nonetheless, this narrative approach remains useful because it allows a broader, context-sensitive reading of vaccine hesitancy in Pakistan, where the problem is shaped by overlapping behavioural, political, and service-delivery realities that are not easily captured through a single analytic framework.

The findings have important implications for policy, practice, and future research. Policymakers should prioritize integrated immunization strategies that combine myth-correction, community-based outreach, and strengthened frontline delivery systems. Health authorities should invest in training vaccinators, stabilizing supply chains, and improving local accountability in underserved regions, while also partnering with trusted community figures to counter misinformation in culturally appropriate ways. Future research should move beyond descriptive assessments and examine how specific determinants vary across provinces, vaccine types, and population subgroups, particularly among mothers, rural households, and communities with repeated campaign exposure. More methodologically robust analytical studies, including mixed-methods and longitudinal designs, are needed to clarify how trust, access, and misinformation interact over time and to identify which intervention models produce the most durable gains in vaccine uptake and completion.

CONCLUSION

Vaccine hesitancy in Pakistan is a complex and context-dependent public-health challenge driven by the combined influence of inadequate vaccine knowledge, misinformation, sociocultural beliefs, distrust in immunization programmes, and persistent weaknesses in healthcare delivery. Its impact on immunization coverage is substantial, contributing to incomplete vaccination, uneven protection across communities, and continued vulnerability to vaccine-preventable disease outbreaks. The available evidence supports the need for a coordinated response that simultaneously strengthens frontline immunization services, improves public communication, addresses local myths and distrust, and expands equitable access to reliable vaccination. Sustainable improvement in immunization coverage in Pakistan will depend not only on increasing vaccine availability, but also on rebuilding public confidence through consistent, community-responsive, and trustworthy health-system performance.

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