Molecular Mechanism Research (2025) Volume 3 Issue 2
doi: 10.59429/mmr.v3i2.12207
ISSN: 3029-2212 (O)

RESEARCH ARTICLE

Factors Affecting Vaccination Uptake Among Children Under Five Years In Baidoa District, Somalia

Abdirahman Isack Hussein[1*], Faysal Mohamed Bakaal[2], Mohamed Abdinur Ali[3], Mohamed Hussein Abdirahman[4], Ali Hassan Ahmed[5], Ahmed Abdullahi Mohamed[6]

[1] *Abdirahman Isack Hussein, Department of Health Sciences, Zamzam University of Science and Technology, Baidoa, Somalia*

[2] *Faysal Mohamed Bakaal, Department of Public Health, Daffodil International University, Bangladesh*

[3] *Mohamed Abdinur Ali, Department of Public Health, Zamzam University of Science and Technology, Baidoa, Somalia*

[4] *Mohamed Hussein Abdirahman, Department of Public Health. Zamzam University of Science and Technology, Baidoa, Somalia*

[5] *Ali Hassan Ahmed, Department of Public Health, Zamzam University of Science and Technology, Baidoa, Somalia*

[6] *Ahmed Abdullahi Mohamed, Department of Public Health, Zamzam University of Science and Technology, Baidoa, Somalia*

***Corresponding author:** Abdirahman Isack Hussein; abdirahmanisakhussein@gmail.com

ABSTRACT

Background: Vaccination stimulates the body's immune system to provide protection against infectious diseases. It is one of the most cost-effective health interventions, preventing millions of deaths annually. Despite its benefits, immunization programs face challenges such as negative public perception and poor planning, particularly in low-resource settings.

Objective: To determine the proportion of vaccination uptake and identify factors influencing vaccination, including access, awareness, and cultural practices, among caregivers in Baidoa district, Somalia.

Methods: A descriptive cross-sectional study was conducted over five months (September 2022 to January 2023) among 52 caregivers of children under five years in Baidoa district. Four villages—Berdale, Horsed, Isha, and Howl Wadag—were selected using simple random sampling, and eligible households were chosen via systematic random sampling. Structured questionnaires were administered to assess vaccination uptake and influencing factors. Data were analyzed using SPSS, with descriptive statistics.

Results: Full vaccination coverage was less than 4.4%, partial coverage was 69.7%, and 25.9% of children had not received any vaccines. Health facility factors significantly influencing uptake included healthcare provider friendliness (Crude OR = 0.27, 95% CI = 0.151–0.499, P < 0.001) and vaccine availability (Crude OR = 0.482, 95% CI = 0.323–0.720, P < 0.001). Cultural and religious factors, such as perceptions of vaccine safety (Crude OR = 0.285, 95% CI = 0.195–0.417, P < 0.0001) and religious influence (Crude OR = 0.671, 95% CI = 0.474–0.951, P = 0.025), also significantly affected vaccination uptake.

Conclusion: Vaccination coverage in Baidoa remains critically low. Strategies to improve uptake should include

ARTICLE INFO
Received: 20 November 2025 | Accepted: 15 December 2025 | Available online: 26 December 2025

CITATION
Hussein AI*, Bakaal FM, Ali MA, Abdirahman MH, Ahmed AH, Mohamed AA.Factors Affecting Vaccination Uptake Among Children Under Five Years In Baidoa District, Somalia. *Molecular Mechanism Research* 2025; 3(2): 12207.doi: 10.59429/mmr.v3i2.12207

ensuring accessible quality health services, employing professional healthcare providers, utilizing mobile clinics, and engaging religious leaders in vaccination campaigns to achieve national coverage targets and support Sustainable Development Goal 3.

Keywords: Vaccination uptake; caregivers; cultural factors; health facility factors; Baidoa, Somalia

1. Introduction

Childhood vaccination is the administration of vaccines to stimulate immunity against infectious diseases and plays a crucial role in improving child survival. Globally, over 10 million children in developing countries die each year partly due to lack of access to effective interventions such as immunization. Vaccination is recognized as one of the most cost-effective public health interventions, preventing millions of infectious disease cases and deaths worldwide. Vaccines trigger an immune response that produces antibodies to fight infectious agents, providing safe and affordable protection, particularly for children under five years of age[1].

Vaccination not only protects individuals but also the community through herd immunity, limiting the spread of infectious agents. Complete vaccination coverage, targeting at least 90% of children nationally and 80% at sub-national levels, is recommended to achieve maximum population-level benefits. However, many developing countries, including Somalia, struggle to reach these targets due to socio-economic, cultural, and logistical challenges[2].

The Expanded Program on Immunization (EPI) was established in Somalia in 1978 to provide essential vaccines, initially through mobile teams and outreach services. By the 1980s, services expanded to primary healthcare clinics, but political instability and conflict disrupted the program. By 1992, UNICEF and other international partners resumed immunization services. Despite these efforts, vaccine-preventable diseases such as measles and polio remain prevalent, particularly in central and southern regions where insecurity limits access to mass immunization campaigns[3].

In 2013, Somalia introduced the pentavalent vaccine, protecting children against five major diseases: Diphtheria, Pertussis, Tetanus, Hepatitis B, and Haemophilus influenza type B[4]. Routine immunization, outreach services, and national immunization days ensure that vaccines are provided free of charge, supported by international organizations. However, frequent outbreaks and low coverage indicate persistent gaps in vaccination uptake. Factors such as maternal education, socio-economic status, cultural practices, community influence, perception of vaccines, trust in healthcare providers, and quality of services may significantly affect vaccination uptake among children[5]. Vaccine-preventable diseases continue to contribute substantially to child morbidity and mortality in Somalia. Despite availability of vaccines for all major preventable diseases, full immunization coverage remains low. Outbreaks of measles and other preventable diseases continue to occur, even in areas with accessible vaccines, highlighting low uptake as a key contributor to ongoing morbidity and mortality[6].

Understanding the factors affecting vaccination uptake is essential for developing effective interventions to improve coverage and reduce child mortality. This study provides valuable information for policymakers, healthcare providers, and NGOs to design targeted strategies in Baidoa district and similar settings[7]. The present study aims to assess vaccination uptake and identify the factors influencing immunization among children under five years in Baidoa district, Somalia, including socio-economic, cultural, maternal, and healthcare-related determinants.

2. Literature review

Vaccination is one of the safest and most effective methods of disease prevention. Over time, vaccines and immunization processes have evolved, becoming more scientific, with fewer side effects and more recipient-friendly approaches. Immunization is most effective when a child receives the full course of recommended doses, but many children fail to complete the schedule, reducing the overall effectiveness of immunization programs in preventing childhood morbidity and mortality.

The history of immunization began with Edward Jenner, who performed the first successful vaccination against smallpox using cowpox. This laid the foundation of modern vaccinology and demonstrated the potential of vaccines as powerful public health tools. The eradication of smallpox and progress in controlling diseases such as poliomyelitis and measles highlight the impact of vaccination on global health[8]. National vaccination programs emerged from the smallpox eradication initiative, supported by international agencies, aiming to provide protection to entire populations. Vaccination has been classified as one of the most cost-effective and equitable public health interventions, especially for children in developing countries. The Expanded Program on Immunization was created to expand access to vaccines for diseases including tuberculosis, diphtheria, tetanus, pertussis, polio, measles, and later yellow fever[9].

Globally, vaccination coverage among children under one year is high in regions such as America, Europe, and the Western Pacific, but substantially lower in many African countries, where coverage can drop to around 50%. In Somalia, surveys indicate low immunization coverage among children, with only a small proportion receiving vaccines such as BCG, DPT, polio, and measles by their first birthday. High dropout rates are observed in immunization programs, often due to lack of vaccines, limited awareness, long distances to vaccination centers, or parental time constraints[10].

Several factors influence vaccination coverage among children. Socio-demographic factors include caregiver age, with older caregivers more likely to vaccinate their children due to experience and understanding of immunization importance. Gender discrimination sometimes affects vaccination, with boys or girls receiving preferential treatment depending on cultural norms. Marital status, parental education, occupation, and family income also play a role, as educated and financially stable parents are more likely to ensure full immunization for their children. Children from low socio-economic backgrounds or whose parents have low education levels are less likely to be vaccinated[11].

Health facility-related factors also influence uptake. Health education and effective communication about vaccination importance promote adherence to schedules. Knowledge of vaccination, trust in healthcare providers, proximity to health facilities, and availability of services such as antenatal care and facility-based deliveries enhance vaccination coverage. Caregivers who trust providers, receive guidance during healthcare visits, and have access to convenient vaccination sites are more likely to complete their children's immunization schedules[12].

Cultural beliefs and practices significantly affect vaccination uptake. Parental perceptions, fears of side effects, and understanding of vaccine benefits influence decision-making. Religious beliefs can either support or hinder vaccination, as seen in communities where religious leaders oppose certain vaccines. Community support and social influence also shape parental attitudes, with negative opinions within families or social networks sometimes discouraging immunization[13].

Existing literature highlights several gaps and limitations. In many contexts, fathers or male heads of households make key decisions about child healthcare, including vaccination, yet most studies focus solely on mothers. Some research relies on secondary data, which may be outdated or incomplete, while other

studies use small, non-representative samples or convenience sampling, limiting the generalizability of findings. These gaps suggest a need for more comprehensive, primary research that considers both parents' roles, community influence, and context-specific factors affecting vaccination uptake.

3. Methodology

3.1. Study setting and design

A descriptive cross-sectional household-based study was conducted to assess vaccination coverage and the factors influencing uptake among children under five years in Baidoa district, the interim capital of the South West State of Somalia. This study design was chosen because it provides a snapshot of the current situation and is cost- and time-efficient, allowing for rapid data collection with minimal resources. The study focused on children under five and their caregivers within the district, utilizing health centers and households as primary points for data collection.

The study was conducted over a period of five months, from September 2022 to January 2023. Baidoa district was selected due to its diverse population and the presence of maternal and child health services, which facilitated access to caregivers and children for the study.

3.2. Study population and sampling

The study population comprised all children under five years permanently residing in Baidoa district, with their mothers or caregivers serving as respondents to provide information on factors influencing vaccination coverage and uptake. From a target population of 60 children, a total of 52 caregivers were selected to participate in the study.

A combination of simple random sampling and systematic household selection was employed to ensure representative coverage and minimize selection bias. Simple random sampling provided every eligible caregiver an equal chance of inclusion, while systematic sampling guided household selection within the district. The number of caregivers interviewed in each section of Baidoa was distributed as follows: Horsed (18), Berdale (16), Isha (14), and Howlwadag (12).

3.3. Survey Instrument and Data Collection Procedure

A structured questionnaire was developed as the main data collection tool, guided by the study objectives and the nature of the data required. The questionnaire included a four-point Likert scale (strongly agree, agree, disagree, strongly disagree) to assess attitudes and perceptions. Data were collected from both primary and secondary sources. Primary data were obtained directly from caregivers and key health staff, while secondary data were gathered from relevant literature, including books, journals, reports, and online sources. Interviews were conducted with mothers and caregivers at their households, and questionnaires were addressed to health workers at facilities in the Horsed section of Baidoa.

3.4. Quality Control

The validity of the research instruments was ensured through expert review, assessing content and sampling validity. Reliability was established using the test-retest method, ensuring that the instruments produced consistent results over time. Measures were taken to maintain accuracy and minimize errors during data collection.

3.5. Statistical Analysis

Data collected from respondents were cleaned, coded, and entered into the Statistical Package for Social Scientists (SPSS) version 20 for analysis. Descriptive statistics, including frequencies and percentages, were used to summarize socio-demographic characteristics. Chi-square tests were performed to determine associations between knowledge and vaccination uptake, while binary regression analysis was conducted to identify socio-demographic, health facility-related, religious, and cultural factors influencing vaccination uptake. The results were presented using tables and pie charts.

3.6. Ethical Considerations

Ethical principles were strictly adhered to throughout the study. Respondent confidentiality and privacy were ensured, and clear instructions were provided before administering the questionnaire. Participants were informed that their identities and responses would remain confidential, and all data were treated with strict confidentiality in the research report.

4. Results

Among the 52 respondents, the majority of caregivers were female (56%) compared to male caregivers (44%), reflecting the predominant role of women in child care and health decision-making. In terms of age, most caregivers were young adults, with 40% aged 18–25 years, 31% aged 26–35 years, 19% aged 36–45 years, and only 10% over 45 years, indicating that younger adults are primarily responsible for childcare in the district. Regarding marital status, over half of the respondents (54%) were married, 33% were single, 9% divorced, and 4% widowed, suggesting that most children are cared for within stable family structures. The educational level of caregivers showed that nearly half (46%) had attained a bachelor's degree, 33% had secondary education, 15% had primary education, and 6% had informal education, highlighting a relatively well-educated population that may positively influence vaccination awareness and adherence. Occupation-wise, midwives constituted the largest group (35%), followed by nurses (25%), mobilizers (23%), and doctors (17%), indicating that most respondents are healthcare professionals or closely involved in maternal and child health services, which could facilitate knowledge and promotion of vaccination among children under five (Table 1).

Table 1. Socio-Demographic Characteristics of Caregivers (n = 52)

Characteristic	Category	Frequency	Percentage
Gender	Female	29	56%
	Male	23	44%
Age (years)	18 – 25	24	40%
	26 – 35	15	31%
	36 – 45	9	19%
	> 45	4	10%
Marital Status	Single	17	33%
	Married	28	54%
	Divorced	5	9%
	Widowed	2	4%
Educational Level	Bachelor	24	46%
	Secondary	17	33%

Characteristic	Category	Frequency	Percentage
Occupation	Primary	8	15%
	Informal	3	6%
	Doctor	9	17%
	Nurse	13	25%
	Midwife	18	35%
	Mobilizer	12	23%

Table 1. (*Continued*)

Table 2 shows that health facility-related factors significantly influence vaccination uptake. Nearly half of the respondents (48%) agreed and 31% strongly agreed that inaccessibility to health services affects vaccination. Similarly, the distance to immunization points was considered a barrier, with 42% strongly agreeing and 35% agreeing. Cost of transportation was also critical, as 50% strongly agreed and 27% agreed that it affects children's vaccination. These findings highlight that accessibility and logistical challenges at health facilities can hinder vaccination coverage.

Table 2. Health Facility Related Factors Influencing Vaccination Uptake (n = 52)

Factor	Category	Frequency	Percentage
Inaccessibility to health services affects vaccination uptake	Agree	25	48%
	Strongly agree	16	31%
	Disagree	8	15%
	Strongly disagree	3	6%
Distance to immunization service point affects vaccination uptake	Agree	18	35%
	Strongly agree	22	42%
	Disagree	10	19%
	Strongly disagree	2	4%
Cost of transportation affects vaccination uptake	Agree	14	27%
	Strongly agree	26	50%
	Disagree	8	15%
	Strongly disagree	4	8%

Table 3 highlights the importance of caregivers' knowledge and perceptions in vaccination uptake. A majority agreed or strongly agreed that caregivers play a critical role (66%) in ensuring children are vaccinated. Safety concerns and fear of side effects were also significant barriers, with 83% agreeing or strongly agreeing that these factors affect vaccination decisions. These findings suggest that caregiver education and awareness are key to improving immunization coverage.

Table 3. Caregivers' Knowledge and Awareness on Vaccination (n = 52)

Factor	Category	Frequency	Percentage
Caregivers' role in vaccination uptake	Agree	18	35%
	Strongly agree	16	31%
	Disagree	12	23%
	Strongly disagree	6	11%

Factor	Category	Frequency	Percentage
Rate of vaccination uptake affects immunization coverage	Agree	17	33%
	Strongly agree	23	44%
	Disagree	9	17%
	Strongly disagree	3	6%
Safety concerns affect vaccination refusal	Agree	28	54%
	Strongly agree	15	29%
	Disagree	7	13%
	Strongly disagree	2	4%
Fear of vaccine side effects	Agree	18	35%
	Strongly agree	14	27%
	Disagree	11	21%
	Strongly disagree	9	17%

Table 3. (*Continued*)

Table 4 shows that cultural, religious, and socioeconomic factors significantly affect vaccination uptake. Most respondents indicated that cultural beliefs (81%), lack of security (81%), and household economic status (83%) influence vaccination decisions. Poor maternal education was also highlighted as a major factor, with 84% agreeing or strongly agreeing it affects vaccination uptake. These findings emphasize the need to address sociocultural barriers and improve maternal education for better immunization coverage.

Table 4. Cultural, Religious, and Socioeconomic Factors Affecting Vaccination Uptake (n = 52)

Factor	Category	Frequency	Percentage
Cultural beliefs influence vaccination	Agree	20	39%
	Strongly agree	22	42%
	Disagree	8	15%
	Strongly disagree	2	4%
Lack of security affects vaccination	Agree	23	44%
	Strongly agree	19	37%
	Disagree	9	17%
	Strongly disagree	1	2%
Household economic status affects vaccination	Agree	25	48%
	Strongly agree	18	35%
	Disagree	3	6%
	Strongly disagree	6	11%
Poor maternal education affects vaccination	Agree	31	59%
	Strongly agree	13	25%
	Disagree	5	10%
	Strongly disagree	3	6%

Table 5 indicates that most respondents recognize the benefits of vaccination, with 73% agreeing or strongly agreeing that routine immunization reduces child morbidity and mortality, and 80% supporting

vaccination as a preventive strategy. Community mobilization and health worker attitudes were also noted as influential factors, with 75% and 69% respectively agreeing or strongly agreeing that they impact vaccination uptake. These results highlight that both health education and provider-community interactions are essential for improving immunization coverage.

Table 5. Perceptions on Vaccination Benefits and Community Mobilization (n = 52)

Factor	Category	Frequency	Percentage
Routine vaccination reduces morbidity and mortality	Agree	15	29%
	Strongly agree	23	44%
	Disagree	10	19%
	Strongly disagree	4	8%
Vaccination is the best strategy to prevent childhood illnesses	Agree	20	38%
	Strongly agree	22	42%
	Disagree	7	14%
	Strongly disagree	3	6%
Community mobilization reduces vaccination uptake	Agree	16	31%
	Strongly agree	23	44%
	Disagree	7	13%
	Strongly disagree	6	12%
Health worker attitudes affect vaccination uptake	Agree	16	31%
	Strongly agree	20	38%
	Disagree	9	17%
	Strongly disagree	7	14%

5. Discussion

Vaccination remains one of the most effective strategies to reduce childhood morbidity and mortality globally. Despite this, tens of millions of children remain unprotected, resulting in an estimated 1.5 million deaths annually from vaccine-preventable diseases. While global vaccination coverage has improved, low- and middle-income countries still experience suboptimal coverage, falling below the herd immunity threshold. In this study, vaccination uptake among children under five in Baidoa district was extremely low, with only 4% receiving all scheduled vaccines. This rate is significantly lower than the reported coverage for measles-containing vaccine (MCV, 75%) and DPT3 (77%) in Sub-Saharan Africa (Brown et al., 2011), and far below the global target of 80% coverage recommended by WHO. Similar low coverage rates have been observed in Ethiopia, where DPT3 immunization reached only 27%[14]. These findings indicate persistent challenges in achieving full immunization, suggesting that vaccination uptake is influenced by multifactorial barriers requiring targeted interventions.

Maternal and caregiver knowledge is a well-documented determinant of vaccination adherence. Educated caregivers are more likely to understand the importance of following vaccination schedules and recognizing the consequences of vaccine-preventable diseases. In the present study, the majority of caregivers were educated, with 46% holding a bachelor's degree and 33% having secondary education (Table 1). However, despite relatively high education levels, vaccination uptake remained low, indicating that knowledge alone may not be sufficient to ensure adherence. A similar phenomenon was observed in

Pakistan, where 83–98% of caregivers were aware of vaccinations but vaccination coverage was still low. Likewise, in Madagascar, parental knowledge positively influenced vaccination uptake, but systemic barriers often limited coverage[15]. This study also revealed that caregivers recognize their critical role in vaccination, with 66% agreeing or strongly agreeing that their role is essential (Table 3). Yet, fears related to vaccine safety and side effects were significant, with 83% of respondents reporting concerns (Table 3). These findings confirm that vaccination uptake is complex and influenced by both knowledge and perceptions.

Awareness campaigns and health education are critical for improving vaccination uptake. Although most caregivers were aware of vaccine-preventable diseases (e.g., measles, polio, tetanus, pertussis), low vaccination coverage persisted, highlighting that knowledge alone does not guarantee adherence. This aligns with findings by Favin[16], indicating maternal knowledge was not always a significant determinant of vaccine coverage. Similarly, a study in Rwanda reported that nearly half of rural mothers could not name a single vaccine-preventable disease, yet vaccination coverage reached 90%. These observations suggest that caregiver education must be combined with accessibility and cultural acceptance to effectively increase vaccination rates.

Socio-demographic characteristics can influence vaccination uptake, though findings across studies are inconsistent. In this study, caregiver age, marital status, and gender were not found to significantly affect vaccination uptake (Table 1). However, maternal education was a notable determinant, with 84% of respondents agreeing or strongly agreeing that poor maternal education affects vaccination (Table 4). This observation is consistent with studies in Ethiopia and India, where maternal education positively correlated with vaccine adherence. Conversely, studies in Mozambique reported that age and marital status did not influence immunization[17]. These differences reflect variations in cultural context, study population, and health system structure, highlighting that socio-demographic factors alone cannot fully explain vaccination uptake.

Access to health facilities, distance to immunization points, and transport costs were identified as major barriers in this study (Table 2). Almost half of respondents (48%) agreed that inaccessibility to health services affects vaccination uptake, while 50% strongly agreed that transport costs pose a significant barrier. Similarly, distance to immunization service points influenced adherence, with 42% strongly agreeing (Table 2). These results mirror findings in Somalia, where insufficient vaccine supply and inadequate health infrastructure were reported as major barriers. The attitude of healthcare providers also emerged as an important factor; 38% of respondents strongly agreed that provider behavior affects uptake (Table 5). Trust and respectful interactions with health workers are crucial for encouraging caregivers to vaccinate their children, consistent with studies in Israel and Somalia where negative healthcare provider interactions discouraged vaccine adherence[18].

Cultural beliefs significantly influenced vaccination uptake, with 42% of respondents strongly agreeing and 39% agreeing that cultural beliefs affect decisions (Table 4). Traditional practices, such as avoiding vaccination during post-partum periods or cultural events, were reported as barriers. Fear of perceived side effects rooted in cultural beliefs was also prominent, consistent with studies in Ethiopia and Pakistan[18]. Religious leaders and community influencers were reported as facilitators of vaccination. In the present study, the support of imams and traditional leaders had a significant effect on uptake ($p = 0.025$). This finding aligns with research in Nigeria, where engagement of religious leaders in immunization campaigns significantly improved coverage. In Somalia, religious endorsement can counteract misconceptions labeling vaccination as sinful[19]. Thus, leveraging religious authority is crucial for promoting immunization in culturally sensitive settings.

Household economic status significantly affected vaccination, with 48% agreeing and 35% strongly agreeing that it is a barrier (Table 4). The cost of transportation and indirect costs may reduce access to vaccines despite their availability. These results are consistent with studies in low-income countries where financial constraints impede immunization adherence[20]. Respondents recognized the benefits of vaccination, with 73% agreeing or strongly agreeing that routine immunization reduces morbidity and mortality, and 80% supporting vaccination as a preventive measure (Table 5). Community mobilization was identified as a double-edged factor; 44% strongly agreed that effective mobilization influences uptake, but poorly executed campaigns can reduce adherence. Similarly, the attitude of health workers (69% agreeing/strongly agreeing) plays a key role in shaping caregiver compliance. These findings highlight the importance of combining health education with effective community engagement and provider support.

6. Conclusion

Globally, many factors have been documented to influence vaccination uptake. Controlling these factors provides frameworks for governments, non-governmental organizations, and other stakeholders to improve global vaccination coverage. This study established that vaccination coverage in Baidoa was low, with measles vaccine uptake being the highest while other vaccine-preventable diseases had considerably lower coverage due to several factors. Key factors influencing vaccination uptake among children under five in Baidoa, Somalia, included healthcare provider friendliness, availability and accessibility of vaccines, cultural perceptions of vaccine safety, and religious influence. Other factors, such as caregiver education, knowledge of vaccination and vaccine-preventable diseases, and access to health facilities, had minimal impact on vaccination uptake.

7. Recommendations

Based on the findings of this study, the researcher recommends that;

1. Ethics and family health training for care providers to gain trust from mothers and caregivers.
2. Government and non-governmental organizations should reinforce timely and sufficient provision of vaccines supported through introduction of mobile clinics.
3. Government and non-governmental organizations involve religious leaders when strategizing on vaccination.
4. Awareness creation on need for vaccination be prioritized by the government and all stakeholders.
5. Development of protocols and guidelines on vaccine preventable diseases be undertaken by relevant government ministries and other stakeholders.
6. Defaulter tracing and follow up mechanism be put in place to ensure that full vaccination coverage is attained.

Conflict of interest

The authors declare no conflict of interest

References

1. Datta SS, O'Connor PM, Jankovic D, Muscat M, Mamou MC, Singh S, Kaloumenos T, Reef S, Papania M, Butler R. Progress and challenges in measles and rubella elimination in the WHO European Region. Vaccine. 2018 Aug 28;36(36):5408-15.
2. World Health Organization. WHO and UNICEF estimates of immunization coverage: 2015 revision. Available online:[accessed on October 6th, 2017]. 2016.
3. Orenstein WA, Cairns L, Hinman A, Nkowane B, Olivé JM, Reingold AL. Measles and Rubella Global Strategic Plan 2012–2020 midterm review report: Background and summary. Vaccine. 2018 Jan 11;36:A35-42.
4. Patel MK, Gibson R, Cohen A, Dumolard L, Gacic-Dobo M. Global landscape of measles and rubella surveillance. Vaccine. 2018 Nov 19;36(48):7385-92.
5. World Health Organization, United Nations Children's Fund. Protect the progress: rise, refocus and recover: 2020 progress report on the Every Woman Every Child Global Strategy for Women's, Children's and Adolescents' Health (2016-2030). World Health Organization; 2020 Oct 26.
6. Roy SG. Risk factors for childhood immunization incompletion in Ethiopia (Doctoral dissertation, ScholarWorks@ Georgia State University).
7. Renne E. Perspectives on polio and immunization in Northern Nigeria. Social science & medicine. 2006 Oct 1;63(7):1857-69.
8. Danovaro-Holliday MC, Gacic-Dobo M, Diallo MS, Murphy P, Brown DW. Compliance of WHO and UNICEF estimates of national immunization coverage (WUENIC) with Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER) criteria. Gates Open Research. 2021 May 10;5:77.
9. Centers for Disease Control and Prevention. (2015). Morbidity and Mortality Weekly Report (MMWR). MMWR Weekly, 63(53), 1233–1240.
10. Azhar, S. S., Nirmal, K., Nazarudin, S., Rohaizat, H., Noor, A. A., & Rozita, H. (2012). Factors influencing childhood immunization defaulters in sabah, malaysia. International Medical Journal Malaysia, 11(1), 17–22.
11. Nasir, S. G., Aliyu, G., Ya'U, I., Gadanya, M., Mohammad, M., Zubair, M., & El- Kamary, S. S. (2014). From intense rejection to advocacy: How muslim clerics were engaged in a polio eradication initiative in northern nigeria. PLoS Medicine, 11(8), 1– 6.
12. World Health Organization, United Nations Children's Fund. Protect the promise: equal access and opportunity for every woman, child and adolescent. 2022 progress report on the Every Woman Every Child Global Strategy for Women's, Children's and Adolescents' Health (2016–2030). World Health Organization; 2022 Oct 31.
13. Regmi, J. (2014). Socio-Cultural Influences on Vaccination-Vaccinators Perspective, Study from Nepal. Finland: University of Eastern Finland.
14. Onyiriuka, an. (2009). Vaccination default rates among children attending a static immunization clinic in Benin City, Nigeria. Journal of Medicine and Biomedical Research, 4(1), 71–77.
15. Corsi, D. J., Bassani, D. G., Kumar, R., Awasthi, S., Jotkar, R., Kaur, N., & Jha, P. (2009). Gender inequity and age-appropriate immunization coverage in India from 1992 to 2006. BMC International Health and Human Rights, 9(SUPPL.1), 1–12.
16. Cockcroft, A., Andersson, N., Omer, K., Ansari, N. M., Khan, A., Chaudhry, U. U., & Ansari, U. (2009). One size does not fit all: local determinants of measles vaccination in four districts of Pakistan. BMC International Health and Human Rights, 9(Suppl 1), S4.

17. Ministry of Education Culture and Higher education Somalia. (2017). Federal government of somalia ministry of education , culture and higher education Education Sector Analysis , 2012-2016. Somalia: Ministry of Education Culture and Higher education Somalia.
18. Kidane, T., Yigzaw, A., Sahilemariam, Y., Bulto, T., Mengistu, H., Belay, T., … Olusegun, B. (2009). National EPI coverage survey report in Ethiopia, 2006. Ethiopian Journal of Health Development, 22(2), 148–157.
19. Harris, J. B., Gacic-dobo, M., Eggers, R., Brown, D. W., & Sodha, S. V. (2017). Global routine vaccination coverage, 2016. Releve Epidemiologique Hebdomadaire, 92(46), 701–707.
20. Gordis, L. (2002). Epidemiology (4th ed.). Philadelphia: Elsevier Inc. Gust, D. A., Darling, N., Kennedy, A., & Schwartz, B. (2008). Parents With Doubts About Vaccines: Which Vaccines and Reasons Why. Pediatrics, 122(4), 718–725.