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Understanding contraceptive-induced menstrual changes: insights from contraceptive discontinuation due to side effects in 7 low- and middle-income countries

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Abstract

Background Concerns about side effects and perceived adverse health effects have been identified as major drivers of contraceptive nonuse and discontinuation among women, leading to reduced uptake of contraceptive methods. A major side effect is contraceptive-induced menstrual changes, which may manifest as alterations in menstrual frequency, regularity of onset, flow duration, and blood volume compared with the normal menstrual cycle. The rates of contraceptive discontinuation in low and middle-income countries (LMICs) due to menstrual side effects are alarmingly high. Therefore, this study sought to determine contraceptive discontinuation due to side effects to give insights into contraceptive-induced menstrual changes in 7 LMICs.

Methodology We conducted a secondary analysis using data from 7 Demographic and Health Surveys. The outcome variable, contraceptive-induced menstrual changes discontinuation (CIMCD), was constructed using the variable on "reason for discontinuation". Side-effect-related discontinuation was classified into two mutually exclusive categories: (i) menstrual changes, and (ii) other non-menstrual side effects. Subsequently, the outcome variable was generated, coded as "1" for women who discontinued contraception due to menstrual changes and "0" for women who discontinued due to other side effects. The sample characteristics were summarised using frequencies and percentages, while the proportion of CIMCD among women with side effect-related discontinuation was presented using weighted proportions and confidence intervals.

Results In most countries, more than 50% of the interviewed women had ever used contraceptives. Contraceptive discontinuation rate was highest among women from Ghana (50.4%), followed by those from Tanzania (47.5%) and then Nepal (44.9%). The weighted proportion of CIMCD was highest in the Ivory Coast (42.6%), followed by Tanzania (38.7%), Ghana (38.0%), Burkina Faso (32.9%), Nepal (30.1%), Kenya (29.7%), and the Philippines (13.8%). Adolescents aged 15–19 years and those who had discontinued use of injectable contraceptives consistently experienced the highest prevalence of CIMC-related discontinuation in most countries.

Conclusion This multi-country analysis demonstrates that contraceptive-induced menstrual changes remain a major reason for contraceptive discontinuation across diverse LMICs. The study findings highlight the need for targeted interventions, such as a more user-centered approach in contraceptive technologies, to address the unique

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individual-level factors and inadequacies of the one-size-fits-all approach prevalent in contraceptive development and family planning services.

Keywords Contraceptives · Side effects · Contraceptive-induced menstrual changes · CIMC · Menstruation

Background

Despite the availability of effective methods, contraceptive uptake and continuation remain suboptimal in many low- and middle-income countries (LMICs), largely due to concerns about side effects. As of 2019, modern contraceptive use was at 31% in low-income countries and 48% in LMICs, compared to 74% in upper-middle-income countries [1]. Within LMICs, the method mix is dominated by female sterilisation (14.8%), followed by short-acting resupply methods such as pills (6.3%), injectables (4.8%), and condoms (4.4%), while long-acting reversible contraceptives like intrauterine devices (IUDs) account for a smaller share (3.6%) [2]. Notably, discontinuation remains a significant challenge, with approximately 40% of women in LMICs stopping contraceptive use due to side effects, including contraceptive-induced menstrual changes (CIMC) [3–5]. These concerns about side effects and related health issues are a major driver of both non-use and discontinuation of contraception [6, 7].

Contraceptive discontinuation or disuse encompasses various scenarios, including switching between methods, ceasing use altogether, or experiencing failure due to inconsistent use or side effects such as CIMC [8–10]. CIMC may manifest as an alteration in menstrual frequency, onset regularity, flow duration, and blood volume compared to the normal menstrual cycle [11, 12]. These changes impact women's lives both positively and negatively. For some women, lighter, less painful, or less frequent bleeding may improve quality of life and support management of menstrual disorders. Certain hormonal methods, including combined oral contraceptives, are also used therapeutically to manage conditions such as dysmenorrhea, while other hormonal methods may reduce heavy menstrual bleeding and suppress menstruation [13, 14]. However, heavier, longer, irregular, or painful bleeding associated with CIMCs can compound challenges in managing menstruation, including the need for different menstrual materials, increased reliance on pain relief medications, and heightened requirement for safe, private, and accessible water, sanitation, and hygiene facilities [15, 16]. Furthermore, CIMCs can significantly impede women's abilities to engage in regular activities such as schooling, employment, sexual intercourse, and participation in social and religious events, which could lead to an unmet need for modern contraception [15–17].

Menstrual side effects, particularly CIMC, are frequently overlooked or trivialised, resulting in inadequate support for women experiencing these changes, contributing to higher rates of contraceptive discontinuation [18]. Evidence shows variations in side-effect-related discontinuation across settings ranging from 9% in Mozambique to nearly 50% in Tanzania, highlighting the variability and the need for context-specific responses [7, 19, 20]. Differences in national contraceptive method mix may also contribute to cross-country variation in CIMC-related discontinuation because contraceptive methods have different effects on menstrual bleeding. This challenge is further exacerbated by poor provider capacity, as many healthcare providers lack sufficient training and awareness on the management of CIMC and appropriate counselling support [21]. Overall, contraceptive discontinuation remains high in LMICs, undermining efforts to meet women's reproductive health needs. The World Health Organization (WHO) reports that approximately 16–18% of women discontinue contraceptive methods within their first year of use, with even higher rates among those with unmet contraceptive needs [3]. Additionally, factors such as the type of contraceptive method used, parity, educational attainment, age, partner's fertility preferences, community-level contraceptive availability, and geographical location have been identified as associated with contraceptive discontinuation [7].

Given the already low levels of contraceptive use in many LMICs, addressing women's individual experiences and needs is essential for improving continuation. However, despite recognition of the contextual realities surrounding side effects, much of the existing literature continues to prioritise service quality improvements,

promotion, and misinformation correction, leaving a gap in understanding the specific role of CIMC in driving discontinuation [16, 22]. Evidence on the magnitude and cross-country variation of CIMC-related discontinuation could inform contraceptive counselling, side effects management, and the development of more user-centered family planning services. This study examined contraceptive discontinuation due to side effects, with a particular focus on CIMC, in Kenya, Ghana, Burkina Faso, Ivory, Tanzania, Nepal, and the Philippines. The seven countries were purposively selected based on the availability of recent and broadly comparable DHS datasets containing the contraceptive-calendar and discontinuation-reason variables required to construct the CIMCD outcome. They also represent diverse settings forming a useful basis for describing variation in CIMC-related discontinuation across contrasting settings. The countries were not intended to be representative of all LMICs.

Methods

Data source and study population

This study used secondary data from the Demographic and Health Surveys (DHS) Program [23]. We analysed Individual Recode (IR) datasets from nationally representative household surveys conducted in seven low- and middle-income countries (LMICs): five from sub-Saharan Africa (Kenya 2022, Ghana 2022, Burkina Faso 2021, Ivory Coast 2021, and Tanzania 2022) and two from Asia (Nepal 2022 and Philippines 2022).

The Demographic Health Surveys employ standardised methodology across LMICs, using a stratified two-stage cluster sampling design. The first stage involves selecting clusters from enumeration areas (EAs), which are drawn from a national sampling frame with probability proportional to size. In the second stage, a systematic sample of households is selected from each EA through complete household listing [24]. All women aged 15–49 years residing in selected households or present in the household on the night before the survey are eligible for interview. The DHS achieves high response rates (typically > 90%) through rigorous fieldwork protocols, including multiple callback visits and interview scheduling flexibility. Additional details regarding the DHS are described elsewhere [24].

Measures

Outcome variable

The outcome variable for this analysis was contraceptive-induced menstrual changes discontinuation (CIMCD), operationalised as a specific subtype of side-effect-related contraceptive discontinuation. The outcome was constructed through a stepwise process in which participants who did not meet the predefined eligibility criteria were progressively excluded from the analytical sample: First, the analytical sample was limited to women aged 15–49 years who reported ever using a contraceptive method, as CIMC can only occur following contraceptive exposure. Women who reported never having used contraception were excluded from further analysis.

Second, among those who have ever used contraceptives, the sample was restricted to women who reported discontinuation of a contraceptive method prior to the survey. From this group, only women who cited side effects or menstrual changes as the reason for discontinuation were retained. Discontinuation for non-biological reasons, such as desire to become pregnant, infrequent sexual activity, partner opposition, or access-related barriers, were excluded because these reasons were outside the scope of the study outcome.

Lastly, side-effect-related discontinuation was classified into two mutually exclusive categories: (i) menstrual changes, and (ii) other non-menstrual side effects. A binary outcome variable (CIMC discontinuation) was then generated, coded as "1" for women who discontinued contraception due to menstrual changes and "0" for women who discontinued due to other side effects. This operationalization defines CIMC as the proportion of

Fig. 1 .

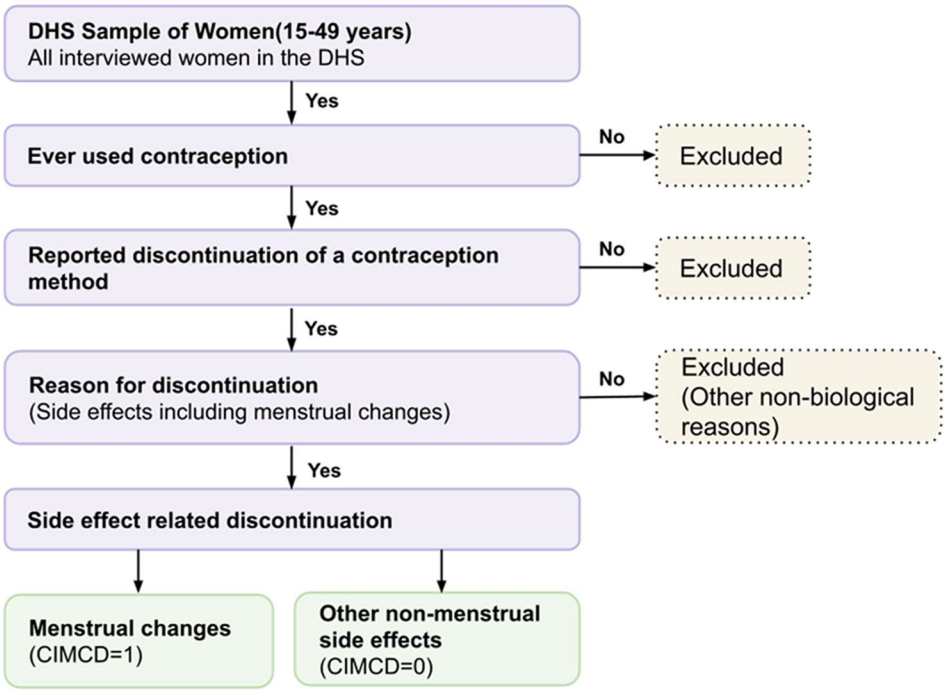


Table 1 Operationalisation of variables

Variables	Operation of definitions
Age	Age in years was categorised as 15–19, 20–29, 30–39, 40–49
Residence	Urban or rural
BMI categories	Underweight, Normal, Overweight, and Obese
Age at Sexual Debut	Less than 15 years, 15 + years
Marital status	Never married, married/cohabiting, widowed/divorced/separated
Education level	Categorized as no education, primary, and secondary and above
Employment	Formal, Informal, Casual, and no employment
Wealth	Participants were classified as poorest, poorer, middle, richer and richest
Parity	0, 1, 2–3, >3
Age at menarche	Early 15 years, normal /late 15 years
The last method discontinued	Pills, IUD, Injections, Implants, Emergency pills

menstrual-related discontinuations among all side-effect-related discontinuations, rather than as a population-level prevalence measure. This has been illustrated in Fig. 1 below.

Independent variables

Independent variables were selected a priori based on the existing literature on contraceptive discontinuation and menstrual disturbances and their availability in the dataset [20, 25–27]. These included socio-demographic characteristics (age, education level, marital status, place of residence, and household wealth quintile), reproductive history variables (parity, age at menarche, and age at sexual debut), and contraceptive-related factors (method type) *(*Table 1).

Statistical analysis

Data was analysed using STATA version 19 (Stata Corporation, College Station, Texas) [28].The distribution of sample characteristics for each selected country was summarised using frequencies and percentages. Clustered

sampling design was accounted for by applying the country-specific sample weights, primary sampling units, and strata provided in each dataset and using the Stata "svy" command in STATA. Proportions and confidence intervals were used to summarise the prevalence of discontinuation due to contraceptive-induced menstrual changes among women with side effect-related discontinuation. The analysis was restricted to descriptive estimates because the outcome-specific samples became sparse after stratification by country and participant characteristics. Inferential and multivariable analyses were therefore not undertaken because several subgroup cells contained few observations, limiting the reliability and comparability of country-specific association estimates.

Results

Sample characteristics

Table 2 presents the demographic, reproductive, and contraceptive characteristics of women across the study countries. Across all countries, women aged 20–29 and 30–39 years constituted the largest proportion of the sample. The 20–29 age group accounted for the largest share in most settings, ranging from (32.9%) in the Philippines to (46.1%) in Tanzania, while women aged 30–39 years accounted for between (34.5%) in Tanzania and (42.2%) in the Philippines. Educational attainment varied substantially across countries. The proportion of women with no formal education was highest in Burkina Faso (61.5%) and the Ivory Coast (46.0%), while the proportion of those attaining primary education was highest in Tanzania (58.9%) and Kenya (45.2%). Women with secondary education or higher constituted the majority in the Philippines (81.3%), Ghana (62.8%), and Kenya (50.1%).

Employment patterns differed across settings. Formal employment was highest in the Ivory Coast (35.9%), whereas informal employment was most prevalent in Ghana (57.7%) and Nepal (58.9%). Casual employment accounted for a notable proportion in Tanzania (27.4%). The proportion of women not employed was highest in the Philippines (40.4%) and the Ivory Coast (28.0%). Most women were married or cohabiting across all countries, with particularly high proportions observed in Nepal (99.6%) and the Philippines (96.7%). Never-married women represented 19.3% in the Ivory Coast and 17.3% in Ghana, while widowed, divorced, or separated women constituted a larger share in Kenya (14.4%) and Tanzania (17.4%).

Parity distributions showed that women with two to three children formed the largest group in most countries, including Kenya (46.3%), Tanzania (44.2%), Nepal (57.2%), and the Philippines (48.1%). Women with more than three children represented nearly half of the sample in Burkina Faso (49.0%). Age at menarche also varied by country. Early menarche ($\leq$15 years) was most common in the Philippines (79.6%), Nepal (67.7%), and the Ivory Coast (64.6%), while normal or late menarche (>15 years) was more frequently reported in Ghana (61.0%), Burkina Faso (63.8%), and Tanzania (56.8%). The majority of the women reported a sexual debut at age 15 years or older across all countries, ranging from 77.6% in the Ivory Coast to 95.2% in the Philippines. Early sexual debut (<15 years) was most common in the Ivory Coast (22.5%) and Kenya (18.6%).

Body mass index distributions showed that most women were of normal weight, with proportions of 51.6% in Kenya, 57.3% in Ghana, 54.6% in Burkina Faso, and 56.8% in the Ivory Coast. Overweight and obesity were also observed across the countries, with obesity highest in Kenya (17.4%) and Ghana (15.5%). In terms of residence, rural women constituted the majority in Kenya (62.0%), Burkina Faso (58.3%), Tanzania (62.6%), and the Philippines (63.2%), while urban residence was more common in the Ivory Coast (53.1%) and Nepal (50.4%). Women across all wealth quintiles were represented. The poorest quintile accounted for 32.6% in Nepal and 33.1% in the Philippines, while the richest quintile was highest in Burkina Faso (27.6%) and Tanzania (25.1%).

Regarding the last contraceptive method discontinued, injectable contraceptives were the most commonly reported method in Kenya (51.4%), Ghana (47.0%), Tanzania (46.0%), and Nepal (55.6%). Pills were most frequently discontinued in the Philippines (53.9%) and the Ivory Coast (33.4%). Implant discontinuation was common in Burkina Faso (46.6%) and Tanzania (41.7%). IUD discontinuation was relatively uncommon across most countries.

Table 2 Participants' characteristics

Characteristics	Kenya (*n* = 1701)	Ghana (*n* = 1244)	Burkina Faso (*n* = 854)	Ivory Coast (*n* = 441)	Tanzania (*n* = 1026)	Nepal (*n* = 900)	Philippines (*n* = 1382)
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
Age (Years)							
15—19	41(2.4)	58(4.7)	28(3.3)	23(5.2)	16 (1.6)	17(1.9)	23 (1.7)
20—29	742(43.6)	570(45.8)	333(39.0)	189(42.9)	473 (46.1)	358(39.8)	455 (32.9)
30—39	606(35.6)	444(35.7)	339(39.7)	163(37.0)	354 (34.5)	354(39.3)	583 (42.2)
40—49	312(18.3)	172(13.8)	154(18.0)	66(15.0)	183 (17.8)	171(19.0)	321 (23.2)
Education level							
No education	81(4.8)	239(19.2)	525(61.5)	203(46.0)	155 (15.1)	277(30.8)	13 (0.9)
Primary level	768(45.2)	224(18.0)	126(14.8)	102(23.1)	605 (58.9)	313(34.8)	245 (17.7)
Secondary +	852(50.1)	781(62.8)	203(23.8)	136(30.9)	266 (26.9)	310(34.4)	1,124 (81.3)
Employment Type							
Formal Employment	463(27.6)	201(16.2)	243(28.6)	158(35.9)	183 (18.9)	122(13.6)	435 (31.7)
Informal Employment	564(33.6)	717(57.7)	331(38.9)	111(25.2)	256 (26.6)	530(58.9)	201 (14.6)
Casual Employment	165(9.8)	171(13.8)	60(7.1)	48(10.9)	264 (27.4)	98(10.9)	183 (13.3)
Not Employed	487(29.0)	154(12.3)	217(25.5)	123(28.0)	261 (27.1)	150(16.7)	555 (40.4)
Wealth Index							
Poorest	293(17.2)	273(22.0)	93(10.9)	63(14.3)	135 (13.2)	293(32.6)	458 (33.1)
Poorer	296(17.4)	300(24.1)	144(16.9)	100(22.7)	186 (18.1)	158(17.6)	380 (27.5)
Middle	389(22.9)	292(23.5)	194(22.7)	104(23.6)	217 (21.2)	174(19.3)	244 (17.7)
Richer	409(24.0)	215(17.3)	187(21.9)	85(19.3)	231 (22.5)	166(18.4)	164 (11.9)
Richest	314(18.5)	164(13.2)	236(27.6)	89(20.2)	257 (25.1)	109(12.1)	136 (9.8)
Marital Status							
Never married	138(8.1)	215(17.3)	56(6.6)	85(19.3)	55 (5.4)		29 (2.1)
Married/cohabiting	1318(77.5)	929(74.7)	765(89.6)	332(75.3)	793 (77.3)	896(99.6)	1,337 (96.7)
Widowed/divorced/separated	245(14.4)	100(8.0)	33(3.9)	24(5.4)	178 (17.4)	4(0.4)	16 (1.2)
Parity							
0	48(2.8)	141(11.3)	36(4.2)	35(7.9)	13 (1.4)	5(0.6)	17 (1.2)
1	293(17.2)	252(20.3)	105(12.3)	82(18.6)	141 (13.7)	187(20.8)	267 (19.3)
2—3	788(46.3)	410(33.0)	295(34.5)	149(33.8)	453 (44.2)	515(57.2)	665 (48.1)
3 >	572(33.6)	441(35.4)	418(49.0)	175(39.7)	419 (40.8)	193(21.4)	433 (31.3)
Age at Menarche							
Early 15 Years	845(49.7)	485(39.0)	309(36.2)	285(64.6)	443 (43.2)	609(67.7)	1,100 (79.6)
Normal/Late 15 Years	856(50.3)	759(61.0)	542(63.8)	156(35.4)	583 (56.8)	291(32.3)	282 (20.4)
Age at Sexual Debut							
Less than 15 Years	316(18.6)	154(12.4)	80(9.4)	99(22.5)	125 (12.2)	90(10.0)	66 (4.8)
15 + Years	1385(81.4)	1090(87.6)	774(90.6)	342(77.6)	901 (87.8)	810(90.0)	1,316 (95.2)
BMI Categories							
Underweight	128(7.6)	25(3.8)	28(6.8)	11(5.0)	33 (6.4)	28(6.0)	-
Normal	851(50.6)	336(51.6)	249(60.0)	126(57.3)	280 (54.6)	264(56.8)	-
Overweight	415(24.7)	177(27.2)	97(23.4)	49(22.3)	115 (22.4)	127(27.3)	-
Obese	289(17.2)	113(17.4)	41(9.9)	34(15.5)	85 (16.6)	46(9.9)	-
The last method discontinued							
Pills	178(10.7)	175(14.4)	79(9.3)	143(33.4)	104 (10.7)	197(22.4)	654 (53.9)
IUD	45(2.7)	10(0.8)	49(5.8)	0	14 (1.4)	33(3.8)	74 (6.1)
Injections	852(51.4)	573(47.0)	322(38.1)	176(41.1)	448 (46.0)	489(55.6)	372 (30.6)
Implants	560(33.8)	360(29.5)	394(46.6)	102(23.8)	406 (41.7)	158(18.0)	114 (9.4)
Emergency pills	23(1.4)	101(8.2)	2(0.2)	7(1.6)	1 (0.1)	290.2)	-
Residence							
Urban	646(38.0)	552(44.4)	356(41.7)	234(53.1)	384 (37.4)	454(50.4)	508 (36.8)
Rural	1055(62.0)	692(55.6)	498(58.3)	207(46.9)	642 (62.6)	446(49.6)	874 (63.2)

Note: BMI data was not collected for this sample in the 2022 Philippines DHS

Table 3 The contraceptive discontinuation cascade

	Kenya	Burkina Faso	Tanzania	Philippines	Ivory Coast	Ghana	Nepal
	n (%)	*n* (%)	*n*(%)	*n*(%)	*n*(%)	*n*(%)	*n*(%)
Total women in DHS dataset	32,156	17,659	15,254	27,821	14,877	15,014	14,845
Ever used a contraceptive	20,011(62.23%)	8,838(50.05%)	7,142(46.82%)	11,985(43.08%)	5118(34.40%)	8476(56.45%)	9,615(64.77%)
Discontinued Contraceptive use	5482(27.39%)	3,935(44.52%)	3,392(47.49%)	4,806(40.10%)	1897(37.53%)	4259(50.39%)	4,319(44.92%)
Discontinued contraceptive use due to all side effects(including CIMC)	1701(31.03%)	854(21.70%)	1,026(30.24%)	1,382(28.77%)	441(22.96%)	1244(29.13%)	900(20.84%)
Discontinued Contraceptive due to CIMC only	515(30.28%)	277(32.00%)	387(37.72%)	188(13.60%)	190(43.08%)	490(39.39%)	270(30.00%)

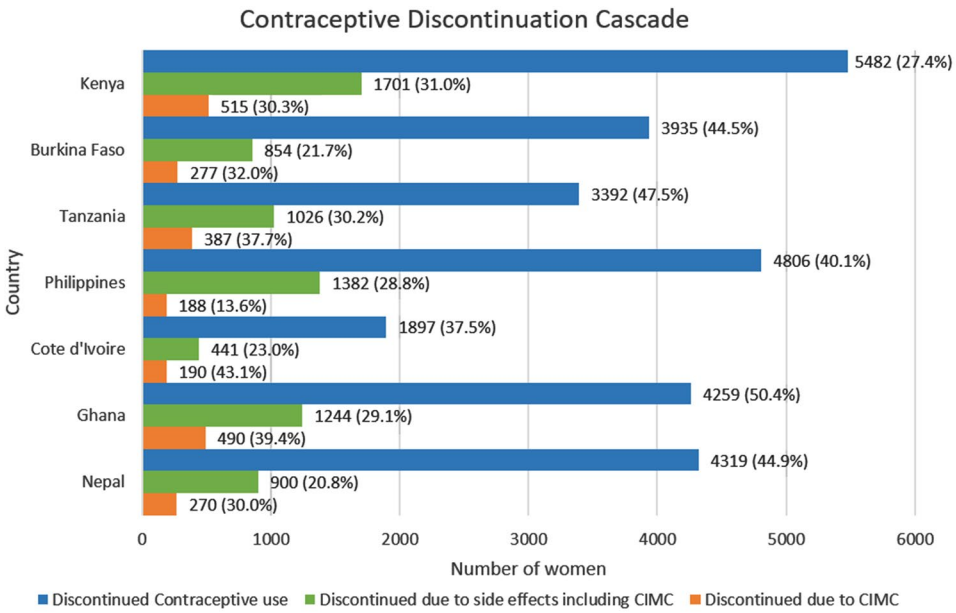


Fig. 2 Contraceptive discontinuation due to CIMC

Table 3; Fig. 2 present the progressive restriction of the sample from all surveyed women to women who discontinued contraception because of CIMC. Other non-menstrual side-effect-related discontinuations formed the comparison category in the binary outcome but were not presented as a separate endpoint in the cascade. A total of 32,156 women in Kenya, 17,659 in Burkina Faso, 15,254 in Tanzania, 27,821 in the Philippines, 14,877 in the Ivory Coast, 15,014 in Ghana, and 14,845 in Nepal were included in the respective Demographic and Health Surveys (DHS). The proportion of women who had ever used contraception varied across countries, from 34.40% in the Ivory Coast to 64.77% in Nepal.

Among ever-users, discontinuation of contraceptive use in general was highest in Ghana (50.39%) and Tanzania (47.49%), and lowest in Kenya (27.39%). The proportion of women who stopped using contraception because of all side effects (including CIMC) ranged from 20.84% in Nepal to 31.03% in Kenya. Among side-effect-related discontinuations, CIMC alone accounted for the largest share in Ivory Coast (43%), Ghana (39%), and Tanzania (38%) (Table 3). The contraceptive discontinuation cascade has been further illustrated in Fig. 2 below.

Table 4 presents the proportion of contraceptive discontinuation due to contraceptive-induced menstrual change (CIMCD) out of all side-effect-related discontinuation across seven countries. Substantial heterogeneity in CIMCD was observed across countries and population subgroups. Overall, the weighted prevalence of

Table 4 Prevalence of contraceptive discontinuation due to contraceptive-induced menstrual change

Characteristics	Kenya	Ghana	Burkina Faso	Ivory Coast	Tanzania	Nepal	Philippines
	% [95% C.I]	% [95% C.I]	% [95% C.I]	% [95% C.I]	% [95% C.I]	% [95% C.I]	% [95% C.I]
Prevalence of CIMCD	30.3[26.9,32.6]	39.4[34.5,41.7]	32.0[29.1,36.9]	43.1[36.3,49.3]	37.7[34.8,42.7]	30.0[27.0,33.4]	13.6[11.8,16.1]
Age (Years)							
15—19	29.1[16.0,46.9]	53.8[36.2,70.5]	45.3[25.8,66.3]	44.9[22.3,69.8]	70.6 [42.9, 88.4]	22.1[7.7,49.1]	3.5[0.7,16.4]
20—29	31.8[27.4,36.6]	39.3[34.4,44.5]	36.0[30.2,42.2]	38.3[29.6,47.9]	40.2 [35.1, 45.6]	36.5[31.2,42.1]	13.1[9.7,17.5]
30—39	28.9[24.5,33.7]	37.5[31.7,43.8]	31.5[25.8,37.7]	47.8[38.7,57.1]	38.0[30.8,45.8]	24.0[19.3,29.4]	13.6[10.6,17.3]
40—49	26.1[20.6,32.5]	28.7[20.7,38.1]	27.4[20.0,36.3]	38.9[26.3,53.3]	33.1[25.6, 41.6]	30.3[22.7,39.1]	16.5[11.1,23.9]
Education level							
No education	41.7[28.3,56.4]	36.5[29.2,44.5]	32.5[27.8,37.6]	43.2[33.1,53.9]	44.2[33.0,56.1]	28.6[23.3,34.5]	19.1[2.8,65.8]
Primary level	27.8[24.2,31.8]	34.8[27.4,43.0]	32.5[23.7,42.6]	46.5[34.1,59.4]	36.1[31.8,40.6]	30.1[24.9,36.0]	10.1[6.1,16.3]
Secondary +	30.7[26.4,35.3]	39.0[34.8,43.4]	34.1[27.5,41.3]	39.3[27.9,51.9]	41.5[34.7,48.6]	31.2[25.9,37.0]	14.4[12.2,17.0]
Employment Type							
Formal Employment	25.9[21.1,31.4]	38.8[30.7,47.7]	28.5[21.9,36.1]	44.6[33.7,56.0]	35.0[27.9,42.8]	25.6[18.1,34.9]	13.8[9.9,19.0]
Informal Employment	29.1[24.9,33.7]	36.2[31.7,40.9]	31.4[25.9,37.5]	40.3[29.5,52.1]	40.2[32.7,48.1]	32.3[28.0,36.8]	15.8[10.4,23.5]
Casual Employment	30.5[21.7,41.0]	47.5[38.2,57.1]	29.1[18.3,42.8]	50.9[32.3,69.3]	40.9[33.4,48.9]	28.8[19.9,39.6]	12.4 [7.2,20.6]
Not Employed	34.5[28.5,40.9]	35.6[26.9,45.3]	40.3[32.5,48.6]	37.1[26.9,48.5]	33.8[26.8,41.7]	28.8[21.5,37.6]	13.8[10.7,17.6]
Wealth Index							
Poorest	31.7[26.1,37.9]	34.0[27.5,41.2]	36.6[25.2,49.6]	37.6[26.5,50.2]	41.3[31.7,51.7]	30.0[24.1,36.6]	13.5[10.0,18.1]
Poorer	27.9[22.9,33.7]	41.5[33.6,50.0]	31.4[22.7,41.6]	43.4[32.9,54.6]	42.7[35.0,50.8]	34.3[27.2,42.2]	15.6[11.6,20.7]
Middle	28.8[23.7,34.6]	35.0[28.7,41.8]	35.4[28.0,43.5]	43.0[31.1,55.8]	38.1[31.0,45.8]	30.1[23.4,37.9]	10.6[6.7,16.4]
Richer	29.2[23.9,35.2]	39.7[32.1,47.8]	31.4[24.4,39.3]	42.1[26.9,58.9]	36.3[26.5,47.3]	32.7[25.5,40.9]	15.3[9.3,24.3]
Richest	30.9[24.3,38.4]	39.6[30.9,49.0]	31.6[25.4,38.4]	44.6[31.8,58.2]	37.2[30.2,44.8]	22.6[14.5,33.3]	14.0[8.5,22.1]
Marital Status							
Never married	34.4[26.5,43.2]	40.4[32.3,49.1]	44.5[30.3,59.7]	34.3[23.0,47.8]	30.5[19.4,44.5]	0	18.5[6.0,44.8]
Married/cohabiting	29.5[26.5,32.6]	38.9[35.1,42.9]	32.2[28.2,36.4]	44.1[36.5,52.0]	39.1[34.7,43.7]	29.8[26.7,33.2]	13.6[11.5,16.0]
Widowed/divorced/ separated	27.9[20.9,36.2]	26.1[17.2,37.7]	29.5[14.3,51.0]	51.0[23.9,77.5]	39.4[31.5,47.8]	64.4[16.6,94.3]	21.3[5.2,57.1]
Parity							
0	29.4[13.4,52.7]	39.2[29.6,49.7]	45.8[28.9,63.7]	28.1[13.7,49.0]	67.5[34.7,89.1]	18.4[2.3,68.1]	1.7[0.2,12.1]
1	31.8[24.8,39.6]	44.2[36.8,52.0]	36.0[26.1,47.2]	33.9[21.7,48.7]	40.7[32.5,49.5]	25.3[19.3,32.4]	11.6[7.5,17.5]
2—3	30.0[25.8,34.5]	39.7[33.9,45.8]	30.4[24.4,37.0]	51.6[39.7,63.2]	39.6[33.7,45.9]	33.7[29.4,38.2]	14.8[11.4,19.1]
3 >	28.0[24.0,32.5]	31.8[26.0,38.1]	32.8[27.5,38.5]	43.7[33.4,54.5]	36.0[30.6,41.7]	26.1[19.4,34.3]	14.3[10.7,18.8]
Age at Menarche							
Early 15 Years	28.5[24.5,32.9]	38.8[33.1,44.9]	30.0[24.5,36.1]	44.5[36.7,52.6]	39.9[34.4,45.6]	30.2[26.5,34.2]	13.5[11.3,16.1]
Normal/Late 15 Years	30.9[26.7,35.4]	37.4[33.1,41.9]	34.5[29.8,39.5]	39.4[30.3,49.3]	37.9[32.5,43.6]	29.8[23.8,36.6]	15.2[9.7,23.0]
Age at Sexual Debut							
Less than 15 Years	28.1[22.6,34.3]	38.0[28.4,48.6]	35.3[25.3,46.7]	56.3[43.5,68.3]	33.9[24.9,44.2]	32.6[23.5,43.3]	16.5[7.5,32.4]
15 + Years	30.0[26.9,33.4]	38.0[34.2,42.0]	32.7[28.7,36.8]	38.8[31.9,46.2]	39.3[35.2,43.6]	29.8[26.5,33.4]	13.7[11.5,16.1]
BMI Categories							
Underweight	37.4[27.4,48.6]	65.9[44.3,82.5]	34.4[16.9,57.5]	57.3[25.3,84.2]	49.3[30.5,68.3]	32.5[15.6,55.6]	-
Normal	28.9[25.0,33.0]	37.9[31.2,45.0]	35.7[29.8,42.0]	39.6[28.4,51.9]	38.2[30.9,46.2]	36.6[30.3,43.5]	-
Overweight	32.0[26.8,37.8]	36.6[29.3,44.5]	36.8[27.3,47.3]	42.5[24.1,63.3]	39.2[29.0,50.4]	21.8[15.3,30.1]	-
Obese	27.4[20.8,35.2]	35.0[25.6,45.7]	26.7[14.5,44.0]	27.9[12.9,50.4]	29.6[19.0,43.1]	33.3[19.2,51.1]	–
The last method discontinued							
Pills	21.2[14.2,30.6]	37.3[29.7,45.6]	38.0[26.9,50.4]	33.6[23.8,45.0]	32.0[21.9,44.1]	16.3[10.9,23.5]	8.6[5.9,12.3]
IUD	20.8[5.86,52.4]	19.3[3.33,62.4]	11.7[3.81,30.8]	0	8.7[1.2,42.7]	9.3[3.0,25.3]	9.4[3.7,21.7]
Injections	36.3[32.1,40.7]	42.7[37.7,47.9]	43.9[37.5,50.4]	51.3[39.5,63.0]	37.1[32.3,42.2]	36.3[31.7,41.1]	9.3[6.3,13.6]
Implants	24.2[19.4,29.7]	28.7[23.0,35.2]	24.2[19.8,29.2]	47.1[33.8,60.9]	36.9[29.8,42.7]	34.0[26.1,43.0]	25.8[16.0,38.9]
Emergency pills	10.7[2.31,37.8]	40.4[29.7,52.0]	0	12.4[2.35,45.2]	0	0	0
Residence							

Table 4 (continued)

Characteristics	Kenya	Ghana	Burkina Faso	Ivory Coast	Tanzania	Nepal	Philippines
	% [95% C.I]	% [95% C.I]	% [95% C.I]	% [95% C.I]	% [95% C.I]	% [95% C.I]	% [95% C.I]
Urban	29.6[24.4,35.5]	38.9[33.5,44.6]	31.2[25.2,37.9]	43.8[35.1,53.0]	36.2[29.9,43.0]	27.8[23.7,32.3]	14.3[11.4,17.8]
Rural	29.7[26.9,32.7]	37.1[32.7,41.8]	34.0[29.3,39.0]	40.5[32.3,49.3]	40.1[34.9,45.6]	34.3[30.0,38.9]	13.2[10.3,16.8]

CIMCD was highest in the Ivory Coast (43.1%), followed by Tanzania (37.7%), Ghana (39.4%), Burkina Faso (32.0%), Nepal (30.0%), Kenya (30.3%), and the Philippines (13.6%).

Adolescents aged 15–19 had the highest CIMCD rates in Tanzania (70.6% [95% CI: 42.9, 88.4]), Ghana (53.8% [95% CI: 36.2, 70.5]), and Burkina Faso (45.3% [95% CI: 25.8, 66.3]). In contrast, the Philippines had only 3.5% (95% CI: 0.7,16.4) among teenagers. Higher proportions were also observed among young adults(20–29), in Tanzania (40.2% [95% CI: 35.1, 45.6]) and Ghana (39.3% [95% CI: 34.4, 44.5]). Prevalence generally declined with age in Kenya, Burkina Faso, and Nepal, while Ivory Coast showed the highest prevalence among women aged 30–39 years (47.8%).

Women with no formal education had high CIMCD prevalence in Tanzania (44.2% [95% CI: 33.0, 56.1]), the Ivory Coast (43.2% [95% CI: 33.1, 53.9]), and Kenya (41.7% [95% CI: 28.3, 56.4]). However, similarly elevated prevalence was observed among women with secondary or higher education in Tanzania (41.5% [95% CI: 34.7, 48.6]) and the Ivory Coast (39.3% [95% CI: 27.9, 51.9]).

High CIMCD rates were observed among women in casual or informal employment, notably in the Ivory Coast (50.9% [95% CI: 32.3, 69.3]) and Ghana (47.5% [95% CI: 38.2, 57.1]). Unemployed women had high CIMCD prevalence in Burkina Faso (40.3% [95% CI: 32.5, 48.6]) and the Ivory Coast (37.1% [95% CI: 26.9, 48.5]). Formal employment tended to show lower discontinuation in Kenya (25.9% [95% CI: 21.1, 31.4])and Burkina Faso (28.5% [95% CI: 21.9, 36.1]), but not consistently across countries. Both urban and rural women experienced similarly high prevalence in several countries, including the Ivory Coast and Tanzania. Across wealth quintiles, CIMC-related discontinuation rates remained substantial and were almost similar across the wealth groups in all the countries with no clear gradient across the wealth groups.

Never-married women had the highest CIMCD rates in Burkina Faso (44.5% [95% CI: 30.3, 59.7]) and Ghana (40.4% [95% CI: 32.3, 49.1]), while married or cohabiting women had the highest prevalence in the Ivory Coast (44.1% [95% CI: 36.5, 52.0]). Among women with no children, the prevalence of CIMCD was highest in Tanzania (67.5% [95% CI: 34.7, 89.1]) and Burkina Faso (45.8% [95% CI: 28.9, 63.7]). The prevalence was also high among women with two to three children, especially in the Ivory Coast (51.6% [95% CI: 39.7, 63.2]) and Tanzania (39.6% [95% CI: 33.7, 45.9]).

The distribution of the prevalence of CIMCD across early reproductive life-course factors was also reported. Women with early menarche (≤15 years) reported high CIMCD in Ivory Coast (44.5% [95% CI: 36.7, 52.6]) and Tanzania (39.9% [95% CI: 34.4, 45.6]), while women who experienced sexual debut before age 15 showed particularly higher prevalence in Ivory Coast (56.3% [95% CI: 43.5, 68.3]).

Method-specific prevalence revealed a consistent pattern across countries. Injectable contraceptives were the most commonly discontinued method due to CIMC in nearly all settings: 51.3% in the Ivory Coast [95% CI: 39.5, 63.0], 43.9% in Burkina Faso [95% CI: 37.5, 50.4], and 42.7% in Ghana [95% CI: 37.7, 47.9]. In contrast, pill-related discontinuation was generally lower, particularly in the Philippines (8.6% [95% CI: 5.9, 12.3]). Implant-related discontinuation remained high in selected countries, notably the Ivory Coast (47.1% [95% CI: 33.8, 60.9]) and Tanzania (36.9% [95% CI: 29.8, 42.7]).

Discussion

This multicountry descriptive study examined the weighted prevalence of CIMC-related discontinuation among women who discontinued contraception due to side effects across seven LMICs. Three notable patterns emerged. First, CIMC accounted for a considerable proportion of side-effect-related discontinuation in most countries, although the Philippines had a lower prevalence. Second, younger women, particularly adolescents and women who had discontinued injectable contraceptives, frequently recorded higher CIMC prevalence. Third, variations across education, wealth, residence, marital status, and other characteristics showed no consistent cross-country pattern, underscoring the contextual heterogeneity of CIMC-related discontinuation.

The prevalence of CIMCD was substantial in all the countries, with marked heterogeneity across countries, a finding consistent with that of a review that identified CIMC as a major reason for contraceptive discontinuation [16]. Also, there were inconsistent patterns of CIMCD across subgroups. For instance, in Kenya and Burkina Faso, women from the poorest wealth category had the highest rates of CIMCD, while in the Ivory Coast, the richest women had the highest CIMCD prevalence. Additionally, in Kenya, Burkina Faso, Tanzania, and Nepal, women residing in rural areas had increased rates of CIMCD, while a similar pattern was also observed among urban residents in the other countries. Across the BMI categories, in Kenya, Ghana, the Ivory Coast, and Tanzania, underweight women had increased CIMCD prevalence, while in Nepal and Burkina Faso, those with normal and overweight BMI had higher rates, respectively. These findings show variability in CIMCD across subgroups and countries. Additionally, different contraceptives also differ in how they influence different outcomes in women who use them [29].

Women aged 15–19 had higher CIMCD prevalence in most countries. The CIMCD rates among adolescent women were highest in Tanzania (70.6%), Ghana (53.8%), and Burkina Faso (45.3%). Alternatively, in Kenya and Nepal, women aged 20–29 exhibited CIMCD prevalence of 31.8% and 36.5%, respectively. Young women may be particularly sensitive to menstrual changes and have lower tolerance for bleeding irregularities [16], especially heavy bleeding. Unpredictable, heavy and prolonged menstrual bleeding could potentially lead to heightened period poverty among younger women by increasing the financial burden for menstrual materials [30]. Additionally, prolonged menstrual bleeding among adolescents could significantly affect their school attendance and psychological well-being, including self-esteem [31].

In all countries except the Philippines, women who had last discontinued injectable contraceptives had the highest CIMCD rates. The prevalence ranged from 51.3% in the Ivory Coast to 36.3% in Kenya and Nepal. Clinical evidence indicates that depot medroxyprogesterone acetate (DMPA), a widely used injectable contraceptive, commonly alters menstrual bleeding patterns, including prolonged or irregular bleeding and amenorrhoea [32]. Amenorrhea may be beneficial for some women but may also cause anxiety and contraceptive discontinuation, especially in settings where regular menstruation is culturally linked to health and fertility [16]. Other hormonal contraceptives like implants also showed substantial CIMC-related discontinuation in several countries, including Ivory Coast (47.1%), Tanzania (36.9%), and Nepal (34.0%). This indicates that even long-acting reversible contraceptives (LARCs), which are often promoted as highly effective and user-friendly [33, 34], are vulnerable to discontinuation due to side effects like CIMC and health concerns [20]. Although differences in national method mix may partly explain the observed cross-country variation, this relationship was not formally assessed and should be explored in future research.

The findings of this study provide insights on the magnitude of contraceptive-induced menstrual changes as a challenge to maternal health and wellbeing in general. The current response to contraceptive side effects is method switching to alternative methods and counselling on the side effects [13]. While these interventions are valuable, they are inadequate in addressing CIMC side effects. Method switching, for instance, fails to address individual biological differences that cause women using the same method to have entirely different bleeding experiences. Improved counselling promotes expectation management but does not eliminate the physiological reality and lived experiences of problematic bleeding associated with contraceptives use, which many women

find unacceptable regardless of prior warning. A fundamental problem with current family planning programmes is their one-size-fits-all approach: the same limited methods, standardised dosage and counselling are provided to all women, which may not work for most of the users [16, 35, 36].

This study, therefore, argues for a fundamental shift in how contraceptive services are designed and delivered: moving away from a one-size-fits-all approach toward a more user-centered contraception approach in the long term. Contraceptive manufacturers need to adopt user-centered, innovative approaches that seek to incorporate women's personal preferences and experiences in contraceptive development [37, 38]. This will require extensive research on women' s biological profiles, including genetic markers, metabolic factors, and baseline menstrual factors like history of menstrual disorders to support personalization. This shift will also support the future development of updated protocols and guidelines for the management of unpleasant CIMC and individualized methods, switching pathways where necessary. In the short term, there is a need to strengthen contraceptive counselling by building the capacity of healthcare providers to assess risk factors for CIMC, apart from providing information on expected menstrual changes. Health systems have obligations to ensure that women's decisions are informed by accurate information, that they receive supportive care for managing side effects, and that discontinuation due to menstrual concerns does not reflect inadequate counseling or preventable clinical management failures. Women's decisions to discontinue contraceptives due to menstrual changes should be respected as legitimate exercises of bodily autonomy, rather than characterized as failed contraceptive use [39].

This study's strengths include large, population-based samples from seven diverse LMICs, yielding generalizable insights into CIMC-related discontinuation across varied regional, cultural, and health system contexts. The use of standardized DHS methodology enables direct cross-country comparisons. Survey weights were applied to account for unequal probabilities of selection and survey non-response within each country. However, several limitations must be acknowledged. First, the descriptive nature means that causation cannot be inferred. Second, discontinuation data relies on retrospective self-report, which may be subject to recall bias. Women may forget or misattribute their reasons for discontinuation, and social desirability bias may lead some women to underreport menstrual concerns deemed culturally inappropriate to discuss. Third, our measure of CIMC discontinuation is dichotomous and does not capture the severity, duration, or specific types of menstrual changes women experienced, limiting our ability to identify which particular patterns are most problematic. Despite the limitations, this study provides important preliminary estimates and insights on CIMC.

Conclusion

Our findings reveal substantial CIMC-related discontinuation in all the countries, with marked heterogeneity across the countries and population subgroups and particularly high rates among adolescents and users of injectable and implant contraceptives. Menstrual side effects present a universal challenge requiring health system-level solutions for clinical management and continued contraceptive innovation. Current strategies focused on method switching and improved counseling are necessary but insufficient, because they do not address the fundamental reality that women react differently to hormonal contraceptives due to variations in their hormonal constitution. A shift toward personalized contraceptive services that tailor method selection, side effect management, and method switching to each woman's physiology, preferences, and bleeding patterns is urgently needed to reduce unnecessary discontinuation and improve women's health and well-being.

Abbreviations

CIMC Contraceptive-induced menstrual changes
DHS Demographic and health survey
DMPA Depot medroxyprogesterone acetat
IUDs Intrauterine devices

LMIC Low and middle income countries
WHO World health organization

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Author contributions CA conceptualized the study and obtained data. The study idea was further refined by JOO, CN, and SO. CN, LN, IM, DK and NM analyzed the data with inputs from JOO and CA. SO and CA drafted the initial version of the manuscript, which was subsequently revised by LN, IM, NM and DK. All authors read, revised, reviewed, and approved the final manuscript for publication.

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Data availability Availability of data and materials The datasets analysed during the current study are openly available on the Demographic and Health Surveys Program website at https://dhsprogram.com/data. The authors obtained permission to use the data through the DHS program data request system and agreed to use the data within the stipulated guidelines.

Declarations

Ethics approval and consent to participate We utilised secondary data from the Kenya 2022, Ghana 2022, Burkina Faso 2021, Ivory Coast 2021, Tanzania 2022, Nepal 2022, and Philippines 2022 Demographic and Health Surveys, approved by institutional review boards (IRBs) at ICF and the respective country Government/Medical Research Council (MRC) Joint Ethics Committee in the respective countries.

Consent for publication Not applicable.

Competing interests The authors declare no competing interests.

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