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Factors ınfluencing vaccine refusal in children: an umbrella review on COVID-19 and childhood vaccinations

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Summary

Vaccination is a fundamental public health intervention that saves millions of lives and extends human lifespan. However, vaccine hesitancy and refusal have grown into a global threat due to misinformation. The COVID-19 pandemic has highlighted the critical role of vaccines in reducing mortality rates and controlling outbreaks. Parents' attitudes toward vaccines directly affect children's health and vaccination rates in the community. Therefore, understanding the underlying reasons for parents' refusal of childhood vaccines and the COVID-19 vaccine is of great importance for combating epidemics and public health. The umbrella review method was used in this study. Systematic reviews and meta-analyses conducted between January 1, 2020, and December 30, 2024, were examined in this context. The pandemic period and recent history were considered due to the increase in systematic reviews examining the rapidly rising rates of vaccine refusal after the COVID-19 pandemic. Studies published in English in the PubMed, Wos, and Scopus databases were searched. Fifteen studies were included in the research. In conclusion, socio-demographic factors were found to be a major factor in COVID-19 vaccine refusal, whereas factors such as the "information factor," "vaccine-related factors," and "Cognitive Factors" were found to be more prominent in childhood vaccine refusal.

Keywords Vaccine Refusal, Childhood, COVID-19

Introduction

Vaccination stands as one of the most effective public health interventions, saving millions of lives annually and significantly contributing to the increase in human life expectancy. It is also widely recognized as a fundamental human right [1]. In this respect, immunization is considered a cornerstone of public health services. Despite its historical recognition as one of the greatest achievements in public health, vaccine refusal has been increasing in recent years and has emerged as a global threat to population health [2, 3].

Vaccine refusal has risen notably since the early twenty-first century, particularly during global pandemics such as Severe Acute Respiratory Syndrome (SARS), Middle

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East Respiratory Syndrome (MERS), Avian influenza, and COVID-19. Consequently, the World Health Organization (WHO) listed vaccine-related resistance as one of the top ten threats to global health in 2019 [4].

The WHO Strategic Advisory Group of Experts on Immunization (SAGE) defines vaccine hesitancy as a delay in acceptance or outright refusal of vaccines despite the availability of immunization services. This is a complex, context-specific phenomenon that varies across time, place, and vaccine type. SAGE categorizes the reasons behind vaccine hesitancy into three main groups: "apathy" (low perceived risk of disease and lack of understanding about the importance of vaccination), "convenience" (practical barriers such as access, transportation, and cost), and "confidence" (distrust in the safety and effectiveness of vaccines). These factors can operate at individual, social, contextual, and institutional levels [5]. In this regard, vaccine hesitancy and refusal are shaped not only by individual attitudes but also by cognitive processes and the interaction of interpersonal, societal, and structural factors. The Health Belief Model (HBM) explains individuals' perceptions of risk, severity, benefits, harms, and barriers, whereas the Social-Ecological Model (SEM) illustrates how individual, interpersonal, community, and policy-level dynamics influence health behaviors. Together, these models provide a strong and comprehensive theoretical foundation for understanding the determinants that shape parental vaccination decisions [6, 7].

Within this conceptual framework, vaccine refusal is increasingly understood as a behavioral extreme situated along the continuum of vaccine hesitancy, as defined by the World Health Organization's Strategic Advisory Group of Experts on Immunization (SAGE) [5]. In particular, conceptual approaches proposed by the SAGE Working Group suggest that vaccine refusal should not be viewed as a phenomenon independent of hesitancy, but rather as representing a cognitive and emotional progression of vaccine hesitancy [8]. Vaccine hesitancy is therefore widely recognized as a key precursor to vaccine refusal, with individuals who experience hesitancy potentially transitioning to active refusal over time [5, 8]. Accordingly, to comprehensively explain vaccine refusal behavior and to avoid conceptual ambiguity regarding the scope of the present review, this umbrella review incorporated findings from studies addressing vaccine hesitancy, treating hesitancy not as a separate outcome but as a key explanatory construct underlying vaccine refusal [5, 8].

Although numerous studies have attempted to identify factors influencing vaccine refusal, methodological heterogeneity and inconsistent results complicate a comprehensive evaluation of the field. Therefore, there is a clear need for an umbrella review that synthesizes high-level evidence from systematic reviews and meta-analyses.

Infants and preschool children, in particular, represent a high-risk group for vaccine-preventable diseases due to their developing immune systems [9]. The COVID-19 pandemic has adversely affected global immunization programs; according to WHO 2023 data, vaccination coverage has not yet returned to pre-2019 levels [10]. This decline is influenced by growing misinformation and refusal, which continue to pose serious challenges to worldwide public health [9].

On the other hand, the COVID-19 pandemic has reaffirmed the strategic importance of vaccines not only for individual protection but also for achieving herd immunity, controlling disease spread, and reducing mortality [1]. In this context, a thorough analysis of the factors driving vaccine refusal is essential for generating new insights at the intersection of child health, parental behavior, and global vaccine policies.

Vaccinating children is crucial for establishing herd immunity during pandemics, reducing transmission rates, and developing sustainable protection strategies [11]. Although COVID-19 transmission and mortality are generally lower among children, more transmissible and pathogenic variants—such as Delta and Omicron—have been associated with severe clinical outcomes in this age group, with Omicron notably increasing the risk of death in children [12]. Moreover, although children often experience asymptomatic or mild infections, they can act as silent carriers and transmit the virus to vulnerable populations. This poses significant risks to children with comorbidities, school staff, and immunocompromised elderly individuals [11].

Since vaccination decisions for children legally require parental or guardian consent [13], parental attitudes directly influence not only children's health but also overall vaccination coverage. Thus, parents' views on immunization can become a major barrier in epidemic response [14].

Therefore, identifying the factors behind parental refusal of both routine childhood vaccines and COVID-19 vaccines is vital not only for child health but also for safeguarding public health integrity. Based on this need, a systematic understanding of the factors shaping parental decisions will allow for a comparative analysis of both pandemic-specific dynamics and persistent anti-vaccination sentiments related to childhood immunization. This will ultimately support the development of more effective and targeted strategies to address vaccine refusal.

Prior literature reviews

The existing literature on vaccine refusal comprises various studies conducted across different populations, time periods, and vaccine types [15–22]. Iqbal et al. [15]

highlighted a global decline in COVID-19 vaccine acceptance over time, while Nuwarda et al. [16] demonstrated that factors influencing vaccine attitudes are diverse and complex, involving multidimensional elements such as sociodemographic characteristics, individual attitudes, and knowledge levels. Rahbeni et al. [17] evaluated systematic reviews published between 2021 and 2023 focusing on adults during the pandemic. Similarly, McCready et al. [18] examined barriers and facilitators influencing COVID-19 vaccine hesitancy among healthcare workers and healthcare students. Nichol et al. [19] addressed hesitancy related to COVID-19, influenza, and pertussis vaccines among pregnant women and mothers of children under two years of age; however, this review largely focused on the pre-pandemic period and was limited to specific vaccine types. Kaufman et al. [20] reviewed systematic reviews published between 2005 and 2020 and assessed parent-level barriers to routine childhood immunization. In their study, Sacre et al. [21] evaluated socioeconomic inequalities in vaccine access based on systematic reviews published between 2011 and 2020, noting significant heterogeneity in the target populations, vaccine types, and subgroups across the included studies.

When considered collectively, these studies reveal several gaps: COVID-19 vaccine refusal has predominantly been examined among adults; childhood vaccine studies have often been limited to specific vaccines; and the post-pandemic period has not been holistically evaluated. One of the few studies in this area, by Wu et al. [22] explored positive and negative factors influencing parental decisions regarding COVID-19 vaccination for children but did not include other routine childhood vaccines. Moreover, the systematic reviews included in that study were published only between 2022 and 2023.

Taken together, the existing literature tends to examine COVID-19 vaccine refusal and refusal behavior related to routine childhood vaccinations largely in isolation. There is a lack of comprehensive studies that holistically explore the relational dynamics between these two phenomena, particularly in the post-pandemic period. This gap underscores the need for a high-level evidence-based umbrella review that systematically evaluates specific barriers and facilitators within the pediatric population and integrates findings related to both COVID-19 and routine childhood vaccines.

The present study

Umbrella reviews serve to identify gaps in the literature by evaluating the methodological quality of existing systematic reviews, thereby offering a comprehensive framework that provides high-level evidence for researchers and policymakers [23, 24]. Childhood immunization is a cornerstone of public health protection, and vaccine refusal behaviors that arise during epidemics are of critical importance to population health. A comprehensive synthesis of the evidence in this area will facilitate the development of effective intervention strategies.

A review of the current literature indicates that there is no umbrella review that systematically addresses both COVID-19 vaccine refusal in children and parental attitudes toward routine childhood vaccines. Existing umbrella reviews have primarily focused on vaccine refusal or related attitudes among adults, healthcare workers, and pregnant women, lacking a systematic and comprehensive synthesis of findings related to the pediatric population.

This study aims to address this gap by synthesizing systematic reviews and meta-analyses from diverse regions, including the post-pandemic period, to identify evidence-based factors influencing vaccine refusal for both COVID-19 and routine childhood vaccines. This umbrella review does not aim to directly compare the determinants of COVID-19 vaccination with those of routine childhood immunization; instead, it synthesizes the determinants of each vaccine type independently, as reported in the included reviews. The findings will clarify determinants that shape parental vaccination decisions, thereby contributing to the development of evidence-based recommendations for global health policies and strategies aimed at improving childhood vaccine uptake.

In this context, the study seeks to answer the following research questions:

> What factors influence COVID-19 vaccine refusal in children?
> What factors influence refusal of routine childhood vaccines?

Method

This study employed the umbrella review (UR) methodology. URs represent a novel approach designed to address the rapidly growing body of systematic reviews by collecting, evaluating, and synthesizing their findings to support evidence-based decision-making, summarize current evidence, offer guidance, and provide a broad perspective on solutions to health-related problems [25].

The PRISMA guidelines were followed in the conduct of this umbrella review [26]. To minimize bias, all stages of article selection, literature search, data extraction, and quality assessment were carried out independently by two researchers (SG/NT). Any disagreements were resolved through discussion and consensus with a third expert (HYB). As the umbrella review synthesis did not involve the construction of a quantitative coding matrix, a formal inter-coder reliability statistic (e.g., Cohen's Kappa) was not calculated; however, independent data extraction and consensus-based decision-making ensured consistency and rigor throughout the review process.

Search strategy

Our study includes systematic reviews and meta-analyses conducted between January 1, 2020, and December 30, 2024. Due to the increase in systematic reviews examining rapidly rising rates of vaccine refusal among children after the COVID-19 pandemic, the pandemic period and recent history were considered [9, 11, 14, 27]. Studies published in English in the "Pubmed, Wos, and Scopus" databases were searched using the keyword combination "(vaccine refusal or anti-vaccine or vaccine acceptance) and (childhood or child or pediatric) and (epidemic or pandemic or contagious)".

Study selection process

The PRISMA flow diagram for the article selection process is shown in Fig. 1. During the literature search (31.12.2024), a total of 3,814 records were identified in the PubMed ($n = 2{,}931$), Web of Science ($n = 413$), and Scopus ($n = 470$) databases. Three duplicate records were removed prior to screening, and the remaining 3,811 records were reviewed at the title and abstract level by two authors (SG and NT). As a result of this review, 3,795 records were excluded from the study because they did not meet the predefined inclusion criteria. The excluded studies included 3,704 studies that were not systematic reviews or meta-analyses, 5 non-English publications, 39 studies outside the scope of the topic, and 47 studies that were found to be inappropriate during the title/abstract review. The remaining 16 full-text articles were evaluated for eligibility, and as a result of this evaluation, only one study was excluded because its full text could not be accessed. As a result, a total of 16 studies were included in the systematic review. Reports from 15 of these studies were included in the systematic synthesis.

Inclusion and exclusion

Systematic reviews and meta-analyses published in English between 2020 and 2024 that examine COVID-19 vaccine refusal in children and routine childhood vaccination, and whose full texts were accessible, were included in the study. This temporal restriction was adopted to ensure that the findings reflect the contemporary context in which the pandemic substantially reshaped vaccine perceptions and parental decision-making processes. Studies that did not examine factors affecting COVID-19 vaccine refusal in childhood, studies without full-text access or with a quality score below 70%, studies published in languages other than English, studies involving parents of children with chronic conditions, studies focusing on vaccination programs with specific characteristics (e.g., mumps, seasonal influenza, chickenpox), and studies evaluating refusal for only one vaccine type were excluded. In total, 15 studies met the inclusion criteria and were eligible for quality assessment. Details of all included studies are presented in Table S1.

The methodological quality of the studies included in this review was evaluated using the appropriate critical appraisal tools developed by The Joanna Briggs Institute (JBI), in accordance with each study's specific research design [28]. For the systematic reviews and meta-analyses included in this umbrella review, the JBI Critical Appraisal Checklist for Systematic Reviews and Research Syntheses—an 11-item tool widely recognized and employed within the health sciences—was applied to assess methodological rigor and potential for bias (see Appendix 1).

A detailed summary of the quality assessment results is presented in Table 1. All reviewed studies that met at least 70% of the JBI quality criteria thresholds were included in the final synthesis. However, one study by Olson et al. [29] was retained despite not fully meeting the predetermined quality threshold, given that only five high-level reviews were available for routine childhood vaccinations and excluding this study would substantially reduce the evidence base for this group of vaccines. The methodological limitations of the study were clearly indicated, and its findings were interpreted with appropriate caution.

Synthesis approach

Searches conducted across the PubMed, Scopus, and Web of Science databases yielded a total of fifteen systematic reviews and meta-analyses that met the inclusion criteria. Ten of these focused on COVID-19 vaccine refusal in children, and five pertained to routine childhood vaccine refusal.

The findings from these studies were synthesized using a thematic analysis approach. Thematic analysis is a qualitative method widely used in health research, including nursing, to identify, analyze, and report patterns (themes) within data [30, 31].

Data extraction and coding were performed using the MaxQDA 2024 software. Following open coding of the results and discussion sections of the included reviews, codes were grouped based on semantic and conceptual similarity to generate initial themes. These themes were further organized into broader categories to provide a structured understanding of the factors influencing vaccine refusal. In this umbrella review, theme frequencies were calculated based on the total number of times the codes under each factor were reported across the included systematic reviews and meta-analyses. Therefore, the n values presented in the figures do not represent the number of studies in which a factor appeared but rather the overall frequency with which related codes were repeated across the high-level evidence base. This approach reflects the "code density" technique commonly

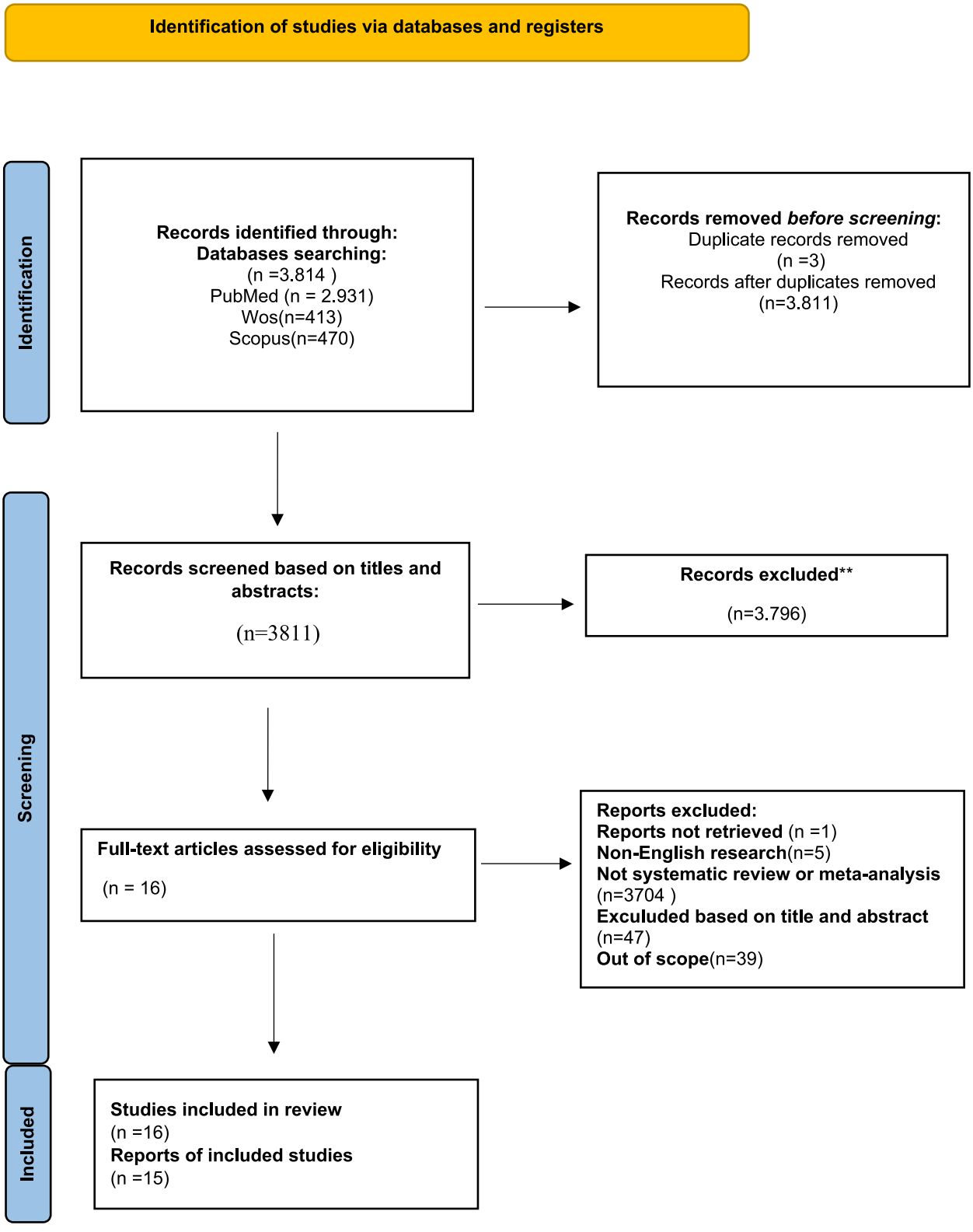

Fig. 1 PRISMA flow diagram for the study

Table 1 JBI critical appraisal checklist results

Research No	1	2	3	4	5	6	7	8	9	10	11	Quality %	Decision
M1	Y	Y	Y	Y	U	Y	Y	Y	Y	Y	Y	90.9%	INCLUDED
M2	Y	Y	Y	Y	Y	U	Y	Y	U	Y	Y	81.8%	INCLUDED
M3	Y	Y	Y	Y	Y	U	Y	Y	Y	Y	Y	100%	INCLUDED
M4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	U	90.9%	INCLUDED
M5	Y	Y	Y	Y	Y	Y	Y	Y	U	Y	Y	90.9%	INCLUDED
M6	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	INCLUDED
M7	Y	Y	Y	Y	Y	U	U	Y	Y	Y	U	72.7%	INCLUDED
M8	Y	Y	Y	Y	U	Y	U	Y	Y	Y	U	72.7%	INCLUDED
M9	Y	Y	Y	Y	Y	Y	Y	Y	U	Y	Y	90.9%	INCLUDED
M10	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	90.9%	INCLUDED
M11	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	INCLUDED
M12	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	INCLUDED
M13	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	INCLUDED
M14	Y	Y	Y	Y	U	U	U	U	Y	Y	Y	54.5%	INCLUDED
M15	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	100%	INCLUDED

Y = Yes, N = No, U = Unclear. "M" refers to the study number presented in Table 1. The numbers in the header row correspond to the item numbers in the JBI critical appraisal checklist, as provided in Appendix 1. For quality scoring, each "Yes" response was assigned 1 point, while "No," "Unclear," and "Not applicable" responses were assigned 0 points. The final quality score for each study was calculated based on the proportion of "Yes" responses relative to the total number of applicable items: Quality score = (Yes/total applicable items) × 100

used in umbrella reviews and enables the identification of factors that appear more prominently and consistently across the synthesized literature. Accordingly, the frequency values should be interpreted as an indicator of the qualitative weight and relative visibility of each factor in the existing evidence. The synthesis process adhered to the umbrella review methodology, ensuring a comprehensive and systematic presentation of the evidence gathered from high-quality systematic reviews and meta-analyses.

Themes and sub-codes for each research question were generated based on the findings and results of qualitative (systematic review) and quantitative (meta-analysis) studies. During the coding process, similar qualitative and quantitative findings were combined, recurring elements across different studies were categorized, and the determinants related to COVID-19 vaccine refusal in children and routine childhood vaccine refusal were classified in a comparative manner. The detailed table regarding the theme–code–theoretical model matches obtained from this analysis is presented in Appendix 3.

Findings

Based on the searches conducted in the PubMed, Scopus, and Web of Science databases, ten systematic reviews and meta-analyses on COVID-19 vaccine refusal in children and five on routine childhood vaccine refusal were included according to the predefined inclusion and exclusion criteria. Following thematic analysis and the coding procedures performed using the MAXQDA 2024 software, 12 themes related to COVID-19 vaccine refusal in children and 11 themes related to routine childhood vaccine refusal were identified. Definitions of all themes and codes used in this study, along with information on the studies in which these codes appeared, are presented in Appendix 2. Furthermore, a comprehensive comparison illustrating the common and distinct aspects of all factors and their associated codes across both vaccine types is provided in Appendix 3. The analysis identified 11 shared factors influencing both COVID-19 vaccine refusal in children and routine childhood vaccine refusal, whereas the "COVID-19 factor" emerged as a determinant unique to COVID-19 vaccine refusal in children.

Factors affecting COVID-19 vaccine refusal in children

The first research question aimed to identify the factors affecting COVID-19 vaccine refusal in children based on the findings of existing review studies. In this context, factors affecting COVID-19 vaccine refusal in children were classified according to frequency as "sociodemographic factors," "attitudinal factors," "parental factors," "vaccine-related factors," "COVID-19 factor," "information factor," "trust factor," "personal factors," "government factor," "media factor," "access to vaccine factor," and

"search for alternative methods factor." Fig. 2 presents the frequency distributions of these factors.

Socio-demographic factors

The vast majority of studies have found that vaccine acceptance rates are higher among families with higher income levels compared to low-income families [14, 32–39]. However, Galanis et al. (2022) and Alimoradi et al. (2023) also reported findings in some studies showing that individuals in the low-income group had a higher positive attitude toward vaccination [34, 35].

Differences in educational level are a critical variable affecting vaccine acceptance. Many studies have indicated that vaccine acceptance increases with higher education levels [14, 32–38]. However, Galanis et al. (2022), Pan et al. (2021), and Alimoradi et al. (2023) reported that vaccine acceptance rates can also be high among individuals with low education levels in some cases [34, 35, 38].

Parental age also emerges as a socio-demographic factor affecting attitudes toward vaccination. Many studies have indicated that vaccine acceptance rates increase with parental age [33–35, 37, 38]. On the other hand, some data in the study by Galanis et al. (2022) reported that parental age had no significant effect on vaccine refusal; Alimoradi et al. (2023), however, showed that vaccine refusal decreased with increasing age [34, 35].

The number of children also emerges as an influential factor in vaccination decisions. Some studies report that having more children negatively affects parents' vaccination decisions [34, 38]. Furthermore, other studies emphasize that the number of children is a factor influencing vaccination decisions [14, 35, 37].

Another issue related to socio-demographic factors is ethnicity. Ethnicity has also been found to be a decisive factor in vaccine refusal. Alharbi [33] reported that non-Hispanic Black parents in the US were less willing to get the COVID-19 vaccine compared to non-Hispanic White parents. Galanis et al. [35] stated that vaccine intent was lower among Black individuals and higher among White and Hispanic individuals. Liu et al. c indicated that Asian parents had higher vaccine acceptance intentions, while Pan et al. [38] found that Black, Asian, and other minority groups were more prone to vaccine refusal. Numerous studies have emphasized that ethnicity is a decisive factor in vaccine decisions [14, 33, 35, 37, 38].

Employment status is another socio-demographic factor influencing vaccination decisions. It has been determined that parents who are unemployed or work part-time have lower vaccine acceptance rates [14, 33, 35, 38]. At the same time, the gender of the parent and child can also influence vaccination behavior [14, 33, 37, 38].

The place of residence has also been found to influence vaccine refusal. Individuals living in rural areas have been reported to have more negative attitudes towards vaccination [34, 36, 37]. Furthermore, the age of the child is also a variable that influences decisions. Parents' reluctance to vaccinate younger children is more pronounced, while the tendency to vaccinate older children has been observed to increase [33, 35].

On the other hand, it has been noted that parents living with family members in high-risk groups have lower rates of vaccine acceptance [38]. Smoking has also been found to have a negative effect on vaccine acceptance [37]. In addition, it has been reported that parents whose children attend face-to-face education or daycare also have lower rates of vaccine acceptance [37]. Finally, it has been stated that vaccine acceptance increases in individuals who receive extensive family support; factors such as the

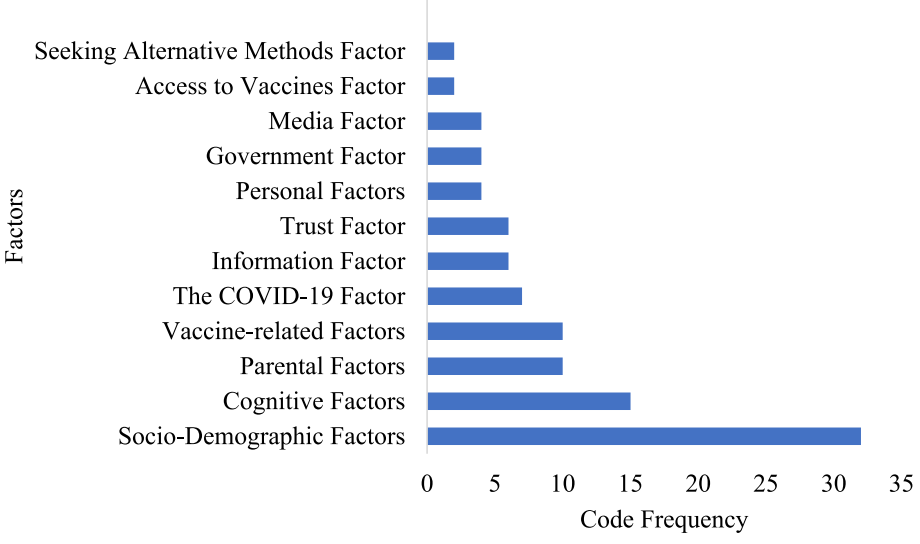

Fig. 2 Factors affecting COVID-19 vaccine refusal in children. Note: The n values represent code repetition frequency rather than the number of studies

structure of the parent's workplace and the parent's age are also among the factors affecting vaccine refusal [14].

Cognitive factors

The belief that vaccines are ineffective emerged as a common factor affecting childhood vaccine refusal in all studies reviewed. Concerns about the effectiveness of vaccines undermine parents' confidence in vaccines and negatively affect vaccine acceptance [9, 11, 14, 32, 39]. Regarding COVID-19 vaccines for children, various misconceptions are widespread among parents, such as the belief that vaccines may cause genetic changes, are risky, may cause infertility, or that children will not contract diseases anyway [14].

Parents' religious beliefs have also been identified as an important factor influencing vaccine refusal [11, 37, 38]. In addition, some parents' perception that vaccination is unnecessary or that the disease is not fatal negatively affects vaccine acceptance [14, 33, 39]. On the other hand, parents who view vaccination as the "only solution" have been found to be more willing to have their children vaccinated [34].

Parental factors4

The psychological status of parents is a significant determinant of childhood vaccine refusal. Evidence indicates that parents exhibiting elevated stress levels, anxiety disorders, or post-traumatic stress disorder (PTSD) report greater refusal-related negative attitudes regarding childhood vaccination [34, 36, 38]. Conversely, parents employed as healthcare workers demonstrate more positive attitudes toward vaccination [33, 37, 38].

Regarding gender differences, mothers are reported to experience higher levels of vaccine refusal-related negative attitudes compared to fathers [34, 35]. Furthermore, parents who have not received a COVID-19 vaccine themselves exhibit negative attitudes toward vaccinating their children [33, 38].

Socioeconomic security status also influences vaccination decisions. Individuals covered by public insurance demonstrated lower vaccine acceptance compared to those with private health insurance, while uninsured individuals were the most negatively affected in their decision to vaccinate their children [33, 38]. Some studies report that a parent having a chronic illness is associated with increased vaccine acceptance [34], whereas others indicate a negative effect or no significant association [14]. Finally, COVID-19 vaccine acceptance has been found to be higher among individuals with intact family structures [14].

Vaccine-related factors

All reviewed studies identified concern about potential side effects as a primary reason for parental refusal of COVID-19 vaccines for children [11, 14, 32, 39]. The foreign origin of vaccine manufacturers was also identified as a factor contributing to vaccine refusal [36, 39]. Locally produced vaccines were reported to be preferred by parents, and the type of vaccine available within a country also influenced acceptance rates [14, 32, 34]. Additionally, vaccine cost was cited as a contributing factor to refusal [31].

The COVID-19 factor

The novelty of COVID-19 vaccines for children has been a significant factor influencing vaccine refusal [36, 38, 39]. While the perception of COVID-19 as a high-risk disease increased vaccine acceptance [33, 34, 37], its rapid development engendered distrust among some parents, leading to refusal [14, 33, 34]. Furthermore, perceptions of COVID-19 as low-risk and belief in conspiracy theories were identified as additional factors contributing to negative vaccine attitudes [33, 38].

Information factor

Inadequate information regarding COVID-19 vaccines for children has been identified as a major factor influencing vaccine refusal [14, 33, 36, 38]. Informational support from healthcare workers has been shown to facilitate positive parental attitudes toward vaccination [34]. However, the informed consent process has presented practical challenges in some jurisdictions, where the consent of both parents—whether married, cohabiting, or divorced—is required for childhood vaccination [11]. Additionally, low vaccine literacy has been reported as a contributing factor to vaccine refusal [34].

Trust factor

Most studies emphasize distrust toward vaccines as a key barrier. Lack of trust in vaccines has consistently been identified as a significant factor negatively affecting vaccine acceptance [11, 32, 34, 36, 39]. Conversely, parents who trust health services demonstrate higher vaccine acceptance [39]. Distrust in pharmaceutical companies has also been reported as a factor contributing to vaccine refusal [32]. Parents of children with chronic illnesses showed greater willingness to vaccinate their children against COVID-19 [14, 35, 36, 38]. Conversely, a history of parental COVID-19 infection and lack of parental vaccination were also associated with vaccine refusal [14, 38].

Personal factors

Parents of children with chronic diseases were found to have a higher willingness to accept vaccines (Galanis et al., 2022; H. Khan Y. et al., 2022; Pan et al., 2021; Sayed, 2024). A parent having contracted COVID-19 and not

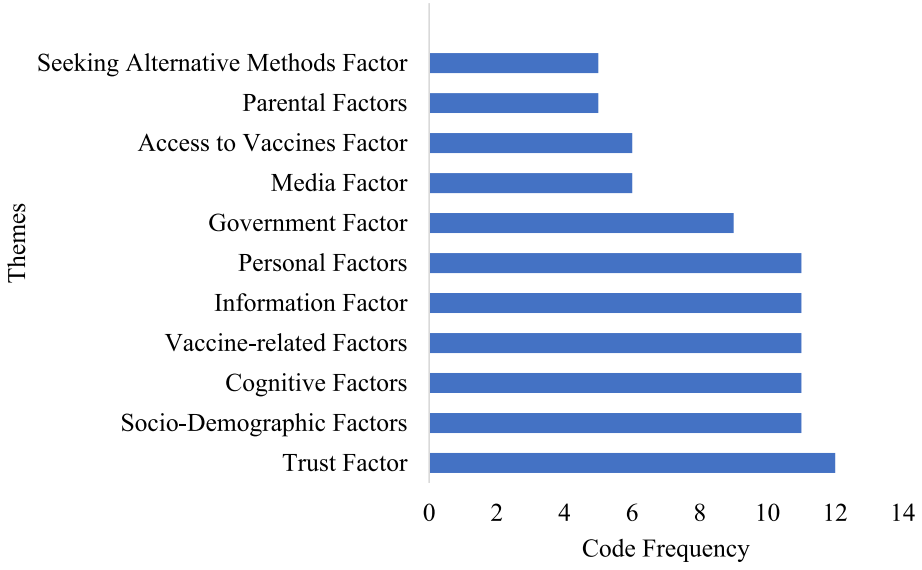

Fig. 3 Factors affecting childhood vaccine refusal. Note: The n values represent code repetition frequency rather than the number of studies

being vaccinated against it were also factors influencing vaccine refusal (Pan et al., 2021; Sayed, 2024).

Government factor

In low- and middle-income countries, distrust in authorities negatively affected vaccine acceptance [32, 36]. In high-income countries, parental willingness to vaccinate was lower than in low- and upper-middle-income countries—with acceptance rates of 62% and 65% in the latter, compared to 52% in high-income countries. Additionally, a country's geographical region within the World Health Organization (WHO) classification influenced vaccine acceptance [34].

Media factor

Multiple studies indicate that social media negatively influences vaccine acceptance [34, 36, 37]. Only one study reported positive effects of social media on vaccine uptake [34].Traditional media, such as television, has also been associated with negative effects on vaccine attitudes [33, 37].

Access to vaccines factor

Access to vaccines has been a determining factor in vaccine refusal [34, 38]. Furthermore, lack of parental time has been identified as a barrier to vaccination [37].

Seeking alternative methods

Parental reasons for vaccine refusal include a preference for alternative medicine and belief in natural immunity. Some parents favor alternative practices over conventional medical interventions, believing that natural immunity is healthier for their children [14, 32, 38]. This perspective may also reflect distrust in modern medical practices.

Factors ınfluencing childhood vaccine refusal

The second research question aimed to identify factors contributing to childhood vaccine refusal based on findings from existing systematic reviews. The identified factors were categorized into 11 main themes (Fig. 3): information factors, vaccine-related factors, belief systems, trust factors, socio-demographic factors, government-related factors, access to vaccines, media influence, parental factors, preference for alternative methods, and communication factors.

Information factor

One of the main reasons for childhood vaccine refusal is the lack of access to information about vaccines among parents. Parents who do not receive sufficient and explanatory information from healthcare professionals are more likely to have doubts about vaccines [29, 40, 41]. In addition, a general lack of information and exposure to misinformation play a role in the development of negative attitudes toward vaccines among parents [9, 27, 40]. Furthermore, factors such as low vaccine literacy and the loss of vaccination cards have also been identified as contributing to childhood vaccine refusal [27, 29].

Vaccine-related factors

Insufficient information about vaccine content has been identified as one of the factors influencing childhood vaccine refusal [29]. Concerns about side effects have also been reported to increase parents' negative attitudes toward vaccines [9, 41]. Moreover, the excessive number of vaccines in the vaccination schedule relative to time

[29], frequent changes in the vaccination Schedule [40], the large number of doses [40], and the type of vaccine to be administered [9], have been identified as factors contributing to vaccine refusal. In addition, the cost of vaccines has been reported as another factor influencing childhood vaccine refusal [27].

Cognitive factors

Religious beliefs have been identified as one of the important factors influencing childhood vaccine refusal [27, 29, 40]. In addition, misconceptions have also been effective in the development of negative attitudes toward vaccines among parents [29, 40]. Beliefs that vaccines are ineffective and perceptions that the disease is not fatal have also been reported as key factors shaping the attitudes of parents who refuse to vaccinate their children [9, 40].

Trust factor

Distrust of vaccines has been identified as one of the main factors negatively influencing childhood vaccine refusal [9, 27, 29, 40]. Similarly, distrust of healthcare workers has also negatively affected parents' vaccination decisions [9, 41]. Furthermore, distrust of pharmaceutical companies has been identified as another factor influencing vaccine refusal by increasing doubts about the reliability of vaccines [29, 40].

Socio-demographic factors

Certain socio-demographic variables stand out among the factors influencing childhood vaccine refusal. Large family size, low income level, living in rural areas, having many children, and employment difficulties have been reported to contribute to the development of negative attitudes toward vaccination [41]. Furthermore, the young age of parents has also been identified as another socio-demographic factor influencing vaccine refusal [27]. In addition, the cultural context in which parents live has been reported to influence vaccination decisions, as certain cultural norms and values have paved the way for negative attitudes toward vaccination [40].

Government factor

Government-related factors also play an important role among the determinants of childhood vaccine refusal. Distrust of authorities has been reported to negatively influence parents' vaccination decisions [27, 29]. In addition, the state of the country's economy has been reported to affect both access to and confidence in vaccines [9]. Moreover, the fact that vaccines are not legally mandatory has been identified as a factor facilitating parents' decision to refuse vaccination [27]. Furthermore, when evaluated in relation to state policies, geographical factors have also been identified as another determinant influencing vaccine refusal [9].

Access to vaccines factor

Access to vaccines has been identified as an important factor influencing childhood vaccine refusal. Difficulties parents experience in accessing vaccination services have been reported to reduce vaccination rates [27, 41]. On the other hand, the implementation of reminder and recall systems has been identified as one of the effective strategies to increase vaccine acceptance [29].

Media factor

Social media tools have often been identified as factors that negatively affect vaccine refusal [9, 27]. However, some studies have also reported that vaccine acceptance can be increased through the correct and effective use of social media [29].

Parental factor

Parental neglect has been identified as one of the determinants influencing childhood vaccine refusal [27, 41]. On the other hand, when the family and social environment embrace vaccination as a social norm, parents' tendency to accept vaccination has been reported to increase [29].

Alternative method search factor

Alternative medicine practices have been identified as one of the factors influencing childhood vaccine refusal [29, 40]. In addition, some parents' preference for natural immunity methods has also been reported to negatively influence vaccination decisions [29].

Discussion

Previous umbrella reviews have primarily examined COVID-19 vaccine refusal among adults, healthcare workers, or specific risk groups, while studies focusing on routine childhood immunization have often been limited to particular vaccine types and have not provided an integrative framework for evaluating the two phenomena together. The substantial methodological heterogeneity across target populations, study periods, and vaccine types has further hindered the ability to obtain coherent and comparable conclusions from the existing literature. This umbrella review addresses these limitations by synthesizing evidence related to both COVID-19 vaccine refusal in children and routine childhood immunization within a single analytical framework, enabling a comprehensive, systematic, and comparable evaluation of studies that have previously been considered independently. Our findings indicate that although similar determinants influence both contexts, the degree of influence differs. Socio-demographic characteristics emerge as the most prominent factor in COVID-19 vaccine refusal among children, whereas knowledge level, vaccine-related structural features, and cognitive factors appear to play a

more decisive role in routine childhood vaccine refusal. Additionally, "COVID-19- factor," identified as elements unique to COVID-19 vaccine refusal, have emerged as distinguishing influences shaping refusal behavior in this age group.

Findings-based evaluations

This umbrella review demonstrates that parental COVID-19 vaccine refusal and routine childhood vaccine refusal are shaped by common thematic structures, yet these themes evolve into distinct behavioral patterns as their content and relative influence shift across contexts. Pandemic-specific uncertainty, the rapid development of novel vaccine technologies, the infodemic, and crises of trust in the health system dominate the COVID-19 context, whereas information gaps, dense immunization schedules, and entrenched cultural beliefs are more prominent in routine childhood vaccination. Collectively, these findings clearly indicate that childhood vaccine refusal is not a fixed attitude but rather a multilayered and fluid behavior shaped by context-dependent dynamics.

Socio-demographic factors

Socio-demographic factors are among the most frequently reported determinants of COVID-19 vaccine refusal [11, 29, 36]. Although many variables—including income, education, parental age, family size, ethnicity, employment status, and place of residence—have been found to be significant, several studies reported unexpectedly high vaccine acceptance among low-income or low-education groups [31, 32, 35]. This suggests that the influence of socio-demographic indicators is not unidirectional and must be interpreted alongside mediating factors such as health literacy, trust, and access to services. Thus, socio-demographic determinants do not function as stand-alone explanatory variables; rather, they represent a multidimensional risk domain reinforced by the interaction of contextual factors.

Cognitive factors & misinformation

Cognitive factors are critically important in both contexts. During the COVID-19 era, doubts regarding vaccine effectiveness, perceptions that the disease is mild in children, and misconceptions such as genetic alteration, infertility, or microchip implantation strongly shaped parental attitudes [6, 8, 11, 29, 36]. In routine vaccination, religious beliefs, appeals to natural immunity, and long-standing misconceptions are more pronounced [6, 24, 26, 37]. These findings underscore that misinformation is influenced not only by its content but also by its speed of dissemination and its capacity for social uptake, which vary according to the prevailing media ecosystem. Therefore, cognitive factors must be understood as dynamic and intervention-sensitive.

Parental & personal psychosocial factors

Parental-related factors also play a strong determinative role in both contexts. During the COVID-19 period, elevated stress, anxiety, and uncertainty disrupted parental risk appraisal, and parents who had not received the COVID-19 vaccine themselves were significantly less likely to vaccinate their children [30–33, 35]. In routine vaccination, parental neglect, limited caregiving capacity, and diminished parental functioning have been identified as influential [24, 38]. These findings highlight that vaccine decision-making is not merely a rational, information-based choice but a holistic process shaped by parental experiences, psychological well-being, and intrafamily relationships.

Vaccine-related determinants

Vaccine-related factors—including concerns about adverse effects, vaccine content, number of doses, schedule density, and cost—are influential in both COVID-19 and routine contexts [6, 8, 11, 24, 26, 29, 38]. In COVID-19 vaccination, the use of novel technological platforms and accelerated development processes intensified safety concerns [30, 33, 35, 36], whereas routine childhood vaccination is dominated by uncertainties related to schedule changes, frequency of administration, and vaccine content [24, 26, 37].

Healthcare communication and counseling gaps

Following these structural concerns, information deficits and inadequate counseling by healthcare providers constitute a secondary cluster of determinants that deepen vaccine refusal in both contexts [6, 24, 26, 31, 33, 35, 37]. Consequently, interventions aimed at increasing vaccine acceptance cannot rely solely on individual-level strategies; a holistic approach that strengthens structural conditions and the communication capacity of the health system is imperative.

Trust-related factors

Trust-related factors are a common denominator across all studies. Trust in vaccines, healthcare providers, the health system, and the pharmaceutical industry constitutes one of the strongest determinants of vaccine decision-making [6, 24, 26, 37, 38]; this distrust has been more intense and volatile in the COVID-19 context [8, 29, 31, 33, 36]. These findings demonstrate that without establishing trust, no communication strategy or educational intervention can generate a lasting impact.

Media & social influence

Media and social media strongly shape both information flow and risk perception. Social media exerted predominantly negative effects during the COVID-19 period [31, 33, 34], whereas in the routine context, both positive and negative influences have been reported [6, 24, 26]. This underscores the necessity of incorporating media literacy and digital verification strategies as integral components of public health practice.

Access & organizational supports

Accessibility, reminder systems, and organizational factors are also important determinants. In the COVID-19 context, time constraints and transportation difficulties were noted as key barriers [31, 34, 35]. In routine vaccination, the absence of reminder-recall systems is a critical challenge [24, 26, 38]. These findings show that non-vaccination is not always a conscious act of refusal but may instead be an unintended outcome produced by structural barriers.

Seeking alternative methods & natural immunity

A tendency toward alternative medicine and beliefs in natural immunity influence both COVID-19 and routine vaccine refusal [11, 26, 29, 35, 37]. This inclination intensifies particularly during periods of uncertainty. This finding once again illustrates that cultural belief systems must hold a central place in intervention design.

Theoretical alignment with HBM and SEM

An examination of the theoretical counterparts of the themes and sub-codes identified in this study indicates that the findings demonstrate a comprehensive and multidimensional alignment with the Health Belief Model (HBM) and the Social-Ecological Model (SEM). The HBM thoroughly explains the cognitive processes shaping parental vaccine decision-making—perceived susceptibility, perceived severity, perceived benefits, perceived harms, perceived barriers, and cues to action. The SEM, with its multi-level structure ranging from individual characteristics to family and social networks, health system practices, cultural norms, and governmental policies, captures the socio-ecological dimensions of the findings and demonstrates that vaccine refusal is shaped not only by individual determinants but also by contextual and structural factors. Taken together, these two models collectively elucidate the psychological, cognitive, social, and political dimensions of vaccine refusal, enabling the determinants identified in this study to be interpreted within an integrated theoretical framework [6, 7]. Overall, the combined application of these models provides strong confirmation that vaccine refusal is a multilayered behavior emerging at the intersection of psychological, cognitive, social, and structural processes. A detailed comparison illustrating the occurrence of each theme and sub-code in both COVID-19 and routine childhood vaccines, as well as their alignment with the Health Belief Model and the Social-Ecological Model, is presented in Appendix 3.

Limitations of the study

One of the primary limitations of this study is its restriction to publications in English. This led to the exclusion of studies published in other languages and limited the inclusion of data from diverse geographical contexts. As a result, cultural, social, and demographic factors influencing vaccine refusal in certain regions may not have been fully captured. Moreover, since the reviewed studies entirely covered the post-pandemic period, opportunities for comparison with pre-pandemic trends were limited. In addition, the exclusion of children with clinical conditions (individuals with chronic diseases, immunodeficiency, or other health problems) constrained the understanding of vaccine refusal dynamics within these vulnerable groups. Despite these limitations, the study provides valuable insights into childhood vaccination and COVID-19 vaccine refusal, offering evidence that may serve as a foundation for future research.

Although all routine childhood vaccine refusal studies included in this umbrella review were conducted during the pandemic period (2020–2024), none of these studies explicitly examined the direct role of the COVID-19 pandemic in shaping refusal of routine childhood vaccines. Therefore, the absence of a "COVID-19 factor" among the determinants identified for routine childhood vaccination reflects a limitation in the scope of the included studies rather than an indication that the pandemic had no influence on routine vaccine refusal. Evidence from broader literature clearly shows that the COVID-19 pandemic disrupted routine childhood immunization behaviors globally; however, this relationship could not be captured in our thematic synthesis because the included studies did not operationalize COVID-19–related variables within their analytical frameworks.

Recommendations

To enhance vaccine acceptance within communities and strengthen the effectiveness of childhood immunization programs, particularly against COVID-19, it is essential to implement multidimensional interventions grounded in a public health perspective. In this regard, scientifically sound, culturally sensitive, and accessible educational programs should be developed to improve access to information and promote vaccine literacy. Communication strategies tailored to the needs of specific target populations—such as families with lower levels of education, rural residents, and socioeconomically disadvantaged groups—are particularly important. Strengthening

social trust and countering misinformation will require collaboration with local leaders, religious figures, teachers, and other community influencers.

Innovative practices such as mobile health teams, outreach vaccination clinics, and home-based immunization services should be expanded to facilitate access to vaccines. Support mechanisms must be established for families experiencing transportation difficulties, while free vaccination campaigns and social assistance programs should be implemented to eliminate financial barriers. Additionally, culturally appropriate educational materials prepared in native languages should be used for communities with diverse linguistic and ethnic backgrounds.

Healthcare workers play a pivotal role in promoting vaccine acceptance. Counseling services delivered by family physicians and public health nurses should employ transparent and empathetic communication regarding vaccine components, benefits, and potential side effects. Actively listening to parents' concerns and providing evidence-based explanations can positively influence decision-making processes.

Leveraging the opportunities of digital transformation, vaccination tracking systems and automated reminder mechanisms should be further developed, and reliable information should be disseminated through social media and other digital platforms. Transparent communication about the vaccine production process and raising public awareness will contribute to preventing conspiracy theories and misinformation.

Finally, contingency plans should be established to ensure the continuity of routine immunization services during extraordinary circumstances such as pandemics. Flexible and inclusive strategies that reach all segments of society should be adopted. This comprehensive approach will not only increase vaccination coverage but also contribute to the long-term sustainability of public health. For future research, studies that encompass diverse languages and geographical contexts, take cultural diversity into account, and include clinically vulnerable populations will enhance the global validity of findings.

Conclusion

This comprehensive literature review demonstrates that multiple interrelated factors influence COVID-19 vaccine refusal and childhood vaccine refusal. While socio-demographic determinants appear to play a central role in COVID-19 vaccine refusal, in the context of childhood vaccine refusal the "trust factor" emerges as one of the key determinants. This is followed by "cognitive factors," "information factors," and "vaccine-related factors," while "socio-demographic factors" also constitute an important component shaping childhood vaccine refusal. Taken together, these findings indicate that reducing both COVID-19 vaccine refusal and routine childhood vaccine refusal requires comprehensive, multilayered, and sustainable public health policies that move beyond individual attitudes and simultaneously address psychological, cognitive, social, and structural determinants.

Abbreviations

COVID-19	Coronavirus disease 2019
HBM	Health belief model
PRISMA	Preferred reporting ıtems for systematic reviews and meta-analyses
SEM	Social ecological model
SAGE	Strategic advisory group of experts on ımmunization
WHO	World health organization

Supplementary Information

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Supplementary Material 1.

Supplementary Material 2.

Supplementary Material 3.

Supplementary Material 4.

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Authors' contributions

SG conceived and designed the study together with HYB and NT. SG performed the literature search, study selection, data extraction, and quality assessment. SG and HP managed the databases and conducted the data analysis and synthesis. MAA and EK contributed to the development of the conceptual framework and to the interpretation of the findings, particularly regarding health communication, educational, and technological aspects. SG drafted the first version of the manuscript. HYB, NT, HP, MAA, and EK critically revised the manuscript for important intellectual content. NT is the guarantor of the work. All authors read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

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Data availability

The data supporting the conclusions of this article will be made available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Not applicable. This study is an umbrella review based exclusively on previously published studies and does not involve human participants or individual-level data.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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