



Research Article

INSIGHTS INTO VACCINE HESITANCY AMONG INDIAN PARENTS: A SYSTEMATIC REVIEW

¹Dr. A. Shamema., ²Dr. Syed Shariq Naeem and ³Dr.WaseemRizvi

Assistant professor, Department of Pharmacology, Jawaharlal Nehru Medical College, AMU, Aligarh

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ABSTRACT

Introduction: Vaccines are some of the most cost-effective public health interventions for reducing disease burden and mortality. However, in recent years, health systems have faced a growing challenge with an increasing number of parents who choose not to vaccinate their children. Vaccine hesitancy refers to all kinds of concerns that parents express by refusing some vaccines, delaying vaccines or accepting others. Primary care providers play a crucial role in promoting prevention and education interventions to achieve high immunization rates. **Aim & Objective:**To interpret the prevalence and major factors behind the hesitancy of vaccination among Indian Parents.**Methodology:** A systematic search of the peer-reviewed literature Indexed in Google Scholar and PubMed was done using search strings “Vaccination AND (Hesitancy OR Resistance) AND (Paediatric OR Parents) AND India”. Results from over 15 published articles met the Inclusion criteria and formed the final basis for the reason for Vaccine hesitancy in parents. **Results:** On interpretation, there is a significant result on parent’s hesitancy over paediatric vaccination. Many factors were found to be contributing, mainly parent’s knowledge of vaccines was poor. Unemployed and pregnant mothers expecting their first child were found as more vaccine-hesitant. The majority of parents were concerned about the safety, side effects, and efficacy of childhood vaccines. Birth order is also one of the most significant risk factors.

Conclusion: Effective strategies like access to accurate information, addressing parent’s specific concerns and building trust and educating parents will combat hesitancy.

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INTRODUCTION

“Vaccine hesitancy [VH] refers to the delay in acceptance or refusal of vaccinations despite the availability of vaccination services”¹. Vaccines are being recognized as one of the most successful public health interventions, preventing millions of deaths and disabilities worldwide. They also played a major role in controlling and eliminating diseases such as polio, measles, and tetanus. Vaccination programs are among the most efficient methods to immunize people. They also hinder the spread of diseases to those who have not been vaccinated, decreasing sickness, death rates, and healthcare expenses². Successful immunization coverage lies in the hands of the decision-makers the children, usually parents or the caregivers. The decisions made by parents regarding vaccination for their children are motivated with the aid of using a mixture of psychological, sociocultural, and political factors, in addition to medical and financial considerations³. Adding to the complexity, there is an increasing quantity of unverified information on vaccines from non-medical sources, online community groups supporting and opposing vaccination, and the challenge of evaluating sources of information. The rise of social media platforms like Facebook, Twitter, blogs, online forums, and wikis has made it easier for people to access various sources of information about

vaccines, including those that lack scientific backing. Given the complexity of this situation, it is not unexpected that conflicting data and a lack of reliable sources may contribute to doubt and suspicion⁴. Thus, in recent times, there has been increasing attention on the conduct of individuals ranging from those who fully accept to those who completely refuse, i.e., are hesitant, to receive vaccines. When individuals decline or delay getting vaccinated, it leads to gaps in vaccine uptake and immunization coverage rates, which can contribute to the spread of vaccine-preventable diseases (VPD). Therefore, vaccine hesitancy (VH) poses a significant danger to the eradication of vaccine-preventable diseases (VPDs), such as measles, polio, and others, and is also a major contributor to their re-emergence¹. India, as a nation, has the highest birth cohort in the world, with 27 million children being born each year. It has not been able to achieve the target of 90% coverage for all vaccines included in the national immunization schedule due to various factors, including VH¹. Therefore, it is imperative to assess the causes of VH in India and thereby proposing a proposal which is economical and acceptable by the community. This study is planned to assess the quantitative data on VH prevalence in India and determine the major factors predisposing to it.

*Corresponding author: **Dr. Syed Shariq Naeem**

Assistant professor, Department of Pharmacology, Jawaharlal Nehru Medical College, AMU, Aligarh

METHODOLOGY

Literature Search

An extensive literature search was performed in PubMed for research articles with “vaccine” AND “hesitancy” [All Fields] AND “India” [All Fields] AND “parents” over the 2019–2023 period and in Google Scholar for additional articles published during the same period by searching as “vaccine hesitancy and resistance among Indian parents”. Articles reporting results from a quantitative survey regarding VH in India were included in the review.

In Other search engines such as Science Direct and Up To Date, we searched for articles using SEARCH TERMS such as 'Vaccination', ' Immunization', 'Immunization programs', 'Choice Making', 'Decision making', 'Risk Evaluation', 'Trust', 'Ambiguity', 'Vaccine Rejection', "Vaccine Refusal", 'Attitude to Health', ' Health conduct', 'Opposition to Vaccination', 'Young Child' and ' Infant', 'Preschool'.

Inclusion Criteria

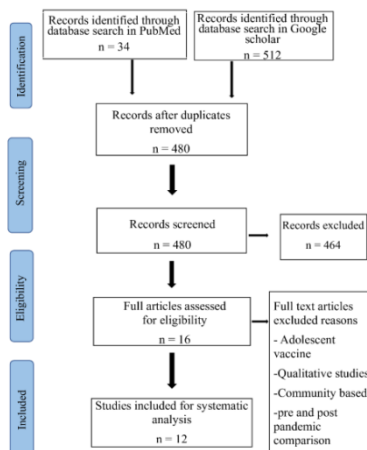
Studies were included if they were quantitative original research studies examining parental vaccine perspectives and/or beliefs; irrespective of whether they examined one or a combination of vaccines or vaccine-preventable illnesses; and published from 2019 to 2023. Full articles with open access were only considered.

Exclusion Criteria

Studies that investigated vaccination barrier prevalence in particular castes and communities, studies on adult and adolescent vaccination, vaccine hesitancy in parents with disabled children, studies on Covid vaccination hesitancy, studies reported from countries other than India, and articles regarding managerial issues on vaccination centres were excluded. Review articles, articles with only abstracts available, and qualitative articles were also excluded.

Data Extraction and Synthesis

For every study, information about the design of the study was extracted from the articles. This included the method of how participants were recruited, the type of participants and from which geographical locations were involved, the number of participants recruited, the relevant vaccine or vaccines studied, and the specific questions used to measure attitudes and beliefs about vaccination.



To analyze the data, the information from each study was organized into a table and categorized according to the type of

study, sample size, method of recruitment, and location. We then summarized the table to determine the prevalence of vaccine hesitancy and the factors associated with it in our country.

RESULTS

After the exclusion of the articles not related to vaccination or focused on adult/covid/traveler vaccination, twelve articles reporting childhood VH determinants in India were retrieved. Six of them 6,7,8,9,10,11 reported results from a cross-sectional study based on SAGE questionnaires. Three of the studies used semi-structured questionnaires 12,13,14. Two of the articles selected were conducted research based on the KAP method 15,11. One study mixed a cross-sectional survey using SAGE with Interviews 15. Among those articles, ten were reported from routine immunization of children, and two were specific to measles-rubella (MR) vaccination. The prevalence of vaccine hesitancy among Indian parents of various states was found to be ranging around 3.4% - 64.6% (median 26.87%) from the reviewed articles. The major factors accountable for vaccine hesitancy were found to be the father and mother’s education, nuclear families, lower socioeconomic class, increased distance to the health care facilities, and mothers who received less antenatal care (<4 antenatal visits). These factors show significant p values (< 0.05) and with 95% CI, which is mentioned in detail in the table (Table 1) below.

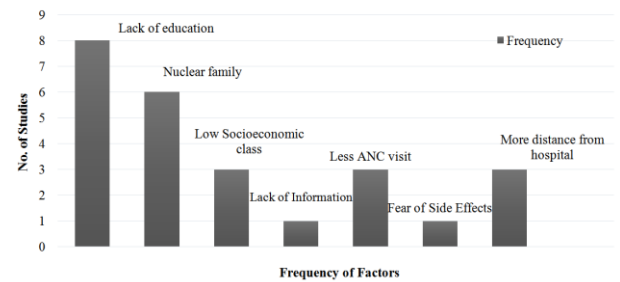


Figure 2 Major factors responsible for Vaccine Hesitancy in the included

The Figure 2 shows the major factors that are found to be responsible for vaccine hesitancy among Indian parents and play a crucial role in determining vaccination coverage over various regions of the country. All these factors are proven to be statistically significant in each study, therefore while taking measures for vaccination coverage, these factors have to be kept in mind and should tailor the plan accordingly.

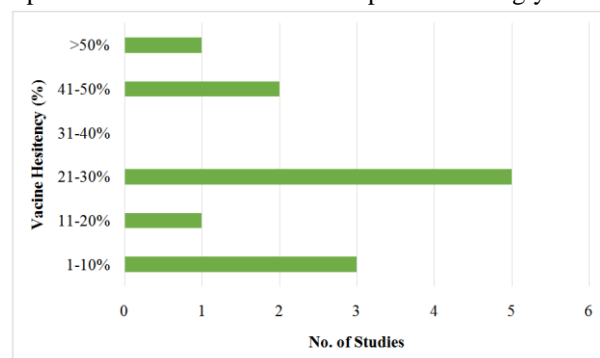


Figure 3 Percentage of parents showing vaccine hesitancy in included studies.

YEAR OF STUDY	PLACE OF STUDY	NAME OF THE STUDY	METHOD USED	PARTICIPANTS	RESULT
2019	Balangir&Nupadadt, Odisha	(Sharma et al., 2020) ⁹	Cross-sectional SAGE questionnaire	n = 250 Households with children under 5 years of age with at least 12 years of residency in the same area	VH= 25.7% Significant P values for Long time and distance to reach the health care<0.001(11% & 9%) Negative information on vaccines 0.03 (28% & 9%)
2019	JIPMER rural health centre, Puducherry	(Krishnamoorthy et al., 2019) ¹⁶	Mixed stud - cross-sectional SAGE questionnaire -In-depth interviews	n = 484 Parents of children over 9 months to 15 years of age	VH= 14.1% Significant P values for Mothers more than 30 years of age 0.01 (19.8%) Less significant values for Less education of father and mother
2020	Rural ward of Bavla, Urban wards of Behrampura, Vasna Gujarat	(Gupta et al., 2021) ⁸	Cross-sectional SAGE questionnaire	n= 9466 Parents and caregivers of children age 12 to 72 months old	VH= 9.6% Significant values with 95% CI for The nuclear family(p-value- 0.02) Other backward classes (p-value- 0.002) Maternal education (p-value- 0.04)

YEAR OF STUDY	PLACE OF STUDY	NAME OF THE STUDY	METHOD USED	PARTICIPANTS	RESULT
2020	JSS medical college, Mysore, Karnataka	(Sebastian, 1704) ¹⁵	Cross-sectional KAP questionnaire	n = 168 Parents of children aged from 2 to 5 years	VH= 23.8% Significant P valuefor Less education of fathers 0.001 More number of children 0.001 Low socioeconomic class 0.001
2020	Wards of Rajpur-Sonarpur municipality, West Bengal	(Sikder et al., 2020) ¹⁰	Cross-sectional SAGE questionnaire	n = 352 Parents of 0 to 59 months old children	VH= 29% Significant P values for Nuclear families (57%) Mothers less educated (29.6%)
2021	Bathalapalli, Anantapur, Andhra	(Goruntla et al., 2023) ⁷	Cross-sectional SAGE questionnaire	n = 547 Mother of children under 5 years of age	VH= 28.05% Significant P values for Nuclear family -0.024 (31.8%) Illiterate mothers <0.001 (50%) Father's education<0.001 (100%) Lower middle class – 0.015 and Upper lowerclass – 0.008 (28%) Lesser Antenatal visit <0.001 (32%)

YEAR OF STUDY	PLACE OF STUDY	NAME OF THE STUDY	METHOD USED	PARTICIPANTS	RESULT
2021	PGIMER, Chandigarh	(Wagner et al., 2021) ¹	Cross-sectional SAGE questionnaire	n = 345 Mother of children under 5 years of age	VH= 10% Significant values of 95% CI for Mothers with less education (p-value- 0.014) Mothers who had fewer antenatal visits-p-value- 0.013
2021	Dallupura, New Delhi	(Cherian et al., 2022) ¹³	Cross-sectional Face to Face interview with semi-structured questionnaires	n = 50 Parents of 13 – 24-month-old children	VH= 28.9% Significant P values for Nuclear family 0.031 (31.1%) >30 mins to reach health facility 0.039 (50%) Antenatal care not received by mother 0.021 (53.8%)
2021	Kasturba medical college, Mangalore	(Thapar et al., 2021) ¹⁴	Cross-sectional Semi-structured questionnaires	n = 172 Mothers of children under 5 years of age	VH= 3.4% Very low prevalence No significant P values Fear of side effects (80.8%) Distance from health care (30.8%)

YEAR OF STUDY	PLACE OF STUDY	NAME OF THE STUDY	METHOD USED	PARTICIPANTS	RESULT
2021	MR campaign, Meerut cantonment, Uttar Pradesh	(HM Kasi Viswanath et al., 2021) ¹¹	Cross-sectional KAP semi-structured questionnaires	n = 30950 Mothers of school children from nursery to 10 th standard	The significant value of 95% CI for Less education of father and mother Unemployed mothers
2022	Midnapore medical college, West Bengal	(Ghosh et al., 2022) ⁶	Cross-sectional SAGE questionnaire	n = 1678 Caregivers of children around 1-5 years of age	VH= 41.6% Significant P value for Nuclear families 0.041 (55.7%) Illiterate mothers <0.001 (64.2%)
2023	Immunization clinic of KIMS, Bhubaneswar	(Banerjee et al., 2023) ¹²	Cross-sectional Semi-structured questionnaires	n = 88 Parents of children less than 18 years of age	VH= 45.3% Significant P values for SEC 0.0016 (Upper lower- 79% & Lower middle- 66%) Father's education 0.03 (primary- 92.6% & Illiterate- 40%) Mother's Education 0.036 (primary- 87% & illiterate- 69%)

Figure 3 depicts the bar chart of the percentage of prevalence of vaccine hesitancy among parents in each study. It shows that five studies have vaccine hesitancy in the range of 21-30% while three studies categorized vaccine hesitancy at 1-10%. Only three studies have mentioned vaccine hesitancy in the parents more than 41%. The reviewed articles were assessed for their quality using a tool QuADS17. It is a tool developed for assessing the quality of diverse types of studies, it evaluates various aspects of the study such as study design, population, methodology and reporting. By systematically evaluating these elements were helpful in determining reliability, validity and potential biases present in the study. This will help in understanding the strengths and limitations of the study findings and in making informed decisions about the clinical applicability.

In the Qu ADS tool, all the studies were scored accordingly based on how clear the research aim was, refined study setting and population, validated study tool and content, data collection methods and how all the data were recorded and analysed. The Qu ADS tool did not mention any high score or low score cut-off in this tool. It's just for the understanding of the researcher on the articles they reviewing.

As shown in the figure 4, some of the reviewed articles got low scores because they failed to explain the section of analysis clearly (Sharma et al., 2020⁹, Sikder et al., 2020¹⁰, HM Kasi Viswanath et al., 2021¹¹, Sebastian, 1704¹⁵). In some articles, it is found that the rationale, format and content of the study tool was not explained in detail (Cherian et al., 2022¹³, Ghosh et al., 2022⁶, Sebastian, 1704¹⁵) while the other articles (Sikder et al., 2020¹⁰, Gupta et al., 2021⁸, HM Kasi Viswanath et al., 2021¹¹, Sebastian, 1704¹⁵) the sampling methods were not clearly mentioned. Questionnaire used for the assessment of the articles is provided as supplementary file 1.

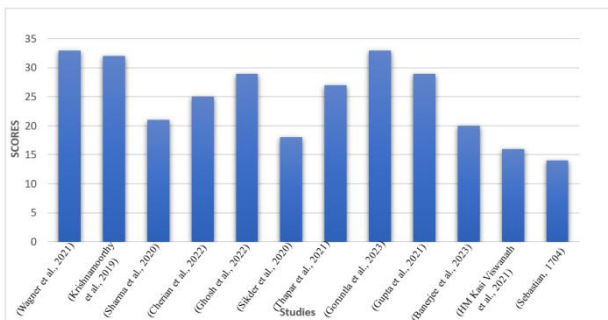


Fig.4 QuADS Tool for evaluation quality of the study

DISCUSSION

In our study, parents who are hesitant about vaccines are made up of a diverse group, with different attitudes and beliefs about specific vaccines. Vaccine hesitant parents can be seen as falling on a continuum, from those who are strongly against all vaccines to those who fully support them¹⁸.

The "Quality" of the bond between parents and the healthcare provider also seems to be significant. It was discovered that parents with reduced levels of trust and reliance on their child's physician also had diminished faith in the safety of vaccines¹⁹. The level of trust is a key factor that distinguishes between parents who are vehemently against vaccines (known as "vaccine refusers") and VHPs. In our review, it has shown that parents are vaccine-hesitant due to a lack of information

from the health care and not providing assurance when asking about their concerns, making them liable for lack of trust in the health care system. Younger parents may rely more on social media networks like Facebook and Twitter for information, resulting in high vulnerability to misinformation. From the articles we have reviewed, over 7 articles showed an increased frequency of vaccine hesitancy reported due to fear of adverse reactions. A study analysing the content of websites or social media platforms regarding vaccination discovered that the data varied in terms of quality, with a majority of unfavorable content²⁰. It should be the exclusive duty of the healthcare system to establish confidence with parents and caregivers by offering sufficient information and addressing all their concerns regarding vaccination.

Ironically, education status of the parents appears to have conflicting impacts on vaccination attitudes, with one study indicating that parents with higher levels of education were nearly four times as likely to express concerns about vaccine safety compared to those with lower levels²¹. Conversely, a recent global study on attitudes toward immunizations found that individuals who were unemployed were more inclined to hold negative views regarding vaccine safety and effectiveness¹⁶. In our analysis, a research study conducted in Indian state of Andhra Pradesh reported a vaccine hesitancy rate of 39.9%, with a p-value of 0.015 in the lower middle class and 0.008 in the upper lower socioeconomic classes. A study conducted in Mumbai revealed that loss of income was a common reason for missing childhood immunizations in slum areas, underscoring the importance of community-based initiatives²². The cost of vaccines and vaccination poses a challenge, as only a limited number of vaccines are provided for free in charitable hospitals or as part of the national immunization program²³. Nevertheless, vaccine hesitancy is also observed among populations with higher socioeconomic levels and higher educational status ²⁴.

In addition, a high level of education is strongly associated with improved health literacy and understanding of vaccine-related information. This is evident in the education and guidance provided by healthcare professionals at both individual and institutional levels, as well as through public health education campaigns. Therefore, the educational level of parents plays a significant role in vaccine hesitancy. The studies have consistently shown that a lack of education among both mothers and fathers leads to an increased likelihood of vaccine hesitancy. This is a statistically significant factor in vaccine hesitancy. Research has indicated that parents with lower levels of formal education tend to have a greater distrust of the medical community, express more concerns about vaccine safety, and have less confidence in the necessity and efficacy of vaccines^{25, 26, 27}.

Information or reassurance from a child's healthcare provider can help parents make informed decisions about vaccinations and increase their acceptance and compliance with childhood infectious diseases. The lack of knowledge on vaccine-preventable diseases might also additionally lead to parents declining vaccination for their children or allowing their children to have the disease run its natural course^{5,15}.

Parents' concerns about vaccine safety can extend beyond immediate reactions to fears of potential long-time period complications, including neurological conditions. Although the proposed affiliation between the measles vaccine and

autism has been scientifically disproven²⁸, a few parents retain to explicit reservations approximately the MMR vaccine inflicting this ^{29, 30}. Two of the reviewed studies discovered that parents exhibited a higher degree of skepticism (29%) and anxiety (39%) due to inadequate information and adverse content on social media. The influenza vaccine is another example, in which a few parents are concerned that this vaccine may also result Guillain-Barre syndrome even though several studies of cutting-edge formulations of the influenza vaccine have now no longer been able to validate such an association³¹. Similar safety issues have been raised after the deaths of 7 women during human papillomavirus (HPV) vaccination trial conducted in 2010³². An enquiry committee investigated the controversial instances and concluded that the vaccines were not responsible for the deaths. Even though the deaths and severe adverse reaction were unrelated to the vaccines, but initial media news regarding such incidences has a long-lasting impact on parents' psyche. The health care system should ensure a swift rebuttal of such reports in the media to prevent the spreading of the rumours.

Lack of get admission to immunization facilities, healthcare workers, and know-how approximately the timing and area for vaccinations had been identified as reasons for delayed or neglected vaccinations in nationally representative surveys conducted between the year 1998 to 2008²². Three of the research studies we evaluated found that long distances and time are the primary factors affecting vaccine accessibility, leading to parental hesitancy or refusal. However, this issue can be addressed through targeted interventions, such as organizing additional vaccine camps or mobile health clinics in areas lacking health facilities and increasing the number of health workers visiting hard-to-reach regions. It has been stated that a large number of children could not complete their immunization schedules because the health services were not able to reach them regularly³³. This highlights the importance of using innovative methods, like geographic information system mapping and collaborating with local community-based organizations, to reach marginalized populations with limited access to healthcare services, including immunization ³⁴.

The study also found that joint family structures are associated with lower vaccine hesitancy rates^{13, 6}. In a joint family, all family members support the child to be vaccinated without delay which results in less vaccine hesitancy. In nuclear families, the mother is solely responsible for the child's vaccination, which may lead to delays if she is occupied with work or caring for other children, or if the child is unwell. Thus, the nuclear family is liable for the increased frequency of vaccine hesitancy compared to joint families supported by significant statistical findings among five of the articles reviewed in our study.

Antenatal care (ANC) refers to care received during pregnancy provided by a health worker in a clinical facility or at home. It addresses both psychosocial and clinical needs of the women. In our study, three of the articles have established that mothers who did not receive antenatal care implicit for vaccine hesitancy with significant p values. Moreover, lacking antenatal visits can result in mothers being unaware of the importance of vaccination, which increases their reluctance to vaccinate their children. Hence, ANC providers play a key function in disseminating relevant facts about mother and infant health to pregnant women, which includes the

significance of vaccination, both for the unborn child and for other children in the family¹³.

Another factor for VH was acute illness of the child at the time of vaccination. Although it was reported in three of the articles but did not come out to be statistically significant. One of the articles even reported mothers of age more than 30 found to be 2.65 times more vaccine hesitant compared to mothers of less than 30 years amenable of around 19.1% of vaccine hesitancy which was also produced statistically significant results¹⁶.

One of our studies reported that hesitancy increased in the case of girls compared to boys, and higher-order children than in first-order birth ²⁴. But it is not showing significant values. Although this context was supported by other articles, but the difference was found to be statistically non-significant^{35, 36}.

Overcoming vaccine hesitancy is crucial for achieving high vaccination rates and ensuring public health. The pillars we must establish to surmount reluctance towards vaccines are specified in the image below (Figure 5). All the above-stated demanding situations to preserve adequate vaccine coverage encompasses overcoming negative vaccine- and individual-specific attitudes and beliefs amidst a persistent barrage of external factors which include vaccine controversies and evolving vaccination schedules that can affect vaccine acceptance. To counteract the developing negative attitude toward vaccination, Healthcare providers need to establish trust and open communication with parents, we have to reduce the spread of non- scientific information and preserve public health. We should also provide an economic aid and further novel techniques to promote successful vaccination. Providing clear, accurate, and evidence- based information about vaccines is crucial. Healthcare professionals can play a pivotal role in addressing parent's concerns and offering reassurance. Educating and creating awareness about immunization and fostering critical thinking on related risks and advantages may have a widespread effect on overcoming VH³⁷. One promising method for mitigating negative vaccine attitudes is the usage of tailored educational materials. Tailored materials target every individual's specific experience, attitudes, and beliefs regarding vaccination, which could result in perceptions that the information provided is more relevant, and therefore more trustworthy and influential.

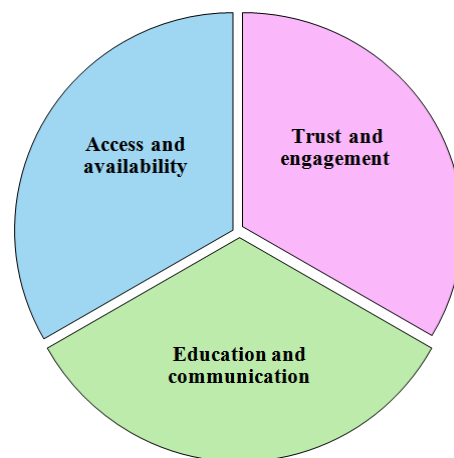


Figure 5 Pillars of successful vaccination

CONCLUSION

The reluctance of parents to vaccinate their children is a more significant problem for public health. This issue is influenced by various factors related to the individual, the vaccine itself, and the environment. Although a few measures had been taken to address the increasing vaccine hesitancy, more interventions are necessary, especially to counteract the negative attitudes and unfounded fears related to vaccines. One promising strategy is to expand information technology that may provide tailored immunization education materials primarily based on every person's individual needs. Another approach is to identify immunization advocates who can connect with the mother and father on a personal level. Additionally, it can be beneficial to highlight the characteristics of the vaccine or vaccination schedule that may alleviate the concerns of hesitant parents. Government agencies and healthcare organizations should maintain rigorous oversight of vaccine safety and communicate their findings transparently to the public. Promoting media literacy can empower parents to critically evaluate the sources of information and distinguish credible information from misinformation.

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