Reproductive Health Indicators and Outcomes Among Refugee and Internally Displaced Persons in Postemergency Phase Camps

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Reproductive Health Indicators and Outcomes Among Refugee and Internally Displaced Persons in Postemergency Phase Camps

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Context Despite increasing awareness of the importance of reproductive health programs and services for refugee and internally displaced populations, there is a paucity of basic epidemiological data on reproductive health outcomes.

Objectives To collect data on reproductive health outcomes among refugees and internally displaced persons in postemergency phase camps and compare these outcomes with those of host country and country-of-origin populations. To determine programmatic factors that may affect reproductive health outcomes.

Design, Setting, and Participants Retrospective study of data collected from August 1998 through March 2000 of 688 766 persons living in 52 postemergency phase camps in 7 countries. Reproductive health outcomes of refugee and internally displaced populations were compared with available data of reference populations within their respective host country and country of origin.

Main Outcome Measures Crude birth rate (CBR), neonatal mortality rate (NNMR), maternal mortality ratio (MMR), percentage of newborns with low birth weight (LBW), and incidence of complications of unsafe or spontaneous abortions.

Results Six of 11 groups had lower CBRs than their country of origin and 5 of 9 groups had lower CBRs than their host country. Four of 5 had lower NNMRs than their country of origin and 6 of 9 had lower NNMRs than the host country. Four of 6 had lower MMRs than their country of origin, and 5 of 6 had lower MMRs than their host country. Seven of 9 had lower percentages of LBWs than in the country of origin and 5 of 9 had lower percentages of LBWs than the host country. Higher CBRs were associated with more recently established camps and higher numbers of local health staff per 1000 persons; and higher percentages of LBW newborns were associated with rainy season, more recently established camps, lower numbers of community health workers per 1000 persons, and camps without supplementary feeding programs.

Conclusions Refugees and internally displaced persons in most postemergency phase camps had better reproductive health outcomes than their respective host country and country-of-origin populations.

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THERE ARE APPROXIMATELY 37 million displaced persons worldwide, consisting of refugees and internally displaced persons.[1] An estimated 20%, or 7 million, of these displaced persons are women of reproductive age (15-49 years).[2] Women and children may be particularly vulnerable in complex emergencies in which families are separated and social support systems are destroyed.

During the emergency phase of a complex emergency, defined by a crude mortality rate of 1 or more deaths/10 000 persons per day,[3,4] infectious diseases such as diarrhea, measles, malaria, and respiratory tract infections account for most of the excess deaths.[3,5] In the postemergency phase of a complex emergency, crude mortality rates decrease, primarily because the incidence of infectious diseases is reduced through improved environmental conditions, public health measures, and health care services.[6-9] Although refugees and internally displaced populations may remain in camps for many years during the postemergency phase, health organizations often continue to focus their programs on diseases that contribute to excess deaths during the emergency phase. Little attention is given to the evolving needs of the population, such as chronic diseases, and psychosocial and reproductive health issues.[10,11]

The 1994 International Conference on Population and Development initiated a shift in reproductive health policy from a narrow focus on family planning programs to more inclusive definitions of reproductive health that were adopted by the humanitarian aid community.[12] Even with the expansion of reproductive health policies and programs, however,

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it is unclear to what extent their services and policies are based on data, despite increasing demands by donors for evidence-based programs.[13]

A survey in 1994 of reproductive health services in refugee populations found few available data beyond antenatal and delivery services.[14] In recent years, the international community has increasingly focused on providing more comprehensive reproductive health services to refugee and internally displaced populations, which include programs on family planning, gender-based violence, and sexually transmitted infections (STIs) (including HIV/AIDS.)[12] However, there is a paucity of basic epidemiological data on reproductive health outcomes of refugee and internally displaced populations in postemergency phase camps. A major reason for this dearth of knowledge is because many health information systems do not include categories for the recording of reproductive health data.

A review of reproductive health research of displaced populations suggests that improved access to and use of health services, as well as social and demographic factors, may account for better health outcomes than those of host country or country-of-origin populations.[15] Better documentation of reproductive health outcomes in refugee and internally displaced populations may lead to improved programs and policies for both conflict-affected and developing country settings. Efforts to link relief and development efforts through the integration of refugee and host communities may help relieve some of the burden refugee populations can put on a host community and increase benefits to both populations.[16,17]

The objectives of this study, which are part of a larger study of health indicators among refugees and internally displaced persons in postemergency phase camps, are 3-fold: (1) to provide baseline information on reproductive health outcomes among refugee and internally displaced populations in postemergency phase camps; (2) to compare these outcomes with those of populations in their respective host country and country of origin; and (3) to identify important policies and programs associated with reproductive health outcomes.

METHODS

Fifty-two refugee and internally displaced persons postemergency phase camps in Azerbaijan (n=7 camps), Ethiopia (n=11), Myanmar (n=3), Nepal (n=7), Tanzania (n=8), Thailand (n=5), and Uganda (n=11) were served by a total of 10 different health organizations and were visited by 1 of 2 project investigators between November 1998 and March 2000. The following inclusion criteria were met for camps in this study: (1) refugee or internally displaced persons residing in a camp during the postemergency phase; (2) stable camp population size (defined as <5% change in population size during the 3 months before data collection); (3) camp population at least partially dependent on outside organizations for both food aid and health care; and (4) functioning health information system (defined as those health organizations that recorded morbidity and mortality in their health care units and produced a monthly report).

Using a standardized data collection form, investigators collected 3 months of retrospective record-based data on all health outcomes except maternal deaths, which were collected for a 12-month period. Sources of data for all health outcomes included mortality reports from the United Nations High Commissioner for Refugees (UNHCR) and health organizations, camp registers from the inpatient and outpatient departments in the camp health clinics, maternal and child health reports, birth and death registers, and community health worker (CHW) reports. To verify these data, investigators interviewed key informants, including community leaders, camp health staff, ambulance drivers, and CHWs. Live birth data were taken from monthly reports and checked against maternal ward registries. Stillbirths or abortions mistakenly included in these figures were removed. Because no camp in the study reported the number of complications due to unsafe or spontaneous abortion, we systematically gathered the data from registers kept by the camps' inpatient departments or referral hospitals. Project investigators sought information on individual deaths from various sources available in each camp and cross-checked the information to create as complete a list as possible. Information collected for each death included the decedent's age, sex, and cause of death. The ethical review boards at the Centers for Disease Control and Prevention and Johns Hopkins University reviewed and approved the research study proposal.

We chose the following reproductive health outcomes for our study on the basis of available data and recommendations from the Reproductive Health in Refugee Situations Interagency Field Manual[18]: crude birth rate (CBR), defined as live births per 1000 population per year; neonatal mortality rate (NNMR), defined as deaths among live-born infants during the first 28 days of life per 1000 live births; maternal mortality ratio (MMR), defined as maternal deaths during or within 42 days of pregnancy from any cause related to or aggravated by the pregnancy or its management per 100 000 live births; low–birth-weight (LBW) rate, defined as the percentage of live-born infants weighing less than 2500 g; and incidence of complications due to unsafe or spontaneous abortion (ICUSA), defined as the number of women treated for complications of abortions per 1000 live births. Unsafe abortion was defined as a procedure for terminating unwanted pregnancy either performed by persons lacking the necessary skills, performed in an environment lacking minimal medical standards, or both. Spontaneous abortion was defined as termination of pregnancy before the 20th week with spontaneous expulsion of the fetus. Because we recorded maternal deaths for a 12-month period and live births only for a 3-month period within those 12 months, we did Monte Carlo simulations to estimate the confidence intervals for the MMR.

To compare reproductive health outcomes among the refugee and inter-

nally displaced persons with those of reference populations within their respective host country and country of origin (the latter for refugees only), we aggregated camp data into 9 refugee and 2 internally displaced persons groups according to their country of origin and host country when applicable (TABLE 1). We also compared reproductive health outcomes of refugee populations from the same country of origin residing in different host countries and among refugee populations from different countries of origin residing within the same host country. For example, reproductive health outcomes among Sudanese refugees residing in Uganda were compared with outcomes of Sudanese refugees living in Ethiopia as well as with outcomes of Rwandan refugees living in Uganda.

We performed descriptive analysis using SPSS software (Version 9.0, SPSS Inc, Chicago, Ill). We calculated reproductive health outcomes and their 95% confidence intervals for camp residents and compared these with country-of-origin

Table 1. Reproductive Health Indicators in Postemergency Phase Camps During 1998-1999 and Comparisons of Indicators in Host Country and Country-of-Origin Populations*

Displaced Group, Host Country, and Country of Origin	Region	No. of Camps	Period of Data Collection†	Population Mean	No. of Births in Camps	Crude Birth Rate (95% CI)‡	Neonatal Mortality Rate (95% CI)§	Maternal Mortality Rate (95% CI)‖	Low Birth Weight, % (95% CI)¶	Incidence of Complications of Abortions (95% CI)#
Cambodians in Thailand	Asia	1	August-October 1998	14 928	90	24 (22-27)	22 (0-53)	NA	24 (16-33)	NA
Thailand						17 (NA)	NA	NA	7 (NA)	NA
Cambodia						34 (NA)	NA	NA	18 (NA)	NA
Myanmars in Thailand	Asia	4	August-October 1998	15 247	121	32 (29-35)	0 (0-0.03)	225 (0-887)	4 (0.6-8)	NA
Thailand						17 (NA)	NA	44 (NA)	7 (NA)	NA
Myanmar						21 (NA)	NA	230 (NA)	24 (NA)	NA
Myanmars in Myanmar	Asia	3	August-October 1998	7729	51	26 (23-30)	0 (0-0.07)	NA	NA	NA
Myanmar						21 (NA)	NA	NA	NA	NA
Bhutanese in Nepal	Asia	7	January-March 1999	98 101	425	17 (16-19)	28 (13-44)	59 (3-289)	6 (4-8)	31 (14-47)
Nepal						34 (NA)	58 (NA)**	540 (NA)	23 (NA)	NA
Bhutan						38 (NA)	75 (NA)	380 (NA)	16 (NA)	NA
Somalis in Ethiopia	Africa	8	October-December 1999	177 551	582	13 (12-14)	5 (0-11)	730 (438-1146)	4 (2-6)	43 (26-59)
Ethiopia						44 (NA)	60 (NA)	1400 (NA)	15 (NA)	NA
Somalia						52 (NA)	NA	1100 (NA)	16 (NA)	NA
Sudanese in Ethiopia	Africa	3	October-December 1999	60 669	553	36 (33-40)	7 (0.2-14)	136 (34-368)	5 (3-7)	38 (22-54)
Ethiopia						44 (NA)	60 (NA)	1400 (NA)	15 (NA)	NA
Sudan						33 (NA)	NA	550 (NA)	15 (NA)	NA
Sudanese in Uganda	Africa	9	December 1998 to February 1999	102 890	825	32 (30-34)	9 (2-15)	135 (43-325)	2 (1-3)	49 (34-63)
Uganda						51 (NA)	34 (NA)**	510 (NA)	10 (NA)	NA
Sudan						33 (NA)	45 (NA)	550 (NA)	15 (NA)	NA
Rwandans in Uganda	Africa	2	December 1998 to February 1999	10 988	70	26 (20-31)	29 (0-68)	357 (17-1748)	7 (1-13)	64 (7-122)
Uganda						51 (NA)	27 (NA)**	510 (NA)	10 (NA)	NA
Rwanda						43 (NA)	40 (NA)	810 (NA)	16 (NA)	NA
Burundians in Tanzania	Africa	7	February-April 1999	171 021	2586	61 (58-63)	7 (4-10)	76 (33-150)	10 (9-11)	68 (54-81)
Tanzania						41 (NA)	37 (NA)**	530 (NA)	13 (NA)	NA
Burundi						42 (NA)	35 (NA)	1300 (NA)	16 (NA)	NA
Congolese in Tanzania	Africa	1	October-December 1998	10 419	104	40 (36-44)	0 (0-0.03)	0 (0-887)	12 (5-18)	96 (39-153)
Tanzania						41 (NA)	37 (NA)**	530 (NA)	13 (NA)	NA
Democratic Republic of Congo						46 (NA)	35 (NA)	800 (NA)	15 (NA)	NA
Azerbaijanis in Azerbaijan	Azerbaijan	7	October-December 1998	19 193	69	14 (11-15)	0 (0-0.06)	NA	NA	NA
Azerbaijan						16 (NA)	NA	NA	NA	NA

*Unless otherwise specified, country comparison data are for the entire country. CI indicates confidence interval; NA, data not available.
†Maternal deaths were collected for a 12-month period during the same year.
‡Live births per 1000 population per year.
§Neonatal deaths per 1000 live births.
‖Maternal deaths per 100 000 live births.
¶Percentage of live-born infants weighing less than 2500 g.
#Number of women treated for complications due to unsafe or spontaneous abortion per 1000 live births.
**Data for eastern Nepal, northern Uganda, western Uganda, and the lakes region in Tanzania were collected with demographic and health surveys.

(for both internally displaced and refugee groups) and host country (for refugees only) outcomes. When reproductive health outcomes from specific areas within the host country and country of origin were available, we used those for comparison; such data from demographic and health surveys were available for Nepal, Rwanda, Tanzania, and Uganda.[19-23] For other countries, comparison data were obtained from United Nations' statistics.[24-27]

We performed multiple regression analyses to identify programmatic, demographic, and policy factors that may be associated with the chosen reproductive health outcomes. These independent variables were grouped into the 5 categories below.

Demographic and Seasonal Characteristics

Age of camp at the time of data collection was measured in years. Monthly population figures for each camp were obtained from UNHCR and nongovernmental organizations. The average population was determined by using the mean of the 3 monthly populations. Because studies have shown that birth and death rates can vary by season,[28-30] the season in which the data were collected for each camp was recorded and categorized as rainy, dry, or cold.

Site and Shelter Planning

Distance from the camp to the border or area of conflict was recorded in kilometers. Time to referral hospital was provided by the health staff and defined as the mean time it took for a camp resident to reach the referral hospital from the camp using the most common mode of transportation.

Health Care Services

Obstetric referral rates were defined as the number of documented obstetric referrals by camp health staff to a referral hospital per 100 000 live births. The percentage of births in health institutions was defined as the percentage of all documented births occurring in either the health unit within the camp or at a referral hospital.

Food and Nutrition

Availability of supplemental food programs for pregnant women was defined as presence of a program to provide food to pregnant women beyond the general food allotment.

Staffing

Number of local health care workers was defined as the total number of physicians, nurses, and clinical officers from the refugee and internally displaced population or host country working in the camp per 1000 persons. Traditional birth attendants (TBAs) and CHWs were recorded as the number of workers in each category per 1000 persons.

Whenever possible, continuous independent variables were categorized according to recommendations from the Sphere Project[4] and the Reproductive Health in Refugee Situations Interagency Field Manual,[18] which provide minimum standards for the provision of basic services to refugee and internally displaced populations in complex emergencies. For example, because the Reproductive Health in Refugee Situations Interagency Field Manual recommends 0.5 TBAs per 1000 persons, we categorized the TBA variable into less than 0.5, 0.5 to 1.4, and 1.5 or more TBAs per 1000 persons. We categorized all other variables according to a logical division of the variable that would result in an approximately equal number of camps in each category.

We performed weighted multiple regressions using SAS software (Version 8.2, SAS Institute Inc, Cary, NC). For each of the 5 outcome variables, we fit all possible models containing 1, 2, 3, or 4 independent variables and retained only the model with the highest R^2 among those models in which all included independent variables were significant at the .05 level. Not all independent variables were considered for each model to avoid models based on too few camps. For models with adjusted CBR, the percentage of births in health institutions, obstetric referral rate, and time to hospital were not considered. Models for NNMR excluded distance to border and obstetric referral rate. The MMR models excluded distance to border; LBW models excluded distance to border, obstetric referral rate, and time to hospital; and ICUSA models excluded distance to border, percentage of health institution births, TBAs, and CHWs per 1000 persons. For each outcome variable, the subset of camps that we used to fit regression models consisted of those camps for which there was complete data for the outcome variable and all candidate independent variables. All models initially were adjusted for region by means of 2 dummy variables. For this purpose, camps were categorized as African, Asian, or Azerbaijani (Table 1). The camp region was not significant in any of the models for LBW rate, so those models were not adjusted for region in the final analysis. We did not test for interactions in any of the models.

Analysis weights were computed as the inverses of the estimated variances of the outcome variables. Variances were estimated based on the Poisson distribution for adjusted CBR, ICUSA, and MMR, and were based on the binomial distribution for the NNMRs and LBW rates.

Because the number of women of reproductive age in the camps was often estimated, we chose not to use these estimates as denominators for the adjusted CBRs. Most of the health information systems in the camps distinguished only between persons younger than 5 years and 5 years or older as well as between males and females. We used the number of females 5 years or older for each camp as the denominator of the adjusted CBR (number of live births per 1000 females aged ≥5 years per year) in the regression analyses. Eliminating girls younger than 5 years and all males produced a more specific denominator than total population for adjusted CBR. However, this estimate was still imperfect since it included some females outside the reproductive age range.

RESULTS

Of the 52 camps in 7 countries with a total population of 688 766 persons, 7 (13.5%) were internally displaced persons camps with a population of 26 923 (range, 836-4606) and 45 (86.5%) were refugee

camps with a population of 661 843 (range, 2569-40 474). Most camps existed for 4 or more years (63.5%) and had 10 000 or more persons (55.8%). Based on populations in 51 camps, mean household size was 4.8 persons per household (range, 2.7-6.7). Based on 44 camps, the mean male-to-female ratio was 1.01 (range, 0.69-1.47). The mean percentage of children younger than 5 years was 15.7 (range, 4.5-26.2).

The mean percentage of births occurring in health institutions was 26.6 (range, 0-100). Only 1 camp's health facilities had the ability to perform cesarean deliveries; all other camps sent women to referral hospitals, most of which were located less than 60 minutes from the camp (51.9%). Family planning services were provided in all but 1 of the 52 camps, with the remaining camp using services in a neighboring camp. Of the 51 camps with such services, all offered condoms, 44 (86.3%) injectable contraceptives, 41 (80.4%) oral contraceptives, and 13 (25.5%) intrauterine devices. Descriptions of other independent variables from the 5 major categories included in the multiple regression analysis are shown in TABLE 2.

Reproductive Health Outcome Comparisons

Comparisons of reproductive health outcomes in refugee and internally displaced groups with those in their respective host country and country of origin are presented in Table 1. Because the Myanmars and Azerbaijanis were internally displaced within their own countries, host country comparisons are not applicable. Therefore, comparisons with host countries are limited to 9 of the 11 groups of refugees and their respective countries of origin. Missing data either from our data set or country comparison data for NNMR, MMR, LBW, and ICUSA led to fewer comparisons. Differences between the outcomes of groups refer to statistically significant differences at the .05 level.

Crude Birth Rate

A total of 5476 live births from a population of 688 766 refugee and internally displaced persons in 52 camps were reported during the 3-month data collection periods. The CBR data for comparison with country of origin were available for all 11 groups: 6 had lower unadjusted CBRs than their country of origin, 4 had higher CBRs, and 1 had no difference. Comparison data with host country rates were available for all 9 groups: 5 had lower unadjusted CBRs than their host country, 2 had higher CBRs, and 2 had no difference.

Neonatal Mortality Rate

A total of 47 neonatal deaths out of 5476 live births in 52 camps were reported during the 3-month periods. Of the 5 of 11 groups for which comparison country-of-origin data were available, 4 had a lower NNMR than their country of origin. Of the 7 of 9 groups for which comparison host country data were available, 6 had a lower NNMR than the host country.

Maternal Mortality Ratio

Because of the low number of maternal deaths reported in the Asian and Azerbijan camps (3 deaths reported for 10 Asian camps, missing data for 5 Asian camps and all Azerbaijan camps), we calculated MMRs only for the sub-Saharan African camps (6 refugee groups). Maternal mortality data were not available for 2 camps in the region. One camp was in Uganda and the other

Table 2. Description of Independent Variables for 52 Postemergency Phase Camps From 1998 to 2000*

Camp Characteristic	Mean (Range)†	Categorization	No. (%) of Camps‡
Demographic and seasonal characteristics			
Age of camp, y	6.2 (1.1-17.5)	0-3	19 (37)
		4-6	20 (39)
		≥7	13 (25)
Population size	13 254 (836-40 474)	≥20 000	11 (21)
		10 000-19 999	18 (35)
		0-9999	23 (44)
Season	NA	Rainy	22 (42)
		Dry	22 (42)
		Cold	8 (15)
Site and shelter planning			
Camp distance to border or conflict, km	81.5 (0-260)	0-9.9	7 (14)
		10-49.9	10 (19)
		≥50	35 (67)
Time to referral hospital, min	81.4 (5-300)	≥120	8 (15)
		60-119	17 (33)
		30-59	16 (31)
		0-29	11 (21)
Health care services			
Obstetric referral rate (n = 39)§	72.3 (0-777.8)	0-19	11 (28)
		20-49	16 (41)
		≥50	12 (31)
Percentage of births in health institutions	26.6 (0-100)	0-9	17 (33)
		10-29	14 (30)
		≥30	21 (40)
Food and nutrition			
Supplemental food for pregnant women	NA	Yes	43 (83)
		No	9 (17)
Staffing per 1000 persons			
Traditional birth attendants (n = 47)	1.3 (0-6.0)	0-0.4	16 (34)
		0.5-1.4	14 (30)
		≥1.5	17 (36)
Community health workers	1.0 (0-7.2)	0-0.9	31 (60)
		1-1.9	15 (29)
		≥2	6 (12)
Local health staff	0.7 (0.1-4.2)	0-0.4	19 (37)
		0.5-0.9	17 (33)
		≥1	16 (31)

*NA indicates data not available.
†Means are weighted by camp population, except for mean population size, which is unweighted.
‡Number of camps varies for each variable according to available data.
§Obstetric referrals per 1000 live births.

Table 3. Multiple Regressions in Which All Independent Variables Were Significant for Postemergency Phase Camps*

Outcome Variable	Adjusted for Camp Group	Independent Variable	R^2	*P* Value	Regression Coefficients (SEs)†	
Adjusted crude birth rate	Yes	Age of camp in years	0.75	<.01	−8.4 (10.1)	−31.3 (10.1)
		Local health staff/1000 persons		<.001	73.1 (11.9)	77.7 (14.1)
Neonatal mortality rate	Yes	Traditional birth attendants/1000 persons	0.26	.01	0.6 (2.3)	8.3 (3.1)
Low-birth-weight rate	No	Season (rainy, cold, dry)	0.59	<.01	−1.3 (3.1)	−4.3 (1.2)
		Age of camp in years		.04	0 (1.3)	−4.2 (1.6)
		Community health workers/1000 persons		<.01	−3.5 (1.1)	−5.8 (3.5)
		Supplemental food		.02	−20.5 (8.1)	NA

*Independent variables were classified in Table 2. NA indicates data not available.
†For season, coefficients correspond to cold and dry, respectively (rainy is the referent). For supplemental food, the coefficient corresponds to supplying supplemental food (referent is not supplying supplemental food). For other variables, coefficients correspond to middle and highest categories, respectively (referent is lowest category). The values of the outcome variables associated with the middle and high categories are lower than that for the low category when the regression coefficients are negative and higher when the coefficients are positive.

was in Tanzania. Thirty-two maternal deaths were reported for 6 refugee groups in 28 camps during the 1-year data collection period in which we estimated 4350 live births. Four of 6 groups had lower MMRs than their country of origin, and 5 of 6 had lower MMRs than their host country.

LBW Rates

Three hundred eighty-nine (7.5%) of the 5173 live births recorded for 9 refugee groups from 39 camps for which data were available had LBW rates. No data were available for Azerbaijan, Myanmar, and 2 Ethiopian camps. Seven of 9 groups had lower percentages of LBW infants than in the country of origin and 5 of 9 had lower percentages of LBW infants than the host country.

Incidence of Complications Due to Unsafe or Spontaneous Abortion

A total of 201 abortions requiring a medical procedure, such as vacuum extraction or dilatation and curettage, occurred among 7 refugee and internally displaced groups in 34 camps that reported such procedures. Data on abortions were unavailable from health organizations in Thailand, Myanmar, and 3 camps in Tanzania. We excluded Azerbaijan camps from our analysis because abortion is legal, and thus we could not determine whether complications were due to intentional or spontaneous abortion. Medical procedures occurred both in the camp and at referral hospitals. These same 34 camps reported 3845 live births over the same period. Overall, the ICUSA for camps in sub-Saharan Africa was 54.8/1000 live births (range, 47.2-64.5; 188 complications). No country-of-origin or host country data were available to make comparisons.

Comparisons Between Refugees and Displaced Persons From Different Countries

Between refugee and internally displaced populations from the same country of origin living in different host countries, the only different reproductive health outcomes were percentages of LBWs among Sudanese in Ethiopia and Uganda. However, refugee and internally displaced populations from different countries of origin living in the same host country (eg, Somalis and Sudanese living in Ethiopia) showed differences in all reproductive health outcome variables except ICUSA.

Multiple Regression

TABLE 3 shows the final regression models for adjusted CBR, NNMR, and LBW. We report no models for MMR or ICUSA because there were no single-variable models in which the independent variable was significant and no multivariable models in which all independent variables were significant.

Regression coefficients in Table 3 indicate the change in the outcome variable associated with a change in the independent variable from the lowest to the middle or highest category. In all 3 of the models, the coefficients for all categories of the independent variables were monotonically increasing or decreasing, so that the direction of association was consistent across all levels of the independent variable. Because the lowest category was the referent in all models (Table 3), its regression coefficient is always zero by definition. We regard this as an exploratory analysis indicative of the independent variables that seem to be associated with specific outcomes.

The coefficients of the first model listed in Table 3 indicate that camps in the middle category of camp age (4-6 years from Table 2) had (on average) 8.4 live births/1000 per year fewer than camps in the low category of camp age (0-3 years); and camps in the high category of camp age (≥7 years) had 31.3 live births/1000 per year fewer than camps in the low category of camp age. Camps in the middle category of local health staff (0.5-0.9 local staff/1000) had 73.1 live births/1000 per year more than camps in the low-staff category (0-0.4 staff/1000); and camps in the high category of local health staff (≥1 staff/1000) had 77.7 live births/1000 per year more than camps in the low category of local health staff.

Camps in the middle category of TBAs (0.5-1.4 TBAs/1000) had 0.6 neonatal deaths/1000 more than camps in the low category of TBAs (0-0.4 TBAs/1000); and camps in the high category of TBAs (≥1.5 TBAs/1000) had 8.3 more neonatal deaths/1000 than camps the low category of TBAs.

The cold season was associated with 1.3/1000 LBWs fewer than the rainy season, and the dry season with 4.3/1000 LBWs fewer than the rainy season.

Camps in the high category of camp age (≥7 years) had 4.2 LBWs/1000 fewer than camps in the lowest category of camp age (0-3 years), but there was no difference between camps in the low and middle categories of camp age. Camps in the middle category of CHWs (1.0-1.9 CHWs/1000) had 3.5 LBWs/1000 fewer than camps in the low category of CHWs (0-0.9 CHWs/1000); and camps in the high category of CHWs (≥2/1000) had 5.8 LBWs/1000 fewer than camps in the low category of CHWs. Camps that had supplemented food programs for pregnant women had 20.5/1000 LBWs fewer than camps that did not have such programs.

We assessed the statistical power to detect relationships in models containing only 1 independent variable. For this purpose, we determined the partial R^2 corresponding to 80% power for each outcome variable. Partial R^2 in this context is the increase in R^2 produced by adding an independent variable (consisting typically of 2 dummy variables) to a model whose independent variables are only the 2-region dummy variables. The partial R^2 corresponding to a power level of 80% ranged from 0.17 to 0.27 for the 5 outcome variables.

COMMENT

Overall, reproductive health outcomes in refugee and internally displaced populations in postemergency phase camps are better than those of their respective host country and country-of-origin populations. Our results are similar to those of a 1998 UNHCR report, which examined data from 1996 to 1998 of 42 camps in 7 countries.[26] Better access by camp residents to preventative and curative health care services, and to food and nonfood items, as well as improvements in water supply and sanitation,[6-9] may account for better reproductive health outcomes among postemergency phase camp populations than those in their respective host country and country-of-origin populations. The camp populations in our study had access to health services within a maximum of 5 km from where they lived, a much smaller distance than for most rural populations in developing countries.[31] Furthermore, the quality of health care services for refugees is generally assumed to be better than that for the surrounding populations.[7,9]

The CBRs were generally lower than those for host country and country-of-origin populations, although there were exceptions for Myanmar and Burundi camp populations. The association of lower CBRs with camps that have existed longer may be due to access to family planning services combined with low-mortality rates during the postemergency phase,[6] both of which take time to develop and may allow families to better control the timing of pregnancies and influence the number of children they desire. Social and demographic factors as well as improved access to health services may influence CBRs in older camps more than refugee status.[15]

A major factor in preventing maternal deaths is the availability of emergency obstetric care and the population's access to such care.[32] The risk for maternal deaths is most adversely affected by delayed treatment due to a delay in the decision to seek medical care, delay in arriving at a health facility, or the delay of the facility in providing adequate care.[33] Unlike many of the host country and country-of-origin populations, all refugee and internally displaced populations that we studied had access to health care, including emergency obstetric services, at little or no cost. All camps had access to referral hospitals providing emergency obstetric care within 12 hours, an indicator recommended by the World Health Organization.[34] Free transportation and support to the referral hospital was provided by most nongovernmental organizations. The lack of association between MMR and independent variables in our study may be due to lack of statistical power because maternal deaths are rare. Furthermore, we may have underestimated the number of maternal deaths, since most camps did not have a recording system solely established for these events.

Low birth weight is a major risk factor in neonatal and postneonatal deaths.[35] Our study suggests an association between the existence of maternal supplemental food programs in postemergency phase camps and a lower percentage of LBW newborns. However, we do not know whether all pregnant women in the camps, regardless of their nutritional status, received supplemental food rations. Furthermore, the quantity of rations differed according to the nongovernmental organization in charge of those services. Whether an association exists between maternal nutrition and LBW remains controversial, with several studies supporting such an association[34-36] and others finding little evidence.[37] Because there are no conclusive data, neither the World Health Organization nor the UNHCR supports providing a blanket supplemental food program to all pregnant women in refugee and internally displaced populations, regardless of nutritional status.[38,39] However, a blanket supplemental food program for pregnant women may provide an incentive for women to receive antenatal care. The association between higher rates of LBW and the rainy season may be due to increased malarial infection in pregnant women, because a strong association has been found between placental malarial infection and LBW.[40,41] The association found between lower rates of LBW and older camps may be a reflection of better access to health services as well as better health status in general than refugee and internally displaced populations that have recently arrived to a camp from a conflict situation.

The associations between increased staff and both higher CBRs and poorer outcomes of NNMRs and LBWs may be due to a recording bias. More staff working in the camps are more likely to capture and record these events. The reverse associations with lower numbers of CHWs and higher rates of LBW, while making intuitive sense, is difficult to explain given the direction of the other staff indicators.

The ICUSA reproductive health indicator is relatively new, but it allows researchers in complex emergencies to determine the magnitude of the problem

and possible underlying causes. A high ICUSA may indicate inadequate family planning coverage for women who wish to delay or avoid pregnancy.[18] A 1998 UNHCR report included ICUSA data for 5 of 8 postemergency phase refugee sites, documenting a range of 12 to 114 per 1000 live births.[26] We documented a narrower ICUSA range of 31 to 96 per 1000 live births. Despite the lack of comparison data for ICUSA in the host country and country of origin, we present baseline data for the refugee and internally displaced populations to allow for comparisons in future studies.

We were unable to distinguish from the records whether an abortion requiring medical intervention was spontaneous or induced, possibly because of the sensitive nature of the distinction or poor record keeping. Such a distinction, however, has important programmatic implications, and therefore supervisors of health information systems should implement and enforce a standardized case definition for ICUSA.

Other Important Reproductive Heath Indicators not Analyzed

Because of the poor quality of data collected or reported for antenatal coverage, STIs, and gender-based violence in the camps, we did not include these variables in our model. Although all 52 camps reported antenatal care coverage, most reported more than 100% coverage. Possible reasons included recording more than first-time visits, not distinguishing between local and displaced women using antenatal services, or undercounting births. Although 49 (94.2%) of 52 camps collected STI data, the same case was often recorded at different points in the health care system. Conversely, health care workers believed that STIs were underreported because of the stigma of such a diagnosis. Furthermore, STIs were often not disaggregated into their various syndromes using standardized case definitions, making interpretation of the data difficult. Thirty-six (97.3%) of 37 camps queried had gender-based violence programs and collected data. However, the small number of documented cases suggested that few women used the services or that the information was not accurately recorded. In camps with well-established gender-based violence programs, more cases were recorded per capita, suggesting a reporting bias.

Limitations

Our study has several limitations. First, underestimation of deaths and overestimation of camp populations may have led to underestimated mortality in the camps visited. We attempted to minimize the former problem by limiting the reporting period to 3 months before the camp visit to allow for a thorough collection and verification of all data collected; we identified 20% more deaths than the health organizations actually reported.[42] Both factors would likely have occurred in the same direction for most camps, thus minimizing any potential biases in the analysis. Second, the number of live births may have been underestimated because of underreporting. However, families have an incentive to report births to receive additional food rations. Third, the data were collected retrospectively and therefore poor recording and recall bias could have resulted in less accurate data. To improve the reliability of the data, we collected only 3 months of retrospective data (except for annual maternal mortality data), introducing a potential seasonality bias. However, camps in different countries were visited in different seasons, thus distributing this potential bias across all seasons. Furthermore, the season in which data collection occurred was a candidate independent variable for all 5 outcomes. The season variable was significant in several of the models for LBW, suggesting an important seasonal effect for that outcome. Season was not significant in models for any of the other 4 outcomes. To the extent that season was correlated with other independent variables, our models may have missed other important seasonal effects. Fourth, certain independent variables that may affect reproductive health outcomes, such as antenatal care coverage and the incidence of STIs, were not included in the models because of unreliable data. Thus, we could not account for their potential to confound relationships with other variables that were included in the study. Fifth, there is a selection bias. We were unable to visit all postemergency phase camps in every country with postemergency phase camps that met our inclusion criteria because of logistical constraints or lack of government or nongovernmental organization authorization. Lastly, the disparities between reproductive health indicators of camp populations and those of the local populations in the host country and country of origin may actually be greater than demonstrated in this study. Refugee and internally displaced populations often come from and settle in marginal areas. The countrywide and world regional reproductive health indicators used for comparison are likely better than those of the local populations surrounding the camps. Comparison data from host countries were collected during times of relative stability, similar to situations in which we collected data for the postemergency phase camps (one of the study criteria). However, countries of origin may have been in conflict at the time of data collection and thus may have had worse health outcomes due to the instability than the refugee and internally displaced persons in our study. Specifically, the countries with potential disparities are Burundi, DRC, Somalia, and Sudan. Since both the periods and methods of data collection used in determining comparison reproductive health outcomes differ from those we used in the camps, comparisons should be interpreted with caution.

Conclusions

To make reliable programmatic decisions, creators and supervisors of health information systems must systematically include reproductive health indicators and improve their recording, reporting, and interpretation. We refer specifically to maternal mortality, STIs, spontaneous and induced abortions, antenatal coverage, and gender-based violence. Delineation of populations into more specific age categories, such as women of reproductive age and adoles-

cents, rather than younger and older than age 5 years could improve the interpretation and consequently the targeting of reproductive health programs.

Our data suggest that refugee and internally displaced persons in most postemergency phase camps had better reproductive health outcomes than their respective host country and country-of-origin populations. This result is a testament to the skill and dedication of the organizations providing reproductive health care services and of the progress made during the past decade in the field of refugee reproductive health. Lessons learned in the developing world context, such as the need for emergency obstetric care, are being applied in camps during postemergency periods. However, the differences in reproductive health outcomes among these different populations raise important issues regarding the equity of humanitarian aid. The reasons for these disparities need further examination, and solutions for making the health outcomes more equitable between groups need to be found and implemented. We recommend prospective studies to examine these issues as well as to determine the interaction between birth and mortality rates during the different phases of complex emergencies and to examine the relationships between CBRs and the implementation of various reproductive health programs. Furthermore, the effects of supplemental food distribution to pregnant women, and season and socioeconomic patterns should also be examined.

Health programs in postemergency phase camps may provide guidance to improving reproductive health outcomes among the local host country population living near refugee and internally displaced communities. The data from this study as well as from future studies may help health professionals and their organizations develop evidence-based reproductive health programs. Lessons learned from such programs may in turn have applications for program development and implementation in developing countries.

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