

Parental Vaccine Hesitancy and Incomplete Childhood Immunization in Primary Care

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Abstract

Review Article

Parent vaccination responses are an increasingly important cause of incomplete childhood vaccination. The primary healthcare system worldwide is affected by parental vaccination responses. This paper dissects the vaccine hesitancy of parents and incomplete immunization of children, the role of the primary care in more vaccine uptake, and more. This reflects how vaccine hesitancy can be slow, and vaccine-specific. Vaccine hesitancy can stem from misinformation or mistrust. It can also be due to factors such as those who have low education, accessibility issues, and issues with health systems. Health demands can be met by means of evidence-based communication, culturally attuned counselling, shared decision making, reminder recall systems, enhanced scheduling and team organization strategies in primary care. The researchers further explored various interventions that focused on education, behavior and systems in vaccines completion. We will also look at the broader health, social, ethical, and legal contexts that influence parents' decision-making and uptake of vaccines. Monitoring vaccination coverage and identifying groups at risk of being under-vaccinated will inform community interventions to prevent disease outbreaks. On the whole, there is evidence to suggest that vaccine hesitancy is not generally a simple problem of an information-deficit for people to use vaccines. A primary care intervention strategy that is coordinated, relationship-based and family-oriented can enhance parental confidence in vaccines and increase opportunities for vaccination 'OV', and complete and on time childhood vaccination 'COTCV'.

Keywords: Vaccine hesitancy, Childhood immunization, Primary care, Parental attitudes, Immunization uptake.

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1. INTRODUCTION

Vaccine hesitancy refers to delays in acceptance or refusal of vaccines despite the availability of vaccination services [1]. Incomplete childhood immunization denotes missed doses or vaccines not received according to the schedule recommended by the World Health Organization [2]. Primary care has a critical role in addressing vaccine hesitancy and ensuring full and timely immunization against vaccine-preventable diseases in childhood [3]. Vaccination protects children's health and development and helps prevent the reintroduction of vaccine-preventable diseases in the population [4].

Immunization against vaccine-preventable diseases is one of the greatest achievements of public health [5]. High immunization coverage provides individual protection and contributes to herd immunity, which helps protect individuals unable to be vaccinated or for whom the vaccine is less effective [6]. Studies suggest that approximately 20% of children younger than

2 years of age in high-income countries are incompletely immunized [7]. Parental vaccine hesitancy is a key factor contributing to incomplete immunization [8].

2. Conceptual Framework: Vaccine Hesitancy and Immunization Uptake

The WHO Triangle of Immunization suggests that vaccine uptake is influenced by three domains: demand, supply, and the environment [9]. Demand is determined primarily by parental attitudes and beliefs about vaccination [10]. A range of models has been developed to examine the determinants of vaccine hesitancy and to support the planning of interventions to reduce its impact [11]. A modified version of the Health Belief Model suggests that vaccine hesitancy is influenced by cognitive and affective factors such as perceived susceptibility, severity, and vaccine efficacy, as well as the perception of social norm [12]. The reasons for vaccine hesitancy can also be framed in terms of the psychological capability, physical capability, physical opportunity, social opportunity, and reflective social

processes required to undertake a behaviour according to the COM-B model [13].

Despite the use of numerous behaviours and indicators of vaccine hesitancy, the relationship with vaccine coverage remains weak in many settings [14]. A positive association is generally observed only when a general marker of vaccine hesitancy [e.g., agreeing with the statement that vaccines are not safe for the child] is considered [15]. These studies examine all vaccines together and often rely on logistic regression modelling [16]. Therefore, both the specific association of vaccine hesitancy with childhood immunisation coverage and the direction of the relationship over time [i.e., whether an increase in hesitancy is followed by a decline in childhood immunisation coverage] remain unverified for most childhood vaccines [10]. It is also important to ascertain whether the association is present in population subgroups and over shorter periods to enable more targeted interventions or inform policies to strengthen vaccine confidence [17].

3. Epidemiology of Incomplete Childhood Immunization

Globally, more than 25 million infants lacked routine DTP3 vaccination in 2021, with under-immunization rates increasing in many high-income nations [18]. Various data sources highlight the emergence of vaccine hesitancy as a significant barrier to the successful completion of recommended childhood immunization schedules [19]. Such hesitancy can occur even among parents who, for their firstborn children, had fully immunized them against the relevant diseases [20]. Cognitive, affective, social, cultural, and trust-related factors interact to influence a parent's decision to complete a childhood immunization schedule [21]. Unlike parents equipped with evidence-based knowledge regarding vaccines and their associated diseases who are willing to choose or delay vaccination as medically appropriate for their infants, childhood vaccine hesitancy is often driven by misinformation and disinformation [22].

The vaccinations required to start and complete various childhood immunization schedules represent important clinical milestones for individuals and populations, serving as sentinel events in the area of public health [23]. During these transitions, children are at special risk because the emergence of population immunity can be delayed or prevented [24]. For example, although older children represent a small proportion of COVID-19 cases, they may be more vulnerable to severe illness than younger children when viral variants with increased severity of illness emerge [25]. Examination of key milestones for children at risk can highlight the populations most in need of preventive or remedial vaccination interventions [26].

4. Determinants of Parental Vaccine Hesitancy

Vaccine hesitancy has been associated with delays, refusal, and incomplete vaccination; however, it is not a homogenous trait but comprises multiple dimensions [e.g. cognitive, affective], influenced by multiple factors [e.g. individual, social, cultural, environmental] and across diverse population groups [e.g. age, education, income] [20]. Parental vaccine hesitancy leads to delays, refusals, and incomplete vaccination of children and is associated with poor decision-making in health, not just related to vaccinations [27]. Evidence suggests that parental vaccine hesitancy is shaped not only by personality traits, but also by a range of individual, social, cultural, economic, and health system factors [28]. Cognitive biases and personality traits play a role, but external influences are equally important [29]. Communication about immunization is multi-faceted; parents do not engage in vacuum, but derive information from various sources and interact with health-care providers [28]. Research confirms that parent vaccine hesitancy might be influenced by a lesser extent by being knowledgeable about vaccination than by the absence of misinformation regarding vaccination [30]. Vaccine hesitancy varies according to parental educational level, in that high maternal education is associated with higher rate of complete vaccinations, but that very low education might be associated with missed appointments [31].

Initial models conceptualizing vaccine hesitancy relied on perceived risk of illness, the perceived benefits of the treatment against these risks, and vaccine side effects [32]. Progressing towards a broader understanding of vaccine hesitancy, the World Health Organization proposed a triangular model of vaccine hesitancy, where trust in health systems, vaccine manufacturers, and decision-makers are all intimately related [33]. Trust influences vaccine acceptance and uptake, not simply as a background factor but as a social process occurring at different levels—individual, group, and population [34].

5. Role of Primary Care in Vaccination Delivery

The evidence base for parental vaccine hesitancy and its association with incomplete childhood immunization is supported by systematic reviews of data from multiple cohorts, largely based on routine childhood vaccinations [35]. Analyses of these data have revealed critical gaps in vaccination coverage among children in the first two years of life [36].

Barriers to vaccination are myriad and work at multiple levels in the socio-ecological model [8]. Within healthcare systems, patient-provider communication can limit vaccination, and yet the role of primary care is uniquely placed to positively influence vaccination [20]. Shared decision-making [SDM] for vaccination, an evidence-based communication strategy defined in other areas of clinical practice, has received limited attention in the vaccination literature, although it is an accepted

tenet of child healthcare delivery that recommendations are framed in a manner aligned with parental values [18]. Furthermore, primary care plays a critical role in scheduling, tracking, and supporting completion of immunization schedules [7]. Wider implementation of both communication strategies and logistical solutions can facilitate the vaccination process, surmounting some of the barriers to vaccination uptake [30]. These interventions are not panaceas, however, as often vaccination demand is the root cause of parental hesitance [32]. Addressing vaccine hesitancy, systemic financial support of vaccination programs, and the correction of false information in social media require interventions beyond the purview of primary care [31]. Nevertheless, evidence-based communication strategies for parents alongside solutions to logistical barriers present a practical approach for childhood vaccination in primary care [28].

5.1. Communication Strategies with Parents

A non-judgmental, situationally aware, and culturally sensitive dialogue with parents enhances trust and is more likely to influence decision making than strongly-worded advice [37]. Parents should perceive caregivers as partners in the health of their children [38]. Providers should utilise a wide range of risk communication strategies, tailoring vaccinated children's wellbeing to the personal circumstances of vaccine-hesitant parents [39]. Their parents should therefore receive guidance about the dangers of vaccines and their effectiveness through evidence-based materials [e.g. pamphlets from the Infectious Disease Society of America] [40]. One useful technique involves the 'just-in-time' technique designed by the Academy of Breastfeeding Medicine [41]. Parents who are vaccine-hesitant at a visit should be permitted to discuss their concerns and decisions about vaccinations; providers can record anticipated worries in the child's chart and reassure parents that they are free to ask any questions [42]. Such approaches can reduce distress levels and increase adherence rates [43].

The most widely reported method to manage vaccine hesitancy is the accurate and non-judgmental addressing of parents' concerns [44]. One study emphasises the need to balance direction and support, with suggestions acting as positive reassurance rather than pressure [45]. Listening to hesitancy, acknowledging concerns, and seeking to generate conditions in which parents feel free to ask questions generates an alliance [46]. Empathy statements can provide permission for hesitation, affirm the difficulty of the decision and express nurturing for the child [47]. Caregiver reassurance that hesitancy is common seems useful [47]. A matter-of-fact approach that normalises vaccination may likewise help, particularly among parents who have similar social identities or understandings of the world as the health professional [48].

5.2. Shared Decision Making in Immunization

Shared decision making [SDM] in vaccination involves the exchange of information with parents about the risks and benefits of vaccines as well as any other options in the light of uncertain evidence or an uncertain environment [49]. It provides the opportunity for parents to share their values and preferences with healthcare professionals, who then recommend vaccinations according to the evidence [50]. The proposed clinical recommendation should reflect parental values, and when it does not, the option chosen by parents should be documented [47]. The traditional clinical approach and unilateral didactic health communications support situations in which vaccine acceptance is the norm but leave little room for negotiation about individual vaccinations [51]. During disagreement, the classical paternalistic style may drive parents to accept an option they do not support, while a purely communicative approach may miss the opportunity to guide them toward a choice with unequivocal benefit [52].

Vaccines should be offered to parents in the same way as medications or tests when the approach is directive [22]. When parents disagree with the immunization recommendation, they should be given the space to elaborate on their decision-making process and to ask questions [53]. Physicians should explore and seek to understand the reasons for the refusal in order to address any concerns, provide support, and give more time when needed [54]. In this way, the values and beliefs of parents and their children are incorporated into the vaccination decision [54]. Guidance should be provided not only to support a choice aligned with the vaccination recommendation but also to highlight the relevant options and values that parents might wish to consider [55]. Decision aids should be developed to help parents navigate the difficult decision of accepting or refusing immunization for their children, taking into consideration both the values that support the vaccination decision and the broader context of the vaccination exchange in clinical practice [56].

5.3. Scheduling, Access, and Reminder-Recall Systems

Vaccination uptake is influenced by appointment scheduling, access to services, and reminder systems [57]. Recommendations should be offered to parents in a timely manner, taking into account the usual schedule for vaccination [57]. In addition, reminder-recall mechanisms have been shown to be effective in increasing coverage rates and reducing the proportion of children with delayed vaccinations [58]. The implementation of reminder systems can therefore be strongly recommended, especially in practice settings with electronic health record systems [59].

When children are more than 60 days overdue for a vaccine dose, such as for measles, rubella, hepatitis B or varicella, and when multiple vaccines or additional doses [pneumococcus] are indicated, clinicians should

consider advising parents to bring them in even without a scheduled visit [60]. At these visits, services can be added to address additional needs, including well-child care, acute care and screening for lead poisoning [61]. Additionally, whenever a child presents for any other health concern [e.g., fever], clinicians should be diligent in reviewing the immunization record and providing indicated vaccinations [62].

6. Evidence-Based Interventions to Improve Uptake

Several intervention strategies are available to strengthen immunization uptake [63]. Educational strategies aim to mitigate vaccine hesitancy and arboviral trust, and look promising in particular for parents hitherto uninformed or misinformed [62]. Behavioral economics employs nudge to shape the choice context and sustain parental compliance [64]. Finally, organizational changes in primary care seek to engross information and support patients through the vaccination process without overt persuasion [65].

Educational interventions target specific knowledge deficits or misconceptions—in particular, the contributors to vaccine-hesitant parents preferring to delay vaccines until their children are older, giving “fewer vaccines at once”, or receiving “only vaccines that are really necessary”—and adopt many different formats [lectures, pamphlets, videos] for diverse audiences [parents, young people, pregnant women] [44]. A key measure of effectiveness is the change in participants’ knowledge about vaccine safety, side effects, and effectiveness [66]. Although raising knowledge has had minimal effects on vaccination uptake, other evaluations have detected significant changes in parents’ attitudes toward vaccines [45].

6.1. Educational Interventions

Educational interventions about vaccination are usually designed to increase knowledge and/or modify attitudes and beliefs in specific populations [parents, patients, healthcare workers] using different strategies, such as brochures, booklets, presentations, websites, or talking sessions [67]. Knowledge improvement might not be sufficient to increase vaccination rates; modifying attitudes toward vaccination is usually the main target, as vaccines cause allergic reactions or other adverse effects [68]. When attitudes shift toward vaccine acceptance, vaccination rates are usually monitored [69].

Parental education interventions typically focus on the child's immunization schedule and are delivered during prenatal care or early health surveillance consultations [70]. It has been shown that providing objective advice from a trusted healthcare provider during a natural dialogue is more effective than performing formal educational interventions for parents of infants and children [71]. Indeed, other studies found that situational and culturally sensitive communication of risks and addressing the parents’ concerns are key for accepting vaccination [72]. A recent systematic review

on school-based vaccine education programs indicated that they can play a role in increasing vaccination coverage at school entry for an entire population and that they should be offered as a complementary rather than as a stand-alone intervention [73]. Education interventions in childhood primary care have been associated with nonsignificant increases in vaccination rates [74]. Properly designed data collection on the targeted populations and registration of vaccination uptake are essential for adequately assessing the impact of educational interventions [75].

6.2. System-Level Interventions in Primary Care

Immunization in primary care is a system-level intervention whose effect on vaccination uptake is worthy of consideration [76]. Primary care teams can enhance vaccination coverage through team-based approaches, integration of vaccination reminders into routine care across different types of visits, use of standing orders to simplify vaccine delivery, and adoption of population health approaches that identify and engage patients at risk of underimmunization [77]. These interventions improve vaccination rates and reduce disparities in immunization status, and they are frequently more successful than similar initiatives in other healthcare delivery settings [78].

Vaccination delivery is a team sport [79]. Clinicians other than the primary care provider are often the ones who give the vaccine to a patient presenting for an unrelated reason [80]. Immunization rates are greater among patients who receive care in clinics that remind parents of upcoming vaccines within the context of other scheduled visits [81]. Reimbursing physician practices for routine immunization reminders—rather than only for overdue vaccine catch-up reminders—enhances uptake [57]. Extending routine vaccine reminders to visits for non-immunization-related reasons can improve childhood vaccination rates [82]. Consistent with these findings, reminders delivered during visits for unrelated health care have been shown to increase rates of pneumococcal and influenza vaccinations [83].

7. Barriers Within Healthcare Systems and Social Contexts

Incomplete childhood immunization arises from a complex interaction of factors [20]. Alongside parents’ vaccine hesitancy, healthcare system barriers and social contexts also play significant roles [44]. Barriers within healthcare systems relate to organizational, financial, and policy factors, while social contexts encompass the converse determinants of health model [78]. The influence of misinformation and inequities is further recognized [59]. Addressing these issues could reduce the number of children at risk of incompletely immunized status and the resulting public health consequences [84].

Healthcare systems sometimes create obstacles to vaccination for children of willing parents, and

families with the least resources may be the most affected [85]. Provision of vaccines from multiple sources, public and private, for free and fee-for-service, requires careful navigation [86]. Organizational barriers can be managed to some degree with access-focused interventions, but financial and policy hurdles are often beyond the control of front-line clinicians [49]. Interventions that operate on the eligibility or population level are therefore particularly important [14]. While the focus of primary care medicine tends to be on individual patients, the effects of deprivation and other social determinants are most keenly felt among those in the most disadvantaged communities [87]. Vaccination services cover a population requirement, are integrated into population health systems, and address equity issues [88].

8. Ethical and Legal Considerations

The ethics of vaccination decision-making consider the principles of patient autonomy, beneficence, and justice [89]. The respect of individuals' right to decide regarding their health and their children's health cannot be challenged, regardless of the choices made [90]. Questions arise when these choices may expose people to significant health risks, especially when made on behalf of children [91]. This gives rise to the principles of parental and surrogate decision-making [92]. For instance, parents must always act in the best interest of their children to safeguard their healthy development [15]. Vaccination is one of the widely recommended preventive measures during childhood because of its safety and efficacy, and therefore parents should be supported in their decision to accept vaccines [93]. However, when parental vaccine hesitancy leads to increases in vaccine-preventable diseases and outbreaks, mandates, policies, or laws may be supported to deny parents the right to choice [94]. In such situations, parental decision-making may conflict with the principle of beneficence [95]. An ethically justifiable limitation to autonomy is the imposition of an obligation to act in the best interest of children when the right is to refuse an intervention that presents clear clinical evidence of benefit [96]. This can be achieved either by making vaccination a legal requirement of childhood in society without exemptions or by creating external conditions that induce parents to vaccinate their children [96].

The public and clinicians engaged in vaccine-preventable diseases, and their discussion often involves elements of ethics [97]. Legal obligation generally considers the consent of individuals and their right to refuse any medical intervention for themselves or their children [98]. This is also the reason behind the concept of informed consent, which is a legal requirement for all medical treatments in most health systems [99]. Biostatistics and clinical epidemiology are the foundations of benefit-risk frameworks, used to make decisions within the medical community and by governmental health authorities in charge of vaccine recommendation [100]. Their purpose is to demonstrate

a clinical advantage, although resulting numbers often lack understanding by the wider public [101]. However, mandates introduced by different countries and municipalities in the world are part of an increasing list of these ethics discussions: when a parent balks at vaccinating a child, should the child be considered in need of intervention even if the parent is against? Should the parent be sanctioned? Should the parent be helped to reach a decision in beneficence and justice? [102].

9. Measurement and Monitoring of Immunization Coverage

Reliable estimates of vaccine coverage serve to evaluate past performance, detect areas at risk of outbreaks, inform the allocation of resources, and assess the impact of interventions [103]. Immunization uptake can be assessed at a given point in time [cross-sectional surveys] or over longer periods [cohort studies] [104]. Coverage indicators are usually based on the percentage of a defined population that has received a specific vaccine or combination of vaccines by a specified age [105]. Also, more basic indicators, such as the percentage of people susceptible to a given disease [those who have not been vaccinated], can be produced [106].

A variety of sources can be used to monitor immunization uptake. Most countries have developed and implemented national surveillance systems that regularly collect and publish data on vaccination coverage [107]. However, the quality, underlying methodology, and registration practices differ from country to country, especially between high- and low-income settings [108]. Disaggregation of immunization coverage data by key population characteristics—such as geographic location, socioeconomic status, ethnicity, and refugee or migrant status—can aid identification of groups with low coverage levels [109].

10. Implications for Policy and Practice

Addressing parental vaccine hesitancy, supporting child immunization, and ensuring childhood vaccinations are delivered to those who need them most can benefit from collaborative action by clinicians, clinics, and public health authorities [110]. A comprehensive agenda includes development and dissemination of educational materials for parents, culturally sensitive communication strategies for health professionals, support for shared decision-making in vaccination, scheduling appointments in advance and throughout the vaccination season, use of strategies to reduce access barriers, and implementation of mechanisms that remind and recall families when vaccines are due or overdue [18].

Although vaccine hesitancy is rarely the only underlying cause of low uptake in any given area, systematic application of the approaches outlined in this work promises to increase immunization rates [70]. Numerous studies have demonstrated that specific interventions not only help improve complete

immunization status in various settings and populations but can also be implemented effectively in routine practice [111]. Further testing of the approaches—for example, using randomized controlled designs, quantifying effects on immunization coverage as well as knowledge and attitudes, assessing combinations and timing of interventions, and detecting possible unintended consequences—would reveal which are the most successful and important in each local context [112].

11. CONCLUSION

Parental vaccine hesitancy is a multifactorial issue that leads to increasing rates of incomplete childhood immunization in many countries. The epidemic of misinformation related to vaccines through social media amplifies the cognitive and affective aspects of vaccination uptake, generating a reduction in confidence in vaccines and the health authority. Vaccine-hesitant parents have specific doubts and problems compared with hesitant parents who are not informed. Healthcare systems should therefore anticipate a higher demand for risk communication in a non-coercive and culturally sensitive way, avoiding the use of authoritative statements that could increase distrust. The importance of addressing parents' specific concerns and providing accurate information is essential for maintaining parental trust in vaccination safety.

Primary care personnel play a pivotal role in childhood vaccination; vaccination decisions are multilayered and must involve health workers, parents, and children. Adequate schedules, prompt access to vaccination, and continuous reminder–recall systems are effective in promoting vaccination with routine immunizations during early childhood. From a healthcare systems' perspective, the sustainability of childhood vaccination depends on the efficiency of communication within the healthcare team, the allocation of a skilled workforce focused on immunoprophylaxis across the population, organizational support that uses the vaccine activity of the different professional figures, and the integration of immunization programs with population health-management models in primary care.

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