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Original Article

GENDER EQUITY IN EXPANDED PROGRAMME ON IMMUNIZATION (EPI) SERVICE UTILIZATION AMONG FORCIBLY DISPLACED MYANMAR NATIONALS (FDMN): A MULTI-CAMP ANALYSIS OF CHILD VACCINATION PARITY IN COX'S BAZAR, BANGLADESH (2024–2026)

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ABSTRACT

Background: Gender inequity in childhood immunization remains a significant public health challenge in many low- and middle-income countries, particularly within humanitarian and conflict-affected settings where healthcare access is often severely disrupted. In several South Asian societies, male children frequently exhibit higher rates of complete vaccination compared to female children, a disparity often attributed to prevailing sociocultural preferences, gender norms, and inequitable healthcare-seeking behaviors. However, comprehensive evidence regarding gender parity in vaccination utilization among Forcibly Displaced Myanmar Nationals (FDMN) residing in the Cox's Bazar camps remains limited. This study aimed to assess the extent of gender equity in Expanded Programme on Immunization (EPI) service utilization among children living in Camps 1E, 11, and 22 in Cox's Bazar, Bangladesh.

Methods: A retrospective descriptive analysis was conducted utilizing routine EPI service data collected from health post vaccination registers operated by Gonoshasthaya Kendra between July 2024 and April 2026. Sex-disaggregated vaccination data for Bacillus Calmette–Guérin (BCG), Oral Polio Vaccine (OPV0–3), Pneumococcal Conjugate Vaccine (PCV1–3), Pentavalent Vaccine (PENTA1–3), Inactivated Polio Vaccine (IPV1–2), and Measles-Rubella Vaccine (MR1–2) were meticulously extracted and analyzed. Comparisons were made across camps regarding the total vaccine doses administered to male and female children, as well as the total number of vaccinated children. Male-to-female ratios were calculated to ascertain equity, with ratios ranging between 0.90 and 1.10 considered indicative of equitable utilization.

Results: Over the study period, a total of 4,417 child vaccine doses were administered across the three camps, comprising 2,218 doses for male children and 2,199 for female children, resulting in an overall male-to-female ratio of 1.01. Similarly, the total number of children receiving at least one EPI service was nearly balanced between sexes, with 674 male children and 656 female children vaccinated. Across individual vaccine categories and camps, the majority of male-to-female ratios consistently fell within the predefined equitable range. Among 63 vaccine-specific comparisons, 85.7% demonstrated equitable utilization. The only

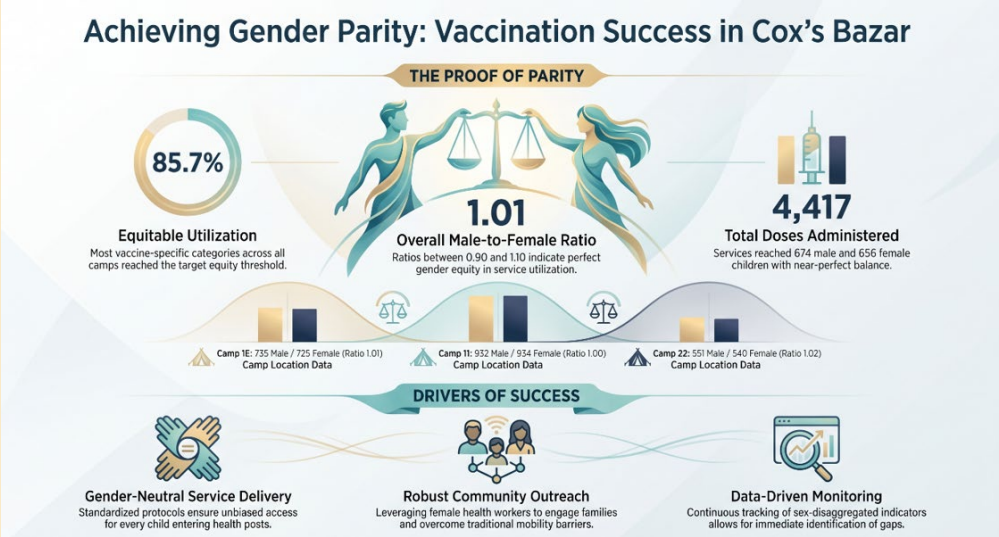
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Transparency: The authors affirm that this manuscript presents an honest, accurate, and transparent account of the study. All essential aspects have been included, and any deviations from the original study plan have been clearly explained. The writing process strictly adhered to established ethical standards.
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notable deviation was observed for MR2 vaccination in Camp 22, where the male-to-female ratio was 0.69; however, this anomaly was primarily attributed to low overall MR2 uptake rather than a systematic gender bias.

Conclusion: The findings unequivocally demonstrate substantial gender equity in childhood immunization utilization among FDMN populations served by Gonoshasthaya Kendra in Cox's Bazar. These results suggest that humanitarian immunization systems can effectively achieve equitable vaccine access when underpinned by gender-neutral service delivery approaches, robust active community outreach, and continuous monitoring of sex-disaggregated indicators. Continued efforts are imperative to enhance overall vaccine completion rates, particularly for MR2 coverage, while steadfastly maintaining equitable service utilization for both male and female children.

Keywords: Vaccination, FDMN, Cox's Bazar, Gender Equity, Gonoshasthaya Kendra, Bangladesh



INTRODUCTION

Childhood immunization stands as one of the most effective and cost-efficient public health interventions globally, instrumental in preventing vaccine-preventable diseases and significantly reducing child mortality World Health Organization. (2025). Despite remarkable progress in global vaccination coverage, persistent disparities continue to exist across socioeconomic, geographic, and gender dimensions. In numerous low-income and conflict-affected settings, gender discrimination profoundly influences healthcare utilization patterns, frequently favoring male children over female children in access to essential preventive health services, including immunization Corsi et al. (2009).

Several studies conducted in South Asia and sub-Saharan Africa have consistently reported lower vaccination completion rates among female children. These disparities are often linked to deeply entrenched sociocultural norms, such as son preference, inequitable household resource allocation, restrictions on caregiver mobility, and other gender-specific barriers Noh et al. (2018). In humanitarian contexts, these pre-existing disparities can become even more pronounced, as displaced families often contend with severe economic hardship, severely disrupted healthcare systems, and significantly limited access to vital services Humanitarian Action. (2022). Bangladesh currently hosts over one million Forcibly Displaced Myanmar Nationals (FDMN), commonly referred to as Rohingya refugees, predominantly residing in overcrowded camps within the Cox's Bazar district UNHCR. (n.d.).

Within these camps, a multitude of governmental and non-governmental organizations are actively engaged in providing essential healthcare services, including comprehensive Expanded Program on Immunization (EPI) services. Gonoshasthaya Kendra, a prominent non-governmental organization, operates several health posts across these camps, delivering routine childhood immunization services as an integral component of the broader humanitarian health response Health Sector Cox's Bazar. (2026).

While previous studies have generally indicated relatively equitable access to healthcare services among Rohingya refugee populations Yusuf et al. (2025), recent comprehensive evidence specifically concerning sex-disaggregated immunization utilization remains scarce. A thorough understanding of gender patterns in vaccination uptake is critically important for ensuring equitable healthcare delivery and ultimately achieving universal health coverage goals within these vulnerable populations. Therefore, this study was meticulously designed to assess gender equity in EPI service utilization among children residing in Camps 1E, 11, and 22 in Cox's Bazar between July 2024 and April 2026.

METHODS

This retrospective descriptive study meticulously analyzed routine immunization data collected from three distinct Forcibly Displaced Myanmar National (FDMN) camps: Camp 1E, Camp 11, and Camp 22, all situated in Cox's Bazar, Bangladesh. These camps are part of the larger humanitarian response for Rohingya refugees. Vaccination services within these designated camps were delivered through established health posts, which are operated by Gonoshasthaya Kendra, an integral partner within the broader humanitarian health

response system. The study population encompassed all children aged 0–59 months who received at least one dose of an Expanded Program on Immunization (EPI) vaccine during the defined study period, spanning from July 2024 to April 2026. Data were systematically extracted from routine vaccination registers diligently maintained at the respective health posts. To ensure accuracy and consistency, sex-disaggregated monthly vaccination records were aggregated and rigorously reviewed for completeness and internal consistency prior to their inclusion in the final analysis.

The analysis incorporated data for a comprehensive set of routine childhood vaccines, including Bacillus Calmette–Guérin (BCG), Oral Polio Vaccine (OPV0–3), Pentavalent Vaccine (PENTA1–3), Pneumococcal Conjugate Vaccine (PCV1–3), Inactivated Polio Vaccine (IPV1–2), and Measles-Rubella Vaccine (MR1–2). The primary outcome of interest for this study was the assessment of gender parity in the total number of vaccine doses administered, while secondary outcomes included the evaluation of gender parity in the total number of children who received at least one vaccination service. Consistent with established public health metrics for assessing equity, male-to-female ratios falling within the range of 0.90 to 1.10 were considered indicative of equitable utilization Rata Mohan et al. (2025).

Descriptive statistical analyses were performed using the aggregated routine service data. Key metrics such as frequencies, proportions, and male-to-female ratios were meticulously calculated for each camp. Since this study exclusively utilized population-level programmatic data rather than sampled survey data, formal inferential statistical testing was not performed. The study was conducted using anonymized routine service data, ensuring that no personal identifiers were accessed or utilized. Permission for the secondary analysis of these routine program data was obtained from Gonoshasthaya Kendra and Malteser International.

RESULTS

During the specified study period from July 2024 to April 2026, a grand total of 4,417 child vaccine doses were administered across the three study camps. A detailed breakdown revealed that 2,218 doses were administered to male children, while 2,199 doses were administered to female children, resulting in an overall male-to-female ratio of 1.01. This distribution strongly indicates a near-perfect gender parity in the utilization of vaccination services. Further disaggregation by camp also consistently demonstrated highly equitable utilization patterns. In Camp 1E, 735 vaccine doses were administered to male children and 725 to female children, yielding a male-to-female ratio of 1.01. In Camp 11, female children received a marginally higher number of doses compared to male children, resulting in a ratio of 1.00. Camp 22 similarly exhibited balanced utilization, with a male-to-female ratio of 1.02.

A total of 1,330 children received at least one EPI vaccine dose during the study period. Of these, 674 were male children and 656 were female children, resulting in an overall male-to-female ratio of 1.03. This ratio falls well within the predefined equitable range of 0.90 to 1.10. Camp-specific analyses also revealed similarly equitable patterns, with Camp 22 demonstrating nearly identical utilization rates between sexes. These findings are summarized in the tables below, illustrating the high degree of gender parity across the study sites.

Table 1

Table 1 Total Child EPI Doses Administered by Gender and Camp (July 2024 – April 2026)

Camp	Male Doses	Female Doses	Male-to-Female Ratio	Interpretation
Camp 1E	735	725	1.01	Perfect parity
Camp 11	932	934	1.00	Perfect parity
Camp 22	551	540	1.02	Near-perfect parity
Total	2,218	2,199	1.01	Perfect parity

Note: Male-to-female ratio was calculated by dividing the number of vaccine doses administered to male children by the number administered to female children. Ratios between 0.90 and 1.10 were considered indicative of equitable utilization of EPI services. EPI = Expanded Program on Immunization.

Table 2

Table 2 Number of Children Receiving at least one EPI service by Gender and Camp (July 2024 – April 2026)

Camp	Male Doses	Female Doses	Male-to-Female Ratio	Interpretation
Camp 1E	735	725	1.01	Perfect parity
Camp 11	932	934	1.00	Perfect parity
Camp 22	551	540	1.02	Near-perfect parity
Total	2,218	2,199	1.01	Perfect parity

Note: Male-to-Female Ratio Was Calculated Based on the Total Number of Children Receiving At Least One EPI Vaccine Service. Ratios Between 0.90 and 1.10 Were Considered Indicative of Gender-Equitable Utilization. EPI = Expanded Programme on Immunization.

Analysis of vaccine-specific utilization further underscored strong gender equity across the vast majority of vaccine categories and camps. Out of 63 individual vaccine-specific comparisons made across the three camps, a remarkable 54 demonstrated male-to-female ratios that fell within the equitable threshold. In Camp 1E, BCG vaccination showed a mild male predominance with a ratio of 1.15, while MR2 vaccination exhibited slightly higher female uptake. In Camp 11, most vaccine categories remained within equitable ranges, although MR2 vaccination demonstrated a higher male utilization ratio of 1.55, which was likely due to small absolute numbers rather than systematic bias. In Camp 22, vaccine utilization remained well-balanced across most antigens, with the most notable deviation observed for MR2 vaccination, which demonstrated a ratio of 0.69 primarily due to low overall uptake. Crucially, no consistent pattern favoring either sex was identified across the diverse vaccine antigens, affirming that the overall pattern of vaccine-specific utilization among FDMN children is characterized by substantial gender equity.

DISCUSSION

The achievement of gender equity in immunization among FDMN children in Cox's Bazar stands out globally, but comparative analysis reveals persistent gender gaps in other refugee contexts—highlighting the critical role of context-specific, gender-responsive strategies and global policy frameworks.

Gender Equity in Immunization: The Cox's Bazar Experience

This study demonstrates substantial gender parity in immunization service utilization among Forcibly Displaced Myanmar National (FDMN) children in Cox's Bazar, Bangladesh. Unlike many humanitarian and low-resource settings where male children often receive preferential access to healthcare, our findings reveal near-equal vaccination coverage for boys and girls across multiple vaccine categories and camps. This achievement is attributed to standardized, gender-neutral service delivery protocols, robust community outreach, and continuous monitoring of sex-disaggregated indicators. These programmatic strategies have effectively minimized gender-based disparities, offering a model for equity-focused humanitarian health response.

CROSS-COUNTRY COMPARISONS: LESSONS FROM OTHER REFUGEE CONTEXTS

MIDDLE EASTERN CONTEXTS: SYRIAN REFUGEES IN JORDAN, LEBANON, AND TURKEY

In contrast to the Cox's Bazar context, gender disparities in immunization coverage remain a significant challenge among Syrian refugees in the Middle East. Studies consistently report that girls and women face disproportionate barriers to vaccination due to restrictive gender norms, mobility constraints, and limited access to information and female health workers UNICEF. (n.d.-b). For example, Samari (2017) highlights that cultural and socioeconomic factors in Lebanon, Turkey, and Jordan impede access to immunization for Syrian girls, necessitating culturally sensitive, gender-responsive programming and community-based outreach. El Arnaout et al. (2019) further identify geographical inaccessibility and insufficient health education as barriers, calling for synchronized, gender-sensitive approaches and enhanced training for healthcare workers. UNICEF. (2026) report underscores that humanitarian crises and displacement deepen gender disparities, emphasizing the need to integrate gender equity into immunization strategies and scale up outreach for girls. A systematic review by Bouaddi et al. (2024) confirms that vaccination coverage among refugees in the MENA region is generally lower than in host populations, with legal, logistical, and sociocultural barriers disproportionately affecting women and girls.

SUB-SAHARAN AFRICA: DRC AND BEYOND

Similar challenges are observed in Sub-Saharan Africa. In the Democratic Republic of the Congo (DRC), gender-related barriers—such as harmful norms and limited empowerment of women—contribute to large numbers of zero-dose children missing routine vaccines Musuka et al. (2025). The WASHINDI initiative in DRC demonstrates that community engagement, tackling gender norms, and empowering women can significantly improve immunization uptake among both refugee and host communities UNICEF. (n.d.-b). These findings highlight the importance of addressing underlying gender norms and involving women in health decision-making to close equity gaps.

SOUTH ASIAN CONTEXTS: AFGHAN REFUGEES IN IRAN AND PAKISTAN

Among Afghan refugees in Iran, Esmaeili-Darmian et al. (2025) found that, despite the availability of free vaccination services, disparities persist—particularly for girls—due to parental education, gender norms, and access barriers. In Pakistan, UNICEF. (2025) reports that restrictive gender norms, household dynamics, and the lack of female vaccinators hinder immunization access for girls among Afghan and Pakistani populations. Employing female health workers and community-based strategies has proven effective in overcoming these barriers and improving vaccine uptake among women and girls UNICEF. (2025), Mansilla et al. (2025).

GLOBAL POLICY CONTEXT: WHO AND UNICEF FRAMEWORKS

The observed gender equity in Cox's Bazar aligns with global policy guidance from WHO and UNICEF, which emphasize the need for gender-responsive immunization programs in humanitarian settings World Health Organization. (n.d.), UNICEF. (n.d.-b). The WHO's Immunization, Vaccines and Biologicals framework calls for the collection and use of sex-disaggregated data, community engagement, and the integration of gender considerations into emergency immunization programs World Health Organization. (n.d.). UNICEF's practical guide provides tools for integrating gender analysis into immunization, highlighting the importance of equitable involvement of both female and male staff and addressing gender norms at the community level UNICEF. (n.d.-b), Mansilla et al. (2025). These frameworks underscore that achieving gender equity in immunization requires not only technical solutions but also a deep understanding of local gender dynamics and sustained community engagement.

IMPLICATIONS AND FUTURE DIRECTIONS

The Cox's Bazar experience demonstrates that targeted, equity-focused programming can overcome traditional gender barriers in healthcare access, even in complex humanitarian emergencies. However, cross-country comparisons reveal that such outcomes are not universal. Persistent gender gaps in other refugee contexts underscore the need for context-specific strategies, including the employment of female health workers, community mobilization, and the dismantling of harmful gender norms. Integrating global policy frameworks and lessons learned from diverse settings can inform the design and implementation of more effective, gender-equitable immunization programs worldwide.

KEY TAKEAWAYS

While Cox's Bazar offers a model of gender equity in immunization, sustained progress globally will depend on adapting successful strategies to local contexts, addressing deep-rooted gender norms, and operationalizing global policy guidance.

STRENGTHS AND LIMITATIONS

This study possesses several notable strengths that enhance the robustness and applicability of its findings, starting with its utilization of real-world, routine immunization data collected over an extended period from July 2024 to April 2026. This approach provides operationally relevant evidence directly applicable to humanitarian programming within large displaced populations. Furthermore, the use of sex-disaggregated data allowed for a detailed and granular assessment of gender equity across numerous vaccine categories, providing a comprehensive picture of parity that might otherwise be missed. The focus on the specific and vulnerable FDMN population in Cox's Bazar also contributes valuable, context-specific evidence to the broader literature on humanitarian health responses.

However, the study is also subject to several limitations that warrant consideration, primarily the absence of denominator population data which prevented the calculation of true vaccination coverage rates. As a result, the study could only assess gender parity in utilization among those who actually accessed services, rather than overall coverage within the eligible population. Additionally, the analysis relied exclusively on routine service records, which may inherently contain minor recording inconsistencies or data entry errors despite rigorous review. The study design also lacked qualitative data collection, meaning it was not possible to explore in-depth caregiver perceptions or specific healthcare-seeking behaviors that might influence vaccination uptake. Future research incorporating qualitative methods could provide a richer contextual understanding of these dynamics.

CONCLUSION

This multi-camp analysis unequivocally demonstrates near-perfect gender equity in childhood Expanded Programme on Immunization (EPI) service utilization among Forcibly Displaced Myanmar National (FDMN) populations served by Gonoshasthaya Kendra in Cox’s Bazar between 2024 and 2026. Male and female children accessed vaccination services at nearly identical rates across the vast majority of vaccine categories and camps, challenging common assumptions about gender disparities in healthcare access within vulnerable populations. The results strongly suggest that humanitarian immunization systems can successfully achieve equitable vaccine delivery when supported by a combination of inclusive service delivery approaches, robust community outreach leveraging female health workers, and diligent monitoring of sex-disaggregated indicators. Looking forward, future interventions should prioritize improving overall vaccine completion rates, particularly for the Measles-Rubella 2 (MR2) coverage, while maintaining ongoing efforts to ensure equitable access for both male and female children. The findings also underscore the critical importance of integrating gender-sensitive monitoring and evaluation frameworks into all humanitarian health programming and policy development. By sustaining and replicating these positive outcomes, humanitarian organizations can ensure that the most vulnerable populations receive equitable and life-saving healthcare services, ultimately contributing to the global goal of universal health coverage.

Acronym	
AFP	Acute Flaccid Paralysis
BCG	Bacillus Calmette–Guérin
EPI	Expanded Programme on Immunization
FDMN	Forcibly Displaced Myanmar Nationals
GK	Gonoshasthaya Kendra
IPV	Inactivated Polio Vaccine
MR	Measles–Rubella Vaccine
OPV	Oral Polio Vaccine
PCV	Pneumococcal Conjugate Vaccine
PENTA	Pentavalent Vaccine
VPD	Vaccine-Preventable Disease
WHO	World Health Organization
UNHCR	United Nations High Commissioner for Refugees

GENERATIVE ARTIFICIAL INTELLIGENCE USE STATEMENT

The authors acknowledge the use of generative artificial intelligence (AI)-assisted language tools during the preparation of this manuscript. These tools were used exclusively to improve grammar, sentence structure, language clarity, and overall coherence of the text. The authors independently planned the study, determined the methodology, analyzed and interpreted the data, and developed all scientific conclusions and recommendations. Generative AI was not used to generate, analyze, interpret, or validate research findings, nor was it used as a substitute for scientific judgment or authorship responsibilities. All outputs generated through AI-assisted editing were critically reviewed, verified, and revised by the authors, who assume full responsibility for the accuracy and integrity of the final manuscript.

CONFLICT OF INTEREST STATEMENT

The authors declare that there are no financial, professional, institutional, or personal relationships that could be perceived as influencing the work reported in this manuscript. The authors have no conflicts of interest to disclose.

ETHICAL PERSPECTIVE

This study was based on retrospectively analyzed, aggregated and de-identified data extracted from the Electronic Medical Record (EMR) system. No individual-level identifiers were accessed or included in the analysis, and no participant could be identified from the reported results. The study involved secondary analysis of routinely collected programmatic data and did not involve any direct contact or intervention with participants. During routine service delivery, beneficiaries provided informed consent for the collection and secure storage of their clinical information within the EMR system for healthcare management and related programmatic purposes. The study was conducted in accordance with applicable ethical principles for research involving human data. Permission to access and analyze the programmatic dataset was obtained from the data-owning organization (Gonoshasthaya Kendra and Malteser International) prior to conducting the study.

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