

Hygiene and Infant and Young Child Feeding Practices Among Rohingya Pregnant and Lactating Women in Cox's Bazar: A Descriptive Cross-Sectional Study with Comparison to a Prior Camp-Wide Assessment

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Abstract

Background

Hygiene and Infant and Young Child Feeding (IYCF) practices are vital for maternal and child health in humanitarian settings. Over 900,000 Rohingya forcefully displaced Myanmar Nationals (FDMN) reside in makeshift settlements in Cox's Bazar, Bangladesh. Pregnant and lactating women face heightened risks due to overcrowding, poor hygiene, limited healthcare access, and food insecurity, increasing maternal and child morbidity and mortality.

Objective

This study aimed to describe hygiene behaviors and IYCF practices among PLWs in the Kutupalong makeshift settlements.

Methods

A community-based cross-sectional study was conducted among 415 PLWs aged 18–35 years, selected using systematic random sampling from four randomly chosen camps. Data were collected through face-to-face interviews using a structured questionnaire between March and April 2023. Descriptive statistics were performed using SPSS version 26. Planned bivariate (chi-square) analyses were withheld after post-hoc data verification identified internal inconsistencies in several behavioral variables that could not be resolved against the original data collection records; findings are therefore reported descriptively.

Results

Among the respondents, 75.08% of mothers provided colostrum to their newborns, and 91.08% practiced handwashing after defecation. However, only 39.73% initiated complementary feeding at the recommended six months, and just 40.48% of children consumed at least five food groups in the last 24 hours. Handwashing before food preparation was reported by 54.83%. Planned associations between these practices and socio-demographic characteristics could not be reliably assessed (see Methods and Limitations).

Conclusion

This descriptive study documents suboptimal hygiene and IYCF practices among PLWs in the Kutupalong makeshift settlements and underscores the need for targeted education and behavior change interventions. Improving hygiene infrastructure and IYCF counseling can contribute to better maternal and child health outcomes in humanitarian contexts like the Rohingya makeshift settlements; future research with verified data should examine which socio-demographic factors drive these gaps.

1. Introduction

Hygiene practices and Infant and Young Child Feeding (IYCF) behaviors are essential pillars of maternal and child health, particularly among pregnant and lactating women (PLWs) in vulnerable populations [1]. These behaviors not only support child survival but also contribute to optimal growth, cognitive development, and long-term health outcomes. In humanitarian settings, displaced populations often face compounded risks due to food insecurity, poor sanitation, overcrowding, and frequent disease outbreaks [2]. Among such populations, the Rohingyas, formally designated as Forcibly Displaced Myanmar Nationals (FDMNs), represent one of the most vulnerable groups. Since August 2017, over one million Rohingya individuals have fled Myanmar due to conflict and persecution, settling in makeshift settlements in Cox's Bazar, Bangladesh. Approximately 52% of this population are women and girls, and over 36,000 are pregnant women [3]. These camps, including the Kutupalong settlement, the largest refugee camp in the world, are characterized by inadequate sanitation, unsafe water, and limited access to healthcare and education [4], all of which adversely impact maternal and child health. IYCF encompasses early initiation of breastfeeding, exclusive breastfeeding for the first six months, and timely and appropriate complementary feeding with adequate dietary diversity for children under two years [5]. Despite WHO recommendations, several barriers, including food insecurity, cultural beliefs, and limited counseling services, affect adherence to optimal practices. An IYCF-E (Infant and Young Child Feeding in Emergencies) assessment reported that although 84.9% of Rohingya mothers provided colostrum, only 74.8% initiated complementary feeding at six months, and just 28.2% of children aged 6–23 months consumed at least five food groups within 24 hours [6]. These figures indicate a substantial gap between recommended feeding practices and actual behaviors in this population. Hygiene behaviors, including handwashing with soap after defecation, before food preparation, and after handling child feces, are equally critical to prevent infectious diseases [7]. In Cox's Bazar makeshift settlements, hygiene promotion assessments have documented persistent behavioral gaps at these critical junctures, particularly around handwashing before food preparation and after cleaning a child's feces [11]. Persistent behavioral gaps are compounded by multiple factors such as limited availability of soap, low hygiene literacy, and the insufficient cultural tailoring of hygiene promotion activities. Socio-demographic characteristics, particularly maternal age, education, and family structure—have been shown to influence IYCF and hygiene practices. Older, more educated mothers and those living in joint families are more likely to adopt recommended behaviors [8, 9], whereas younger or uneducated mothers are less likely to practice timely complementary feeding or appropriate hygiene [10]. Although multiple hygiene and IYCF campaigns have been implemented since 2017 by UN agencies and NGOs, gaps between knowledge and practice remain, especially regarding handwashing before food preparation and complementary feeding [11]. These gaps likely reflect cultural barriers, resource constraints, and inconsistent messaging, rather than the absence of campaigns. To date, there is limited descriptive evidence on feeding and hygiene behaviors in the Rohingya refugee context. This study aims to address this gap by describing key IYCF and hygiene behaviors among PLWs in Rohingya makeshift settlements. The findings will help inform context-sensitive, culturally appropriate strategies for improving maternal and child nutrition and health in humanitarian settings, and lay the groundwork for future studies examining socio-demographic determinants using verified data.

2. Methodology

Study design and setting

A community-based, cross-sectional study was conducted among Forcibly Displaced Myanmar National (FDMN) pregnant and lactating women (PLWs) residing in the Kutupalong makeshift settlements in Cox's Bazar district, Bangladesh. Kutupalong is recognized as the largest temporary refugee settlement in the world, characterized by extreme population density and limited access to essential services. The study aimed to assess hygiene behaviors and Infant and Young Child Feeding (IYCF) practices and examine their associations with selected socio-demographic characteristics. Four camps within Kutupalong (camps 3, 5, 10, and 12) were selected through simple random sampling using a lottery method to ensure adequate geographical and population-based representation of the target population. Systematic random sampling was chosen over stratified or cluster sampling to strike a balance between methodological rigor and operational feasibility in the field.

Study period

Data collection was conducted over a period of two months, from March to April 2023.

Study population and eligibility criteria

The study population consisted of PLWs aged 18–35 years who were residents of the selected camps and had given birth within the previous two years or were currently pregnant or breastfeeding. Women who were critically ill or unwilling to provide informed consent were excluded from the study.

Sample size determination

A total of 415 respondents were included. The sample size was calculated with a 95% confidence interval, 5% margin of error, and an assumed prevalence of 50%. After applying the sample size formula and accounting for a 10% non-response rate, the final sample size was determined to be 415.

Sampling procedure

A systematic random sampling technique was used within each selected camp. A comprehensive household listing of eligible PLWs was obtained in collaboration with Camp-in-Charge (CiC) offices and local community volunteers. The sampling interval (k) was calculated by dividing the total number of eligible PLWs in each camp by the required sample size per camp. Starting from a randomly chosen household, every k^{th} household was approached. If a selected household did not have an eligible participant, the next immediate household was visited, and this process continued until the required sample size was achieved in each camp.

Data collection tools and techniques

Data were collected using a pre-tested, structured questionnaire adapted from WHO and UNICEF IYCF indicators and WASH guidelines in humanitarian settings. The questionnaire covered three major areas: (1) socio-demographic characteristics, (2) hygiene practices, and (3) IYCF practices. The tool was initially prepared in English and then translated into Bengali and the Rohingya dialects. Where the local Chittagonian and Rohingya dialects overlapped, the simpler version was used to ensure clear communication and cultural appropriateness. The questionnaire was back-translated to check accuracy and conceptual equivalence. Data were collected through face-to-face interviews conducted by trained female enumerators fluent in the Rohingya dialect. Each interview lasted approximately 15–20 minutes. Community volunteers provided logistical support and assisted with interpretation when needed.

Data quality control

Multiple measures were implemented to ensure data accuracy and reliability:

- A full-day training session was held for enumerators and supervisors covering questionnaire content, interviewing techniques, and ethical procedures.
- Supervisors reviewed all completed questionnaires daily to identify and correct errors or missing data.
- A random 5% of interviews were revisited by field supervisors to verify the consistency of responses.
- Although Cronbach's alpha was not calculated, pre-testing and field validation helped improve clarity and consistency.

Data management and statistical analysis

All data were entered into Microsoft Excel and exported to SPSS version 26.0 for analysis. Descriptive statistics (frequencies and percentages) were used to summarize socio-demographic characteristics, hygiene behaviors, and IYCF indicators. Bivariate associations between socio-demographic variables and key outcomes were originally planned using chi-square (χ^2) tests. However, during post-hoc data verification, several behavioral variables (colostrum feeding and all four handwashing indicators) showed internally implausible patterns when cross-tabulated against education and family type. Specific subgroups showed deterministic 0% or 100% response rates across multiple independent indicators simultaneously, a pattern inconsistent with genuine survey responses and suggestive of an unresolved data entry, coding, or merge issue in the source file. Because this could not be traced or corrected against original data collection records, planned inferential analyses for these variables were withheld, and findings for these indicators are reported descriptively only (Table 2). This precaution was extended to all planned bivariate comparisons in this dataset, given the scope of the inconsistency. Multivariable modeling was not performed.

Ethical considerations

Ethical approval

(Ref. No. 2023/OR-NSU/IRB/1238) was obtained from the Institutional Review Board (IRB)/Ethical Review Committee (ERC), North South University. Permission to conduct the study was secured from the Refugee Relief and Repatriation Commissioner (RRRC) and Camp-in-Charge (CiC) offices of each selected camp. Informed verbal and written consent was obtained from all participants after explaining the purpose, procedures, potential risks, and benefits of the study in the Rohingya dialect to ensure full comprehension. Participation was voluntary, and respondents were assured of confidentiality and their right to withdraw at any stage without any consequences. Personal identifiers were removed, and all data were anonymized and securely stored.

3. Results

Table 1 presents the socio-demographic profile of the 415 pregnant and lactating women (PLWs). Most respondents (68.5%) lived in joint families, while 31.5% lived in nuclear households. By age, 62.1% were 20–30 years, 23.8% were under 20 years, and 14.1% were over 30 years. Educational attainment was low overall: 27.2% reported no formal education; 23.4% completed up to class two; 25.0% up to class five; and 7.1% up to class eight. An additional 17.3% reported religious education (Hifz/Mowlovi). These distributions indicate limited formal education and a high prevalence of joint family living arrangements in the study population.

Table 1
Socio-demographic characteristics of the respondents (n = 415)

Variables	Frequency	Percentage
Family type		
Nuclear	131	31.5
Joint	284	68.5
Mother's age		
< 20 years	99	23.8
20 to 30 years	258	62.1
> 30 years	58	14.1
Mother's level of education		
Illiterate	113	27.2
Up to Class 2	97	23.4
Up to Class 5	104	25.0
Up to Class 8	29	7.1
Hifj/Mowlovi	72	17.3
Note: This analysis focuses on three a priori socio-demographic predictors (family type, maternal age, maternal education) selected for their established relevance to hygiene and IYCF behaviors and feasibility in a constrained camp setting. Other important variables (e.g., parity, age at marriage/first pregnancy, delivery method, ANC/PNC) were not collected due to operational limitations and are acknowledged as a limitation; future studies should incorporate these to enable adjusted analyses.		

Table 2 summarizes hygiene and child-feeding practices. Tube-well water was the primary drinking source for 91.3% of respondents, and for household chores in 76.8%. While 91.1% reported handwashing after defecation and 76.1% before eating, fewer reported handwashing after cleaning a child's feces (67.6%) or before preparing meals (54.8%), indicating gaps at critical times for disease prevention. Regarding IYCF, 75.1% reported giving colostrum. Among the 343 respondents for whom this item was applicable, only 39.7% initiated complementary feeding at six months, and 40.5% of children achieved minimum dietary diversity (≥ 5 food groups in the prior 24 hours). Handwashing before feeding the child was not captured in the survey instrument; this omission is acknowledged as a limitation and is conceptually distinct from handwashing before preparing meals. Likewise, detailed breastfeeding indicators (e.g., early initiation, exclusive breastfeeding) were not collected and are noted as measurement gaps to be addressed in future surveys.

Table 2
Hygiene & child feeding related information of the respondents (n = 415)

Variables	Frequency	Percentage
Hygiene-related information		
Use tubewell water for drinking	379	91.3%
Use tubewell water for household chores	319	76.8%
Wash hands after defecation	378	91.1%
Wash hands before eating	316	76.1%
Wash hands after cleaning the child's feces	280	67.6%
Wash hands before preparing a meal	228	54.8%
Child feeding-related information		
Gave the child colostrum	312	75.1%
Started complementary feeding in time (From 6 months)	136	39.7%
Children's dietary diversity (5 or more food groups)	168	40.5%
Children's dietary diversity (Less than 5 food groups)	247	59.5%
Notes: (1) "Handwashing before feeding the child" was not captured in the instrument and is analytically distinct from "handwashing before preparing a meal"; this omission is acknowledged as a limitation. (2) Detailed breastfeeding indicators (early initiation, exclusive breastfeeding) were not collected and should be included in future assessments. (3) The complementary feeding indicator applied only to respondents with a child of eligible age (valid n = 343 of 415); the percentage reported (39.7%) is calculated against this valid denominator, not the full sample.		

To contextualize these findings, Table 3 compares key IYCF indicators from this study (2023) with the most recent camp-wide IYCF-E assessment conducted in the same population in 2022 [6]. This comparison, rather than the originally planned socio-demographic subgroup analysis, forms the primary analytic contribution of this paper (see Limitations for why the subgroup analysis was not reported).

Table 3
Comparison of key IYCF indicators with the 2022 camp-wide IYCF-E assessment [6]

Indicator	2022 IYCF-E [6]	This study (2023)	Change
Indicator	2022 IYCF-E [6]	This study (2023)	Change
Gave the child colostrum	84.9%	75.1%	↓ 9.8 pts
Initiated complementary feeding at 6 months	74.8%	39.7%*	↓ 35.1 pts
Minimum dietary diversity (≥ 5 food groups)	28.2%	40.5%	↑ 12.3 pts

*Calculated against the valid denominator (n = 343) of respondents with a child of eligible age; see Table 2, note 3.

Relative to the 2022 assessment, this sample shows a substantially lower rate of timely complementary feeding initiation and a modestly lower colostrum-feeding rate, alongside a notable improvement in minimum dietary diversity. These directional differences may reflect genuine changes in practice, seasonal variation, differences in camp coverage or sampling between the two assessments, or residual measurement differences, and cannot be attributed to any single cause without further investigation. They nonetheless indicate that complementary feeding timeliness in particular may warrant renewed programmatic attention in this population. WASH/hygiene indicators (handwashing practices) are not included in this comparison: the "WASH Cluster" source originally cited for camp-wide handwashing benchmarks could not be verified against any traceable document during final reference checking and has been removed from this manuscript (see Reference list and Introduction); no independent camp-wide handwashing benchmark from this period could be confirmed for comparison.

Note on planned subgroup analysis

Bivariate analyses linking these indicators to maternal age, education, and family type were originally planned but withheld after data verification found implausible, non-random response patterns in several behavioral variables (see Limitations for details). This does not affect the marginal frequencies reported in Tables 1–2 above, which reflect simple counts rather than cross-tabulated comparisons.

4. Discussion

This study provides important descriptive insights into hygiene practices and Infant and Young Child Feeding (IYCF) behaviors among pregnant and lactating women (PLWs) in the Kutupalong makeshift settlements of Cox's Bazar, Bangladesh. Planned analyses of associations with maternal socio-demographic factors (age, education, family structure) were withheld due to data verification concerns (see Methods and Limitations). These findings nonetheless highlight persistent behavioral gaps in critical areas and point to the need for culturally appropriate interventions, informed by verified associational data in future work.

4.1 Infant and young child feeding practices

Three out of four mothers reported giving colostrum to their newborns, which is encouraging but slightly lower than the 84.9% reported in recent IYCF assessments in Rohingya communities [6]. This gap may reflect differences in sampling or program exposure as well as persistent cultural barriers to early breastfeeding. Only 39.7% of respondents initiated complementary feeding at the recommended age of six months, aligning with previous studies that have documented delayed complementary feeding due to food insecurity, cultural beliefs, and inadequate counseling in refugee and low-resource settings [12]. Minimum dietary diversity was met by just 40.5% of children, lower than the national average for Bangladeshi children aged 6–23 months but similar to other displaced populations [13, 14]. Limited

access to diverse foods, economic constraints, and low maternal literacy likely contribute to this gap. Prior literature [17–19] has identified maternal education as a predictor of appropriate IYCF practices; this study's own planned analysis of that association could not be verified and is not reported here (see Methods and Limitations). Educated mothers may generally have greater access to health information and a better understanding of nutrition recommendations, which may positively influence feeding decisions. Importantly, this study did not collect data on early initiation or exclusive breastfeeding, which are critical IYCF indicators. Their absence represents a measurement gap and likely underestimates the full scope of feeding practices in this population. Future assessments should address this omission.

4.2 Hygiene practices

The findings indicate strong adoption of certain hygiene practices, such as handwashing after defecation (91.1%), but much lower adherence before meal preparation (54.8%) and after cleaning a child's feces (67.6%). These results are consistent with studies in other refugee and humanitarian settings [15, 16], which have documented similar behavioral gaps at critical transmission points for diarrheal diseases. Planned analysis of how these practices vary by socio-demographic factors (education, age, family type) was withheld after data verification identified unresolved inconsistencies in these specific variables (see Methods and Limitations); this remains an important question for future research using verified data. One notable limitation is that handwashing before feeding the child, a critical IYCF-linked hygiene behavior, was not captured in this study. This is an important measurement gap that should be incorporated into future hygiene behavior assessments.

4.3 Influence of socio-demographic factors

Existing research [17–21] suggests that maternal age, education, and family structure are associated with both IYCF and hygiene practices in comparable settings. Older mothers and those with higher education may have greater exposure to health information, while joint family structures often provide additional caregiving support and opportunities for health knowledge sharing. This study had originally intended to test these associations directly in the Kutupalong sample; however, that analysis was withheld after data verification identified unresolved inconsistencies in the relevant behavioral variables, as detailed in the Methods and Limitations sections. Ongoing hygiene and IYCF interventions implemented by UN agencies and NGOs since 2017 may also have influenced current behaviors independent of socio-demographic factors, and program exposure data were not collected in this study. A verified re-analysis of these associations, together with program-exposure data, is recommended as a priority for future research in this population.

4.4 Implications for Practice

- Educational and family-based behavior change programs should target young, less-educated, and first-time pregnant/lactating women, leveraging joint-family caregiving support where present.
- Access to safe water, soap, and hygiene infrastructure, alongside integrated hand hygiene and IYCF messaging, should be prioritized in ongoing camp programming.

- Future program monitoring and research should record participants' exposure to ongoing IYCF/hygiene interventions and use verified data collection procedures to enable robust subgroup analysis.

4.5 Limitations and recommendations

This study has several limitations. The cross-sectional design precludes establishing causal relationships. Important variables such as parity, age at marriage, age at first pregnancy, delivery method, ANC and PNC visits, and exposure to hygiene and IYCF interventions were not collected, limiting the ability to adjust for confounding or assess program influence. Self-reported data may also be subject to recall and social desirability biases. Additionally, handwashing before feeding the child and breastfeeding indicators were not measured, leaving critical behavioral gaps unexplored. Future studies should adopt longitudinal or mixed-methods designs to assess behavioral change over time, include a broader set of socio-demographic and program exposure variables, and integrate observational measures to validate self-reported behaviors. Comparative studies across different displaced settings may also help identify structural versus program-driven determinants of maternal and child health behaviors.

5. Conclusion

This study provides important descriptive empirical evidence on hygiene and Infant and Young Child Feeding (IYCF) practices among pregnant and lactating women (PLWs) living in the Kutupalong makeshift settlements of Cox's Bazar, Bangladesh. The findings reveal suboptimal practices in critical areas, including the timely initiation of complementary feeding, dietary diversity, and key hygiene behaviors such as handwashing before food preparation. Planned analysis of associations between these practices and socio-demographic characteristics (maternal age, education, family structure) was withheld after data verification identified unresolved inconsistencies in the source data (see Methods and Limitations); this remains a priority question for future research using verified data. These findings nonetheless highlight the importance of developing context-specific, targeted interventions that emphasize behavior change communication, maternal education, and family and community engagement. Stakeholders involved in humanitarian response and public health programming should prioritize nutrition and hygiene education as integral components of service delivery in similar settings. Strengthening culturally appropriate strategies and improving access to diverse foods, clean water, and adequate sanitation facilities should be central to efforts aimed at enhancing maternal and child health outcomes in vulnerable populations. Policymakers should integrate targeted IYCF and hygiene promotion strategies into national humanitarian response frameworks to ensure sustainable health impact.

Declarations

Ethics approval and consent to participate

This study was conducted in strict adherence to the ethical principles of the Declaration of Helsinki (1964) and its subsequent amendments. Ethical approval (Ref. No. 2023/OR-NSU/IRB/1238) was obtained from the Institutional Review Board (IRB)/Ethical Review Committee (ERC), North South University. Permission to conduct the study was also secured from the Refugee Relief and Repatriation Commissioner (RRRC) and the Camp-in-Charge (CiC) offices of each selected camp. Both verbal and written informed consent (with thumbprint used in place of signature for participants unable to write) were obtained from all participants after clearly explaining the purpose, methodology, potential risks, and benefits of the study in the Rohingya language. All participants were assured of the voluntary nature of their participation and their right to withdraw from the study at any time without penalty.

Consent for publication

All authors have read and approved the final version of the manuscript and consent to its publication.

Competing interests

The authors declare no competing interests. There are no financial, personal, or professional relationships that could have inappropriately influenced the work reported in this study.

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Author Contribution

M.S.H., M.Z.M., and M.D.H.H. conceptualized and designed the study. M.S.H. and A.A.M.R. carried out data collection and initial data curation. M.S.H., A.A.M.R., and M.Z.M. performed data analysis and interpretation. M.S.H. and A.A.M.R. wrote the first draft of the manuscript. M.Z.M., N.P., R.U.A., and M.D.H.H. critically revised the manuscript for important intellectual content. All authors read, edited, and approved the final manuscript for submission.

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Data Availability

The data collected and analyzed during this study are not publicly available to ensure participant confidentiality and compliance with ethical requirements. However, data may be made available upon reasonable request from the corresponding author, subject to institutional approval and ethical clearance.

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