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Childhood Vaccination Uptake in the Arab Region: A Comparative Review of Behavioral, Social and Practical Determinants Based on the WHO BeSD Framework

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Index Terms

Childhood vaccination; Vaccine hesitancy; Vaccine confidence; Behavioral and Social Drivers of Vaccination; BeSD; Libya; Arab region; Immunization; Health-system barriers .

Abstract

Childhood vaccination remains one of the most effective public-health interventions; however, achieving and sustaining high vaccination uptake continues to be challenged by parental hesitancy, misinformation, social influences, and practical barriers to vaccination services. In the Arab region, existing evidence remains fragmented across countries, vaccine types, measurement instruments, and explanatory factors, while the specific interaction between behavioral and health-system determinants remains insufficiently integrated. This study aimed to comparatively examine patterns of childhood vaccination uptake across Arab countries, assess the influence of parental perceptions, vaccine confidence and motivation, analyses the role of social and practical determinants, and identify similarities, differences, and research gaps, with particular attention to the Libyan context. A descriptive, critical, and comparative literature review was conducted using previous studies from Arab countries and relevant international evidence. The WHO Behavioral and Social Drivers of Vaccination (BeSD) framework was adopted as the principal analytical framework, covering four domains: thinking and feeling, social processes, motivation, and practical issues. The findings demonstrate substantial regional consistency in the importance of vaccine safety perceptions, effectiveness, misinformation, social influence, health-worker communication, and parental motivation. However, the Libyan context reveals a stronger structural dimension, in which vaccine stock-outs, service disruption, population mobility, transportation difficulties, and geographical inequalities may contribute to incomplete vaccination alongside parental hesitancy. The study concludes that under-vaccination should not be interpreted solely as a behavioral problem. Effective improvement requires an integrated approach combining confidence-building, misinformation management, community engagement, health-worker communication, reliable vaccine availability, improved accessibility, and health-system strengthening. The findings support the use of the WHO BeSD framework as a context-sensitive basis for future comparative research and vaccination policy across the Arab region.

الإقبال على تطعيم الأطفال في المنطقة العربية: مراجعة مقارنة للمحددات السلوكية والاجتماعية والعملية استنادًا إلى إطار منظمة الصحة العالميةBeSD

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الكلمات المفتاحية

تطعيم الأطفال؛ التردد تجاه اللقاحات؛ الثقة باللقاحات؛ المحددات السلوكية والاجتماعية للتطعيم؛ إطارBeSD ؛ ليبيا؛ المنطقة العربية؛ التحصين؛ معوقات النظام الصحي.

الملخص

تُعدّ تطعيمات الأطفال من أكثر التدخلات الصحية الوقائية فاعلية، إلا أن تحقيق مستويات مرتفعة ومستدامة من الإقبال على التطعيم لا يعتمد على توافر اللقاحات والخدمات الصحية فقط، بل يتأثر بمجموعة مترابطة من المحددات السلوكية والاجتماعية والدافعية والعملية. وتتمثل مشكلة الدراسة في استمرار التفاوت في الإقبال على تطعيم الأطفال بين الدول العربية، مع بروز تردد بعض الآباء تجاه اللقاحات، في حين لا يمكن تفسير عدم اكتمال التطعيم بالتردد الأبوي وحده، نظرًا لتأثير عوامل أخرى مثل الثقة باللقاحات، والمعلومات والمعتقدات، والتأثير الاجتماعي، وتوصيات العاملين الصحيين، وإمكانية الوصول إلى الخدمات وتوافرها وجودتها .

هدفت الدراسة إلى مراجعة ومقارنة أنماط الإقبال على تطعيم الأطفال في الدول العربية، وتحليل تأثير تصورات الآباء والثقة باللقاحات والدافعية، ودراسة دور العمليات الاجتماعية والعوامل العملية، إلى جانب تحديد أوجه التشابه والاختلاف والفجوات البحثية في ضوء إطار منظمة الصحة العالمية للمحددات السلوكية والاجتماعية للتطعيم (BeSD).واعتمدت الدراسة المنهج الوصفي النقدي المقارن من خلال مراجعة الدراسات السابقة في الدول العربية، مع الاستفادة من الأدلة الدولية ذات الصلة، وتنظيم نتائجها وفق المجالات الأربعة لإطار BeSD: التفكير والشعور، والعمليات الاجتماعية، والدافعية، والقضايا العملية .

أظهرت النتائج أن المخاوف المتعلقة بسلامة اللقاحات وفعاليتها وآثارها الجانبية، والمعلومات المضللة، والثقة باللقاحات تمثل محددات مشتركة في عدد من الدول العربية، إلى جانب تأثير الأسرة والمجتمع والتواصل مع العاملين الصحيين. كما بينت المقارنة أن العوائق العملية، مثل ضعف إمكانية الوصول، وعدم توافر اللقاحات، واضطراب الخدمات، تمثل محددات مستقلة نسبيًا عن التردد. وفي الحالة الليبية، برزت بصورة أوضح المحددات الهيكلية والخدمية، بما في ذلك نقص اللقاحات، واضطراب الخدمات، وحركة السكان، وصعوبات النقل والتفاوت الجغرافي، بما يؤكد أن عدم اكتمال التطعيم لا ينبغي أن يُفسر باعتباره نتيجة للتردد الأبوي فقط. وتنسجم هذه النتيجة مع جوهر إطار BeSD الذي يميز بين العوائق الدافعية والعوائق العملية .

وتوصي الدراسة بتبني استراتيجية متكاملة تجمع بين تعزيز الثقة باللقاحات، ومواجهة المعلومات المضللة، وتفعيل دور العاملين الصحيين والمجتمع، وضمان استمرارية توافر اللقاحات، وتحسين الوصول إلى خدمات التطعيم، مع اعتماد مؤشرات BeSD في المتابعة والتقييم وإجراء دراسات محلية على مستوى المناطق والبلديات في ليبيا. وتؤكد الدراسة أن تحسين الإقبال على التطعيم يتطلب الجمع بين التدخلات السلوكية وتعزيز كفاءة واستمرارية النظام الصحي، بدل الاقتصار على معالجة التردد الأبوي

ومحدودية الميزانيات، والتوزيع المركزي للأدوية القريبة من انتهاء الصلاحية تمثل أبرز المعوقات المؤسسية، مما يؤكد الحاجة الملحة للاستثمار في بناء القدرات والتحول الرقمي لإدارة سلاسل الإمداد الطبي.

1. INTRODUCTION

Childhood vaccination is widely recognized as one of the most effective preventive health interventions, yet achieving and sustaining high vaccination uptake depends on more than the availability of vaccines and health services. Parents' decisions to vaccinate their children are shaped by a combination of individual perceptions, social influences, motivation, and practical experiences with vaccination services. Recognizing the importance of these factors, the World Health Organization (WHO) developed the Behavioral and Social Drivers of Vaccination (BeSD) framework to provide a systematic approach for understanding why people accept, delay, or do not receive recommended vaccines. The framework focuses on vaccination-specific beliefs and experiences that can potentially be modified through appropriate programmer interventions, thereby providing a useful foundation for examining variations in childhood vaccination uptake across different social and health-system contexts (World Health Organization [WHO], 2022).

Within the BeSD framework, vaccination behavior is understood through four interconnected domains: thinking and feeling, social processes, motivation, and practical issues. The first domain concerns perceptions of disease risk and confidence in vaccine benefits, safety, and trustworthiness, while social processes encompass family and community norms, support from social and religious leaders, and recommendations from health workers. Motivation reflects parents' intention and willingness to vaccinate their children, whereas practical issues relate to the availability, affordability, accessibility, and quality of vaccination services (WHO, 2022). This multidimensional perspective is particularly relevant for comparative research because differences in vaccination uptake between countries cannot necessarily be attributed to parental hesitancy alone; they may also reflect differences in social environments and the organization and accessibility of health services.

The thinking and feeling domain provides an important starting point for understanding parental vaccination behavior because parents' perceptions of vaccine effectiveness, safety, and benefits influence their willingness to seek vaccination for their children. Psychological research has demonstrated that vaccination decisions are shaped by perceptions of disease and vaccine risks, anticipated benefits, confidence, and other cognitive and emotional factors (Brewer et al., 2017). From this perspective, vaccine hesitancy should not be interpreted simply as a fixed refusal of vaccination, but rather as a behavioral state influenced by the way parents interpret available information and evaluate vaccination. The WHO framework similarly distinguishes vaccine confidence from hesitancy, noting that low confidence is conceptually different from hesitancy but may contribute to the development of hesitancy among parents and caregivers (WHO, 2022).

Parents' decisions, however, are not formed exclusively at the individual level. Social processes constitute another important dimension of vaccination behavior because family expectations, peer influences, community norms, religious leadership, and communication with health professionals can either reinforce or weaken parents' willingness to vaccinate their children. Evidence from qualitative research indicates that parents' vaccination views and practices are embedded within broader social relationships and experiences, rather than being determined solely by individual knowledge or attitudes (Cooper et al., 2021). Accordingly, examining vaccination uptake across Arab countries requires attention to the social environment in which parents make vaccination decisions, particularly the influence of family members, community actors, and health workers. explicitly identifies social norms and health-worker recommendations as important drivers that can encourage or inhibit vaccination behavior (WHO, 2022).

Closely related to these social and cognitive factors is parental motivation and vaccine hesitancy, which represent the immediate readiness or reluctance to seek vaccination. The WHO defines hesitancy as a motivational state involving conflict, reluctance, or opposition toward vaccination, including parents' intentions and willingness to vaccinate their children (WHO, 2022). This conceptualization is important because hesitancy may arise from different underlying mechanisms and therefore requires context-specific responses. A systematic review of strategies for addressing vaccine hesitancy similarly concluded that interventions should be tailored to the specific factors contributing to hesitancy rather than relying on a single universal approach (Jarrett et al., 2015). Consequently, a comparative analysis of Arab countries should distinguish between hesitancy associated with concerns about vaccine safety and effectiveness and reluctance arising from social or service-related barriers.

At the same time, low vaccination uptake may result from practical barriers rather than parental opposition to

vaccination. The BeSD childhood vaccination survey therefore incorporates factors such as knowing where vaccination is available, affordability, ease of access, vaccine availability, service satisfaction, and service quality. These dimensions allow researchers to distinguish between motivational barriers and difficulties arising from the delivery and accessibility of vaccination services (WHO, 2022). Evidence from low- and middle-income countries also indicates that interventions aimed at educating parents about the benefits and schedules of childhood vaccination can improve vaccination-related knowledge and contribute to increased demand for immunization (Lukusa et al., 2018). This suggests that improving childhood vaccination uptake requires an integrated approach combining effective communication with accessible, reliable, and responsive health services.

The value of the BeSD framework is further strengthened by its standardized approach to measuring childhood vaccination drivers. The WHO childhood vaccination survey was developed as a standardized instrument for parents and caregivers of children under five years of age and includes indicators covering the four BeSD domains. Its priority indicators include vaccine confidence, intention to vaccinate, family and peer norms, health-worker recommendations, knowledge of where to obtain vaccination, affordability, ease of access, vaccine availability, service satisfaction, and service quality (WHO, 2022). Such standardization provides an appropriate methodological basis for comparative research because it enables researchers to examine common dimensions across different populations while retaining sensitivity to national and contextual differences.

Against this background, a comparative examination of childhood vaccination uptake across Arab countries can provide a more comprehensive understanding of the factors underlying differences in vaccination behavior. Rather than focusing exclusively on vaccination coverage or treating parental hesitancy as a single explanatory factor, such an analysis can integrate cognitive perceptions, social influences, parental motivation, and practical barriers within a unified analytical framework. The WHO recommends complementing BeSD data with vaccination coverage, surveillance, programmer, demographic, health-system, and social-listening data to contextualize vaccination gaps, identify vulnerable population groups, and better understand the relationship between behavioral and structural factors and vaccination uptake (WHO, 2022). This integrated.

perspective provides a stronger foundation for identifying similarities and differences among Arab countries, revealing research gaps, and informing context-sensitive strategies to improve childhood vaccination uptake and contribute to sustainable health development

2. PROBLEM STATEMENT

Despite the established effectiveness of childhood vaccination, vaccination uptake remains uneven across countries and population groups, and parental hesitancy continues to represent an important behavioral challenge. However, differences in vaccination uptake cannot be explained by parental reluctance alone, as vaccination decisions are influenced by perceptions of vaccine safety and effectiveness, social norms, health-worker recommendations, motivation, and practical conditions such as accessibility, affordability, availability, and service quality. The WHO Behavioral and Social Drivers of Vaccination (BeSD) framework provides an integrated approach for examining these interconnected factors. Nevertheless, there is a need for a comparative theoretical examination of how these behavioral, social, motivational, and practical determinants are reflected across Arab countries and how they may help explain differences in childhood vaccination uptake. Therefore, this study addresses this gap through a comparative review of the literature using the WHO BeSD framework as an organizing perspective.

2.1 Research Questions

1. What are the main patterns of childhood vaccination uptake reported across Arab countries?
2. How do parental perceptions, vaccine confidence, and motivation influence childhood vaccination uptake and hesitancy across Arab countries?
3. How do social processes and practical factors, including family and community norms, health-worker recommendations, accessibility, availability, affordability, and service quality, shape parental vaccination behaviour across Arab countries?
4. What similarities, differences, and research gaps emerge across Arab countries regarding the behavioural, social, motivational, and practical determinants of childhood vaccination uptake?

3. SIGNIFICANCE OF THE STUDY

This study is significant because it moves beyond viewing childhood vaccination uptake as a simple issue of vaccine availability or parental refusal and considers vaccination behavior as a multidimensional phenomenon. The WHO BeSD framework recognizes four interconnected domains—thinking and feeling, social processes, motivation, and practical issues—which provide a coherent basis for understanding why parents accept, delay, or decline childhood vaccination.

The study is also important from a comparative perspective because the Arab region includes countries with substantially different social, cultural, demographic, and health-system contexts. Comparing the available evidence can therefore reveal whether parental vaccine hesitancy is primarily associated with cognitive and motivational concerns or whether social and service-related barriers also contribute to differences in uptake. Such a comparison may help identify common regional patterns while preserving the country-specific context required for interpreting vaccination behavior.

Theoretically, the study contributes by applying the WHO BeSD framework to organize and critically compare existing evidence rather than treating vaccine hesitancy as

a single, uniform construct. Methodologically, the framework offers standardized domains and indicators that can facilitate meaningful comparison across studies and countries. Practically, the findings can provide a basis for researchers, public-health institutions, and vaccination programmers to identify priority areas for communication, community engagement, health-worker involvement, and improvement of vaccination services. The WHO also emphasizes the value of interpreting behavioral evidence alongside vaccination coverage, health-system, demographic, and social-listening information to understand vaccination gaps more effectively.

4. OBJECTIVES OF THE STUDY

1. To comparatively review the patterns of childhood vaccination uptake reported across Arab countries.
2. To examine the influence of parental perceptions, vaccine confidence, and motivation on childhood vaccination uptake and hesitancy across Arab countries.
3. To analyses the role of social processes and practical factors, including family and community norms, health-worker recommendations, accessibility, availability, affordability, and service quality, in shaping parental vaccination behavior across Arab countries.
4. To identify the major similarities, differences, and research gaps in the behavioral, social, motivational, and practical determinants of childhood vaccination uptake across Arab countries within the WHO BeSD framework

5. LITERATURE REVIEW

The literature on childhood vaccination has increasingly shifted from viewing vaccination uptake as a function of vaccine availability alone toward understanding the behavioral, social, psychological, and health-system factors that influence parental decisions. This shift is particularly relevant to the present comparative review because the WHO Behavioral and Social Drivers of Vaccination (BeSD) framework conceptualizes vaccination behavior through four interconnected domains: thinking and feeling, social processes, motivation, and practical issues. Within this perspective, Dyda et al. (2020) conducted a systematic review of studies measuring parental vaccine attitudes and beliefs and demonstrated considerable variation in the concepts and instruments used to assess parental vaccination attitudes, highlighting the importance of standardized measurement for meaningful comparison. Similarly, Kempe et al. (2020) examined parental hesitancy toward routine childhood and influenza vaccines in a national survey and showed the continued relevance of parental concerns and uncertainty in childhood immunization decisions. Boyle et al. (2020) further examined parents' childhood immunization beliefs, intentions, and behaviors using a smartphone panel, reinforcing the importance of examining attitudes and intentions alongside actual vaccination behavior.

The evidence from Arab countries provides a particularly important context for the present study. In the United Arab Emirates, AL Suwaidi et al. (2020) investigated vaccine hesitancy among Arab parents using the Parent Attitudes about Childhood Vaccines instrument and demonstrated the applicability of a structured approach to identifying parental hesitancy in an Arab population. The study is particularly relevant because it addressed both the measurement of hesitancy and its determinants, thereby providing an early empirical foundation for examining childhood vaccination behavior in the Arab context. In Lebanon, Matta et al. (2020) examined parents' knowledge, attitudes, and practices toward childhood vaccination, with particular attention to parent–physician communication, highlighting the importance of communication between healthcare professionals and parents in shaping vaccination-related behavior. These findings are consistent with the BeSD perspective, which places health-worker recommendations and social processes among the important determinants of vaccination uptake.

The importance of vaccine confidence has also received substantial attention in the international literature. Shapiro et al. (2021) critically reviewed measures of childhood vaccine confidence and identified substantial variation in how confidence is conceptualized and measured across different settings. Their review emphasized the need for validated measures that can be applied consistently across populations, particularly in low- and middle-income countries. Cataldi and O'Leary (2021) reviewed the scope, causes, and potential responses to parental vaccine hesitancy and emphasized that hesitancy is influenced by both individual and contextual factors. In a related contribution, Cooper et al. (2021) synthesized qualitative evidence on parents' and informal caregivers' views and practices regarding routine childhood vaccination and demonstrated that vaccination decisions are embedded in individual perceptions, social relationships, and the broader circumstances in which families live. Together, these studies support the multidimensional interpretation of parental vaccination behavior adopted in the present study.

The social dimension of vaccination behavior is particularly relevant when comparing Arab societies, where family structures, community norms, and interpersonal relationships may influence health-related decisions. Olusanya et al. (2021) examined parental vaccine hesitancy and other barriers to childhood and adolescent vaccination during the COVID-19 pandemic and emphasized the interaction between vaccine confidence, social determinants, and access barriers. AL Abdulla et al. (2021) investigated COVID-19 vaccine hesitancy and attitudes in Qatar, providing evidence from a migrant-majority population and demonstrating the importance of demographic and social context when interpreting vaccine attitudes. Similarly, Musa et al. (2021) examined COVID-19 vaccine hesitancy among parents of more than 4,000 young adolescents in Qatar, providing one

of the regionally important studies on parental decision-making regarding vaccination of children and adolescents. These studies collectively demonstrate that vaccination attitudes cannot be separated from the social and demographic environment in which parents make decisions.

The COVID-19 period generated an extensive body of evidence concerning parental willingness to vaccinate children and provided additional insight into the motivational component of vaccine hesitancy. Khaled et al. (2021) examined COVID-19 vaccine hesitancy and resistance in Qatar using a nationally representative survey of Qatari nationals and migrants, highlighting the importance of population characteristics in understanding vaccine attitudes. In Saudi Arabia, Altulaihi et al. (2021) examined parents' perceptions of COVID-19 vaccination for children and contributed evidence concerning parental perceptions in a Saudi context. In Kuwait, Al-Ayyadhi et al. (2021) investigated determinants of COVID-19 vaccine hesitancy using an internet-based survey, illustrating the role of concerns and perceptions in shaping vaccination decisions. Although these studies focused on COVID-19 rather than routine childhood immunization, they provide useful evidence for understanding the motivational and cognitive mechanisms underlying parental vaccine decision-making in Arab societies.

A number of studies subsequently expanded the regional evidence base through multi-country investigations. Abu Hammad et al. (2022) examined parents' attitudes toward COVID-19 vaccination for their own children in Jordan and found that parental attitudes were associated with demographic and personal characteristics, including employment, income, gender, nationality, and previous influenza vaccination. AL Sulaiman et al. (2022) investigated parental willingness to vaccinate children against SARS-CoV-2 in Jordan and explored the explanatory factors associated with willingness. More broadly, Al-Qerem et al. (2022) examined parents' knowledge, attitudes, and practices regarding COVID-19 vaccination of children and provided additional evidence concerning the relationship between parental knowledge, attitudes, and vaccination-related behavior.

Particularly relevant to the comparative objective of the present study is the multi-country research conducted across the Eastern Mediterranean and Arab region. ElSayed et al. (2022) validated and culturally adapted the Parent Attitudes about Childhood Vaccines questionnaire into Arabic, providing an important methodological contribution to research on parental vaccine attitudes in Arabic-speaking populations. The study also demonstrated the need for culturally appropriate instruments for assessing vaccine hesitancy among Arab-speaking parents. AL Suwaidi et al. (2020) had previously demonstrated the relevance of PACV-based assessment among Arab parents in the UAE, while Fadl et al. (2023) extended the regional evidence by examining parental intention to vaccinate children against seasonal influenza in the Eastern Mediterranean Region using the Health Belief Model. Collectively, these studies demonstrate increasing methodological sophistication in assessing parental vaccination behavior in the Arab and Eastern Mediterranean context.

The comparative regional evidence became stronger with studies examining several Arab countries simultaneously. El Barazi et al./regional investigators (2022) examined parental health beliefs, intentions, and strategies regarding COVID-19 vaccination for children
across five Arab countries in the Middle East, reporting that only a proportion of parents expressed an intention to vaccinate and identifying concerns related to side effects, efficacy, safety, and vaccination scheduling. Alsayed et al./regional investigators (2022) also examined children's COVID-19 vaccination rates, parental hesitancy, and determinants across eight countries in the Eastern Mediterranean Region, including Iraq, Jordan, Kuwait, Lebanon, Palestine, Qatar, Saudi Arabia, and the UAE. These multi-country studies are especially important because they demonstrate that parental vaccination attitudes vary across national settings and that regional comparison can reveal both shared determinants and country-specific patterns.

More recent studies have strengthened the evidence concerning routine childhood vaccination rather than COVID-19 vaccination. Ghazy et al. (2023) conducted an external validation of the Parental Attitude about Childhood Vaccination Scale, involving researchers from Egypt, Saudi Arabia, Oman, and other countries, thereby contributing to the methodological development of childhood vaccine hesitancy research. Tekin et al. (2023) investigated reasons for parental hesitancy or refusal of childhood vaccination in Türkiye, identifying parental concerns as an important area requiring targeted public-health responses. In Albania, Gjini et al. (2023) examined parents' and caregivers' roles in childhood vaccination and the predictors of vaccine hesitancy. Although Türkiye and Albania are not Arab countries, these studies are useful for comparative purposes because they illustrate how cultural, educational, attitudinal, and contextual factors may influence parental vaccination behavior across societies with different health-system environments.

The literature published during 2023–2024 increasingly emphasized the distinction between psychological hesitancy and structural or practical barriers. Mavundza et al. (2023) synthesized qualitative evidence concerning parents' views and practices around routine childhood vaccination in Africa and identified the interaction between individual perceptions, social influences, and contextual conditions. Fadl et al. (2023) investigated determinants of parental seasonal influenza vaccine hesitancy in the Eastern Mediterranean Region, while Ghazy et al. (2023) examined parental attitudes toward influenza vaccination in the Eastern Mediterranean using multilevel analysis. These studies are particularly relevant to the WHO BeSD framework because they move the analysis beyond individual vaccine concerns and consider broader social and contextual determinants of vaccination behavior.

Evidence from 2024 further illustrates the persistence of parental hesitancy toward both routine and newly introduced vaccines. Al-Iede et al. (2024) examined

hesitancy toward childhood and influenza vaccines among highly educated Jordanian parents, demonstrating that higher educational attainment does not necessarily eliminate vaccine hesitancy. Al-Rashdan et al. (2024) investigated maternal knowledge, attitudes, and adherence to children's routine vaccination in Jordan and extended the evidence concerning parental decision-making and elective vaccination. In another regional study, Selvam et al. (2024) compared parental attitudes and hesitancy toward COVID-19 vaccination with routine childhood vaccination in the UAE. Together, these studies suggest that vaccine hesitancy should not be assumed to be a consequence of low education or limited knowledge alone; rather, it may persist through more complex combinations of confidence, risk perception, information, experience, and social influence.

The international literature also provides evidence supporting the relationship between parental hesitancy and actual vaccination coverage. Gera et al. (2024) examined the association between parental vaccine hesitancy and geographical coverage of childhood vaccination in Australia and provided empirical evidence for considering hesitancy in relation to spatial variation in vaccination coverage. Chen et al. (2023) examined determinants of parental vaccine hesitancy in Canada using data from the Childhood National Immunization Coverage Survey, providing further evidence that parental characteristics and contextual factors are associated with vaccination decisions. Kaufman et al. (2024) investigated misperceptions about routine childhood vaccination among Australian parents before and after the COVID-19 pandemic, demonstrating the continuing importance of accurate perceptions and information in understanding parental vaccination attitudes.

Recent systematic and scoping reviews further reinforce the need for a multidimensional approach. Obohwemu et al. (2022) systematically reviewed parental childhood vaccine hesitancy and predictors of vaccination uptake and identified recurring barriers associated with confidence, complacency, constraints, calculation, and collective responsibility. Khan et al. (2022) systematically reviewed barriers and facilitators of childhood COVID-19 vaccination among parents and emphasized parental concerns, vaccine information, and perceived risks. Lima et al. (2024) conducted a scoping review of parents' and legal guardians' beliefs and attitudes toward childhood vaccination, confirming the broad range of psychological, social, and contextual factors reported in the international literature. These reviews strengthen the argument that vaccine hesitancy should be conceptualized as a heterogeneous phenomenon rather than a single parental attitude.

The most recent Arab evidence also indicates that childhood vaccination remains an evolving research issue. Alwhaibi et al. (2025) examined parental vaccine hesitancy, awareness, and attitudes toward childhood vaccination in Saudi Arabia, extending the regional literature beyond COVID-19-specific vaccination and returning attention to routine childhood immunization. Saleh and Chedid (2025) examined knowledge, attitudes, and practices toward childhood immunization among mothers in Lebanon and reported regional disparities, with rural areas facing greater challenges and with accessibility, education, and governmental support identified as important areas for improvement. These recent studies reinforce the relevance of examining vaccination behavior through a combination of parental perceptions and practical conditions rather than through hesitancy alone.

Taken together, the reviewed literature reveals several consistent patterns. First, parental vaccine hesitancy is multidimensional and cannot be reduced to a simple refusal of vaccination. Second, vaccine confidence, perceived safety and effectiveness, and risk perceptions represent important cognitive determinants of vaccination behavior. Third, social processes—including family influence, communication with healthcare professionals, community expectations, and broader social norms—play a significant role in shaping parental decisions. Fourth, practical barriers such as accessibility, availability, affordability, service quality, and scheduling may reduce vaccination uptake even when parents are not fundamentally opposed to vaccination. These findings closely correspond to the four domains of the WHO BeSD framework adopted in the present study.

A further observation emerging from the literature is the limited comparability of evidence across Arab countries. While individual studies have examined vaccination attitudes in countries such as the UAE, Lebanon, Jordan, Saudi Arabia, Qatar, Kuwait, Egypt, and other Eastern Mediterranean settings, many investigations differ in their populations, .

5.1 Critical Review of the Previous Literature

The reviewed literature demonstrates that childhood vaccination uptake is a multidimensional phenomenon shaped by parental beliefs, perceived vaccine safety and effectiveness, social influence, trust in health professionals, motivation, and practical access to vaccination services. This evidence is broadly consistent with the WHO Behavioral and Social Drivers of Vaccination (BeSD) framework, which conceptualizes vaccination behavior through four interconnected domains: thinking and feeling, social processes, motivation, and practical issues. However, the existing literature remains fragmented in both conceptualization and empirical measurement. Many studies focus on one determinant, such as vaccine confidence or hesitancy, without simultaneously considering the wider social and health-service context in which parental decisions are made. This is particularly important because parental hesitancy does not necessarily represent outright refusal; it may involve uncertainty, delay, selective acceptance, or concerns about specific vaccines.

A second limitation concerns the substantial methodological heterogeneity across existing studies. Researchers have employed different instruments, definitions, samples, age groups, vaccination types, and outcome measures, making direct comparisons difficult. The worldwide systematic review by Abenova et al. (2024), for example, found a pooled parental hesitancy rate

of 21.1%, but also reported very high heterogeneity across studies and considerable regional variation, with the Eastern Mediterranean Region showing a relatively high pooled estimate. This suggests that differences in reported hesitancy cannot be interpreted independently of geographical, cultural, methodological, and health-system contexts. Consequently, comparing Arab countries requires a common analytical framework rather than simply comparing percentages reported by individual studies.

A third critical issue is that much of the recent Arab literature has concentrated on COVID-19 vaccination, rather than routine childhood immunization. The systematic review of parental COVID-19 vaccine hesitancy in Middle Eastern countries included 25 studies from 10 countries and found substantial hesitancy, with concerns about side effects, vaccine safety, efficacy, and information being prominent determinants. Although these findings are valuable for understanding parental vaccine decision-making, COVID-19 vaccination differs from routine childhood immunization in terms of perceived disease risk, vaccination schedules, vaccine novelty, and parental experience. Therefore, findings from COVID-19 studies should not automatically be generalized to routine childhood vaccination.

A fourth limitation is the uneven geographical distribution of evidence within the Arab region. Some countries, particularly Gulf countries such as Saudi Arabia and the UAE, have generated a relatively visible body of research, whereas comparable evidence is less consistently available for several other Arab countries. For example, a 2024 narrative review of Saudi Arabia identified 18 relevant studies and reported considerable variation in parental reluctance, with concerns about adverse effects emerging as a major reason for hesitancy. More recent evidence from the UAE also demonstrates the continued relevance of parental attitudes, vaccine literacy, and hesitancy to routine immunization. However, these country-specific studies do not by themselves provide a sufficiently integrated regional picture.

A fifth limitation concerns the insufficient integration of behavioural and structural determinants. Existing research frequently emphasizes parental knowledge, attitudes confidence, and concerns, while practical determinants such as vaccine availability, affordability, ease of access, service quality, satisfaction, and interaction with healthcare workers receive comparatively less systematic attention. This distinction is central to the BeSD framework, which explicitly separates motivational and cognitive barriers from practical barriers. The WHO framework was developed precisely to help identify the underlying causes of low uptake and to support context-specific interventions rather than assuming that all under-vaccination results from hesitancy.

Finally, although previous reviews have identified important determinants of vaccine hesitancy, relatively few have provided a systematic comparative synthesis of Arab countries using one unified conceptual framework. The GCC review by Algabbani et al. (2023), for example, provides useful evidence on vaccine hesitancy and its determinants in Gulf Cooperation Council countries, but its geographical scope is limited to the GCC rather than the wider Arab region. Similarly, existing national reviews provide valuable country-specific assessments but cannot adequately explain similarities and differences across the broader Arab region. Thus, the literature provides substantial evidence on individual determinants but remains less developed in terms of integrated, cross-country comparison

5.2 Research Gap

Based on the critical review, the principal research gap lies in the absence of a comprehensive comparative synthesis of childhood vaccination uptake and parental vaccine hesitancy across the Arab region using a unified behavioural and social framework. Although previous studies have examined parental knowledge, attitudes, confidence, hesitancy, and vaccination intentions in individual Arab countries, the evidence remains dispersed across countries, vaccines, populations, and methodological approaches. Existing systematic reviews have either examined global populations, specific vaccine types such as COVID-19, or restricted geographical areas such as the GCC.

More specifically, four interconnected gaps can be identified. First, there is a geographical gap because evidence is not equally distributed across Arab countries, limiting understanding of regional similarities and country-specific differences. Second, there is a conceptual gap because many studies treat vaccine hesitancy as the primary explanatory variable rather than examining its relationship with the broader behavioral, social, motivational, and practical determinants identified by the WHO BeSD framework. Third, there is a methodological gap resulting from differences in measurement instruments, definitions, study populations, and vaccination outcomes, which restricts comparability between countries. Fourth, there is an evidence-integration gap because parental attitudes are not consistently examined alongside vaccination uptake, social influences, health-worker recommendations, and practical service-related barriers.

The need to address these gaps is reinforced by the WHO's position that behavioural and social drivers should be systematically assessed to understand the causes of under-vaccination and to guide tailored interventions. The present study therefore does not attempt to generate a new prevalence estimate or establish causal relationships. Instead, it addresses the literature gap by organizing, comparing, and critically interpreting the existing evidence across Arab countries within a common analytical framework. This is appropriate for the theoretical and comparative nature of the study.

5.3 Concise Research-Gap Statement for the Manuscript

Despite the growing body of research on parental vaccine hesitancy in Arab countries, the existing evidence remains fragmented across national settings, vaccine types, measurement instruments, and explanatory factors.

Previous studies have largely focused on individual determinants or specific vaccines, particularly COVID-19, while comparatively limited attention has been given to integrating parental perceptions, social processes, motivation, and practical barriers within a unified framework across the Arab region. Furthermore, differences in study designs and measurement approaches restrict meaningful cross-country comparison. Therefore, a comprehensive comparative review applying the WHO Behavioral and Social Drivers of Vaccination (BeSD) framework is needed to identify common patterns, country-specific differences, and evidence gaps in childhood vaccination uptake and parental hesitancy across Arab countries

5.4 Scientific Contribution of the Present Study

The present study makes a conceptual, comparative, methodological, and practical contribution to the literature on childhood vaccination in the Arab region.

Conceptually, the study contributes by applying the WHO BeSD framework as an integrated lens for interpreting childhood vaccination behaviour. Rather than conceptualizing hesitancy as a single parental characteristic, the study examines vaccination behaviour across the four interconnected domains of thinking and feeling, social processes, motivation, and practical issues. This corresponds directly to the structure of the WHO framework and allows cognitive concerns, social influences, motivational readiness, and service-related constraints to be interpreted within one analytical model.

Comparatively, the study contributes by moving from isolated country-level evidence toward a regional perspective. Its purpose is not merely to determine which country has the highest or lowest hesitancy, but to examine why patterns may differ between countries and whether differences reflect parental confidence, social norms, health-worker influence, motivation, or practical barriers. This approach is particularly important because vaccination behaviour is embedded within different cultural, demographic, and health-system contexts across the Arab region.

Methodologically, the study contributes by providing a common structure for organizing heterogeneous evidence. The WHO childhood vaccination BeSD approach includes indicators related to vaccine confidence, intention to vaccinate, family and peer norms, health-worker recommendations, access, affordability, availability, satisfaction, and service quality. Using these dimensions as an analytical structure can improve the comparability of findings from different Arab countries despite differences in individual study designs.

Empirically, the study contributes by bringing together evidence that is currently dispersed across individual national studies and different vaccine contexts. Rather than replacing country-specific findings with a single regional estimate, the study preserves contextual differences while identifying recurring patterns. This is particularly important because recent research shows substantial variation in vaccine hesitancy across settings and confirms that vaccine-specific and sociocultural factors can influence parental decisions.

Practically, the study can support public-health institutions and immunization programmes in designing more targeted interventions. If hesitancy is primarily associated with vaccine safety concerns, communication and trust-building may be appropriate; if the major problem is access or availability, service-delivery interventions may be more relevant; and where family or community influence is dominant, community-based engagement may be required. This logic is consistent with the WHO recommendation to use BeSD evidence to understand the reasons for low uptake and design tailored interventions

6. METHODOLOGY

| The study is designed as a comparative theoretical review of previous studies conducted in Arab countries, supplemented where appropriate by relevant international evidence that contributes to the interpretation of the identified determinants. The primary analytical focus is childhood vaccination uptake and parental vaccine hesitancy, while particular attention is given to vaccine confidence, perceived benefits and risks, parental motivation, social norms, family and community influence, health-worker recommendations, accessibility, availability, affordability, service quality, and satisfaction with vaccination services. These dimensions correspond directly to the priority indicators identified within the WHO BeSD approach.

The geographical scope covers the Arab region, with individual countries treated as separate comparative contexts rather than assuming that the Arab region represents a homogeneous population. This distinction is important because vaccination behaviour may be influenced by differences in social structures, cultural norms, demographic characteristics, health-system organization, and access to vaccination services. The study therefore seeks to preserve country-specific characteristics while identifying broader regional patterns

7. RESULTS AND DISCUSSION

7.1 Childhood Vaccination Uptake: The Libyan Context in Comparison with Arab Evidence

The comparative findings of the present review indicate that childhood vaccination uptake in the Arab region cannot be explained through parental vaccine hesitancy alone. This conclusion becomes particularly evident when the Libyan context is examined alongside the evidence reported from other Arab countries. Unlike several Arab studies that have primarily focused on parental attitudes, vaccine confidence, or willingness to vaccinate, the Libyan evidence demonstrates a pronounced interaction between behavioural determinants and health-system constraints.

Evidence from Libya indicates that routine childhood vaccination historically achieved relatively high coverage, with reported coverage ranging between 95% and 97% during the period preceding the major disruptions after 2018. However, coverage subsequently declined, with conflict, insecurity, the COVID-19 pandemic, and repeated vaccine stock-outs identified as important contributing factors. This pattern is important because it demonstrates that a reduction in vaccination uptake does

not necessarily imply a corresponding increase in parental opposition to vaccines.

This interpretation is supported by the Libyan cross-sectional study conducted by Alkoshi, which examined 916 children attending vaccination centres and found that coverage for most routine vaccines exceeded 90%, while lower coverage was observed for some doses, including the second and third rotavirus doses and pentavalent vaccination. Importantly, 64.2% of vaccination appointments were reported as irregular, with delays attributed to being busy, vaccine unavailability, and parental carelessness. These findings are highly consistent with the WHO BeSD distinction between motivational barriers and practical barriers.

In this respect, Libya differs somewhat from the dominant emphasis in studies from countries such as the UAE, Jordan, Qatar, and Saudi Arabia, where parental perceptions, confidence, safety concerns, and vaccination intentions have received substantial empirical attention (Alsuwaidi et al., 2020; Musa et al., 2021; Al-Iede et al., 2024; Alwhaibi et al., 2025). The Libyan evidence suggests that although parental behavior remains relevant, service continuity and vaccine availability may constitute equally important determinants of actual uptake.

7.2 Thinking and Feeling: Vaccine Confidence and Safety Concerns

The first BeSD domain, thinking and feeling, demonstrates considerable similarity between Libya and the broader Arab literature. Studies conducted in the UAE, Jordan, Saudi Arabia, Lebanon, and other Arab settings repeatedly identify concerns about vaccine safety, effectiveness, side effects, and the credibility of information as important influences on parental decisions (Alsuwaidi et al., 2020; Al-Qerem et al., 2022; Al-Iede et al., 2024; Alwhaibi et al., 2025).

Recent evidence from Libya provides an important extension to these findings. WHO-supported monitoring of the 2024 supplementary immunization activities reported that non-vaccination was associated with refusal in 59% of identified cases, with misinformation and safety concerns among the principal reasons, while the remaining 41% were associated with absence and logistical factors such as transportation, communication gaps, and population mobility.

This finding is particularly significant because it demonstrates that both behavioural and practical determinants operate simultaneously in Libya. The Libyan experience therefore supports, rather than contradicts, the conclusions of Shapiro et al. (2021) and Dyda et al. (2020) concerning the multidimensional nature of vaccine confidence and hesitancy.

However, the Libyan context adds an important critical dimension. In settings where vaccination services themselves are interrupted, parental distrust and practical barriers may reinforce each other. For example, repeated vaccine stock-outs can cause parents to make unsuccessful visits to health facilities, potentially reducing confidence in the reliability of the programmer. Consequently, what initially appears to be a behavioral problem may partly originate from negative service experiences.

This distinction is theoretically important. If a parent does not vaccinate because the required vaccine is unavailable, classifying that parent as “hesitant” would represent a conceptual error. The WHO BeSD framework explicitly seeks to avoid this conflation by distinguishing motivation from practical issues such as availability and access.

7.3 Social Processes and the Role of Health Workers

The second domain concerns social processes, including family influence, community norms, communication with healthcare workers, and trusted social actors. The present review indicates strong agreement between the Libyan context and evidence from other Arab countries.

In Lebanon, Matta et al. (2020) demonstrated the importance of parent–physician communication in childhood vaccination behavior. Similarly, Cooper et al. (2021) showed internationally that parental vaccination decisions are embedded within broader social relationships rather than being determined exclusively by individual knowledge.

The Libyan evidence suggests that this social dimension may be particularly important because vaccination programmers have historically relied on public health centers, community mobilization, health workers, and national campaigns. The successful national vaccination campaign of 2018, for example, achieved very high campaign coverage, with WHO reporting 97.7% coverage and post-campaign monitoring of 93.2%. This provides an important contrast with the lower levels observed in some later campaigns.

The difference suggests that community mobilization and institutional engagement can substantially influence vaccination participation. The 2024 campaign evidence similarly showed substantial geographical differences, with stronger coverage in some municipalities associated with stronger community mobilization.

Therefore, the Libyan case broadly agrees with the conclusions of Cooper et al. (2021) and Fadl et al. (2023) that social processes and communication contribute to vaccination behavior. However, it also indicates that social influence cannot be considered independently of the institutional capacity to deliver vaccines. Community mobilization may generate willingness, but willingness alone cannot compensate for unavailable vaccines or inaccessible services.

7.4Motivation and Vaccine Hesitancy: Libya Compared with Other Arab Countries

The third BeSD domain, motivation, provides one of the clearest areas of comparison between Libya and other Arab countries. Evidence from Saudi Arabia, Jordan, Qatar, Kuwait, and the UAE indicates that parental hesitancy may arise from concerns about vaccine safety, side effects, effectiveness, necessity, and uncertainty (Alsuwaidi et al., 2020; Altulaihi et al., 2021; Al-Ayyadhi et al., 2021; Al-Iede et al., 2024; Alwhaibi et al., 2025).

Libya demonstrates many of the same concerns, particularly misinformation and safety-related concerns.

Nevertheless, the Libyan case differs in an important respect: motivation operates within a more pronounced context of service disruption and population mobility.

This distinction is critical when comparing Libya with countries where vaccination services are more continuously available. A hesitant parent in a stable health system may still have an opportunity to vaccinate the child after receiving appropriate counselling. In contrast, a Libyan parent may simultaneously encounter uncertainty, transportation difficulties, population movement, or vaccine stock-outs. Thus, the final vaccination outcome may reflect the cumulative effect of several barriers rather than hesitancy alone.

This interpretation is consistent with the WHO's conceptual distinction between behavioral and practical drivers. The WHO recommends examining vaccine confidence, intentions, social norms, health-worker recommendations, accessibility, affordability, availability, satisfaction, and service quality together rather than assuming that low uptake has a single cause.

7.5 Practical Barriers: The Most Distinctive Feature of the Libyan Case

The strongest distinctive finding emerging from the comparison with Libya is the prominence of practical and health-system barriers.

The evidence indicates that Libya has experienced repeated vaccine stock-outs, disruptions in health-service delivery, logistical difficulties, and challenges associated with population movement. In 2020, WHO and UNICEF reported severe shortages of essential vaccines and disruption of routine immunization services, with more than 250,000 children under one year considered at risk. A contemporaneous assessment of 200 vaccination sites found stock-outs of BCG and extremely limited supplies of hexavalent vaccine, illustrating the extent to which service availability could directly constrain vaccination.

These findings distinguish Libya from interpretations that locate the primary responsibility for low vaccination uptake within parents. They demonstrate that under-vaccination can occur even without widespread parental refusal when the vaccination system is unable to provide continuous access.

The 2025 national immunization programmer review provides further support for this interpretation. WHO reported that Libya's review covered 12 municipalities and 48 health facilities and examined leadership, service delivery, cold-chain logistics, surveillance, community outreach, and data quality. The review also identified Libya's large geographical area and population movement as important challenges to equitable vaccine access.

Thus, the Libyan experience provides a particularly strong empirical illustration of the BeSD principle that practical barriers should be analytically separated from motivational barriers.

7.6 Geographical Inequality: Libya Versus the Broader Arab Region

Another important finding concerns geographical variation. Previous studies in the Arab region have often examined national samples, but the Libyan evidence indicates that national averages may conceal substantial subnational differences.

The 2024 supplementary immunization activities provide a clear example: coverage varied substantially between municipalities, with some locations achieving comparatively stronger participation while others recorded very low coverage. WHO-linked evidence attributed poorer performance in some areas partly to vaccine hesitancy and misinformation, but also to logistical constraints, transportation difficulties, communication gaps, and population mobility.

This finding is consistent with Gera et al. (2024), who demonstrated internationally that parental hesitancy and geographical vaccination coverage may be related. However, the Libyan evidence extends this relationship by demonstrating that geographical inequalities can reflect both behavioral and structural determinants simultaneously

Therefore, comparing Libya with the broader Arab region suggests that future research should move beyond national-level measures of hesitancy and examine municipality-level or locality-level differences. This would make it possible to determine whether low uptake reflects differences in parental confidence, service accessibility, vaccine availability, population mobility, or combinations of these factors

7.7Similarities and Differences Between Libya and Other Arab Countries

The comparative findings can be summarized as follows:

Table 1. Similarities and Differences Between Libya and Other Arab Countries

BeSD domain	Evidence across Arab countries	Libyan evidence	Critical interpretation
BeSD domain	Evidence across Arab countries	Libyan evidence	Critical interpretation
Thinking and feeling	Safety, effectiveness and side-effect concerns are recurrent	Misinformation and safety concerns contribute to refusal	Strong regional similarity
Social processes	Family influence and health-worker communication are important	Community mobilization and communication influence campaign participation	Similar, but institutional context is stronger
Motivation	Hesitancy and uncertainty influence intention	Refusal occurs alongside misinformation and safety concerns	Similar behavioural mechanisms
Practical issues	Accessibility and service barriers increasingly recognized	Stock-outs, transport, mobility and service disruption are highly visible	More pronounced in Libya
Geographical factors	National studies often dominate	Major municipal/regional variation is evident	Libya highlights the importance of subnational analysis
Health-system context	Varies substantially across Arab countries	Conflict, instability and supply interruptions directly affect uptake	Distinctive Libyan determinant

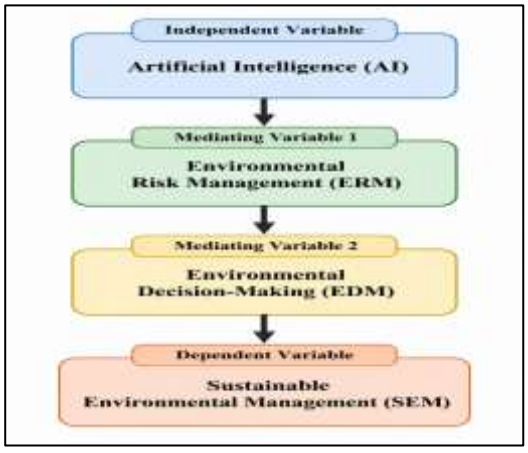
The table demonstrates that Libya does not represent an entirely different vaccination-behaviour system; rather, it represents a context in which the four BeSD domains appear simultaneously, with practical and health-system factors assuming particularly high importance

7.8 Critical Interpretation: Is Low Uptake in Libya Mainly Hesitancy or Access?

A central conclusion of the present comparison is that the Libyan case challenges any interpretation that equates incomplete vaccination with parental hesitancy.

The available evidence indicates at least three interacting pathways

Figure 1. ehavioural, Service-Related, and Access Pathways to Incomplete Childhood Vaccination in Libya



These pathways may also interact. A parent who encounters repeated vaccine stock-outs may become frustrated or distrustful of the vaccination programmer, while a parent who already has safety concerns may be less willing to make repeated efforts to locate an available vaccination center. Consequently, behavioral and practical determinants may reinforce one another rather than operate independently.

This interpretation represents an important extension of the findings of AL Suwaidi et al. (2020), Matta et al. (2020), Al-Iede et al. (2024), and Alwhaibi et al. (2025). Whereas those studies provide strong evidence concerning parental attitudes and hesitancy, the Libyan evidence demonstrates why these variables should be interpreted alongside health-system indicators.

7.9 Overall Comparison and Discussion

Overall, the present study finds substantial agreement between Libya and the wider Arab literature regarding the behavioural foundations of childhood vaccination. Parents' perceptions of safety and effectiveness, confidence in vaccines, misinformation, social influence, communication with health professionals, and vaccination motivation all appear relevant across contexts (Alsuwaidi et al., 2020; Cooper et al., 2021; Al-Iede et al., 2024; Alwhaibi et al., 2025).

Nevertheless, the Libyan case demonstrates a stronger structural dimension. Repeated vaccine stock-outs, disruption of health services, geographical distance, population movement, transportation difficulties, and instability have the potential to limit vaccination uptake independently of parental attitudes.

Accordingly, the main difference is not that Libyan parents are necessarily more or less hesitant than parents in other Arab countries. Rather, the consequences of hesitancy occur within a different health-system environment. This distinction is methodologically important because direct comparison of hesitancy percentages between countries may produce misleading conclusions if differences in vaccine availability, service organization, data quality, and access are not considered.

The Libyan experience therefore strongly supports the central premise of the present study: childhood vaccination uptake should be analyzed as the outcome of an interaction between behavioral, social, motivational, and practical determinants. This interpretation is also consistent with the WHO BeSD framework, which explicitly recommends distinguishing the reasons for low uptake and linking behavioral evidence with health-system and coverage data.

7.10 Concluding Synthesis of the Discussion

The comparative evidence suggests that Libya shares with other Arab countries a common behavioral foundation of childhood vaccination, particularly concerning vaccine confidence, perceived safety, misinformation, social influence, and parental motivation. However, the Libyan context adds a particularly strong health-system and practical dimension, reflected in vaccine stock-outs, interrupted services, geographical inequalities, population mobility, and transportation and communication barriers.

Therefore, the most appropriate interpretation of childhood vaccination challenges in Libya is not "vaccine hesitancy versus vaccine acceptance," but rather "behavioral willingness within a variable service environment." This distinction has direct implications for policy. Communication and confidence-building are necessary where misinformation and safety concerns are dominant, but they cannot substitute for reliable vaccine supplies, accessible vaccination centers, effective outreach, accurate information systems, and continuity of services.

The 2025 national immunization programmer review in Libya itself reflects this broader understanding by examining programmer management, service delivery, logistics, surveillance, community outreach, and data quality rather than focusing exclusively on parental attitudes. Thus, the Libyan case provides strong support for applying the WHO BeSD framework in a context-sensitive manner, while demonstrating that behavioral interventions should be accompanied by health-system strengthening if sustainable improvements in childhood vaccination uptake are to be achieved

8. CONCLUSIONS

The comparative analysis demonstrates that childhood vaccination uptake in the Arab region, and particularly in Libya, is a multidimensional phenomenon that cannot be adequately explained by parental vaccine hesitancy alone. The findings show that vaccine confidence, misinformation, social influence, parental motivation, health-worker communication, service availability, accessibility, and health-system continuity interact to shape vaccination behavior. In Libya, the practical and structural dimensions appear particularly important, as service disruption, vaccine stock-outs, population mobility, transportation, and geographical inequalities may compound behavioral concerns. This interpretation is consistent with the WHO BeSD framework, which distinguishes motivational drivers from practical barriers and recommends integrating behavioral evidence with vaccination coverage and health-system information.

1. Childhood vaccination uptake is multidimensional, involving behavioural, social, motivational, and practical determinants.
2. Parental vaccine hesitancy is an important but insufficient explanation for incomplete childhood vaccination.
3. Vaccine safety, effectiveness, and perceived benefits remain major determinants of parental vaccination decisions across Arab countries.
4. Misinformation and uncertainty can weaken parental confidence and increase refusal or delayed vaccination.
5. Health-worker recommendations and parent–provider communication play an important role in strengthening vaccination confidence.
6. Family and community norms can either reinforce or discourage parents' willingness to vaccinate their children.
7. Parental motivation is heterogeneous, ranging from full acceptance to uncertainty, delay, selective acceptance, and refusal.
8. Practical barriers can produce under-vaccination even among parents who support vaccination, particularly when services are inaccessible or unavailable.
9. Libya shares the major behavioral determinants identified across Arab countries, particularly concerns about vaccine safety and misinformation.
10. The Libyan context is distinguished by stronger structural and health-system constraints, including stock-outs, service disruption, mobility, transportation, and geographical inequalities.
11. Direct comparison of vaccination hesitancy rates across Arab countries should be undertaken cautiously because studies differ in instruments, populations, vaccines, definitions, and study periods.
12. The WHO BeSD framework provides a useful integrated basis for interpreting vaccination behavior and developing context-sensitive interventions across Arab countries, including Libya.

9. RECOMMENDATIONS

Based on the comparative findings and the specific implications identified for Libya, the following recommendations are proposed:

1. Strengthen vaccine confidence through clear, evidence-based, and culturally appropriate communication.
2. Develop targeted strategies to counter misinformation through trusted health and community communication channels.
3. Strengthen the role of healthcare workers in providing individualized counselling and credible vaccination recommendations.
4. Engage families and community leaders in promoting positive vaccination norms and reducing misconceptions.
5. Ensure continuous vaccine availability and minimize stock-outs across vaccination facilities.
6. Improve geographical accessibility by expanding outreach and mobile vaccination services in underserved areas.
7. Address transportation and population-mobility barriers, particularly in remote and vulnerable communities.
8. Integrate BeSD indicators into routine immunization monitoring to distinguish hesitancy from practical barriers.

9. Conduct subnational assessments in Libya to identify municipality-level differences in vaccination uptake and their underlying causes.
10. Standardize measurement instruments to improve comparability of parental vaccine hesitancy across Arab countries.
11. Prioritize research on routine childhood vaccination, rather than relying predominantly on evidence from COVID-19 vaccination.
12. Integrate behavioral interventions with health-system strengthening, recognizing that communication alone cannot compensate for unavailable or inaccessible vaccination services.

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