

Nutritional Counseling of Mothers at Health Facilities Reduces Childhood Stunting in Peruvian Shantytowns

In Peruvian shantytowns, an intervention delivered through health facilities to educate mothers on how to improve nutrition in their young children was associated with better dietary intake and a reduced likelihood of stunted growth early in life, according to results of a cluster-randomized controlled trial.¹ The proportions of mothers correctly answering questions on age-specific infant feeding practices and the proportions who reported following these practices were significantly higher in the intervention group than in the control group. Moreover, the proportions of infants born in the control population who had inadequate dietary intake of iron and zinc were significantly higher than the proportions among infants born in the intervention population. At 18 months of age, only 5% of children in the intervention group had stunted growth, compared with 16% of those in the control group.

The intervention was tested in Trujillo, a city in which stunting in childhood is common; although nearly all families have access to nutritious foods, the cultural preference is for foods with a low energy density. Twelve health facilities serving shantytowns were randomized to the intervention or the control condition. The intervention, implemented as a program of the regional health authority, aimed to integrate nutrition services into established child-oriented national programs, such as immunization, monitoring of growth and development, and management of acute respiratory infections and diarrhea. To improve the quality and provision of nutritional counseling, the program provided simple, standardized messages for intervention facility staff to deliver whenever they had contact with mothers of young children. The intervention also introduced a facility accreditation program to promote institutional compliance with the intervention.

The researchers enrolled a birth cohort of healthy infants born between August 1999 and February 2000 in shantytowns served by the facilities. Fieldworkers visited families shortly after their infant's birth and at eight intervals thereafter, until the child was 18 months

old; during the visits, the workers collected social, demographic, dietary and health information; measured children's weight and length; and assessed mothers' knowledge and practices regarding feeding.

Analyses were based on 187 and 190 infants born in shantytowns served by intervention and control health facilities, respectively. The groups were generally well balanced with respect to infant characteristics. Roughly half of infants were male, and two in five were first-born children. The average birth weight was about 3.4 kg. Almost all mothers began breastfeeding their infants at birth.

The proportion of mothers reporting shortly after their infant's birth that they had received advice on nutrition from their health facility was significantly greater in the intervention group than in the control group (52% vs. 24%). In addition, when mothers were stratified by the age of their child, the proportions correctly answering questions about age-specific feeding practices were significantly greater in the intervention group. For example, among mothers whose child was eight months old, a greater proportion of those in the intervention group than of those in the control group could name the three most important supplementary foods for a 7–8-month-old infant—chicken liver, eggs and fish (64% vs. 48%).

Analyses of actual feeding practices at various ages likewise showed significant differences in favor of the intervention group. For example, the proportion who said they fed their infants nutrient-dense thick foods first at the main meal was greater in the intervention group than in the control group for children aged six months (31% vs. 20%), nine months (35% vs. 17%) and 12 months (42% vs. 26%). In addition, a higher proportion of children in the intervention group than in the control group received chicken liver, fish or egg at ages six months (65% vs. 51%) and eight months (61% vs. 49%).

In analyses of energy and nutrient intake, children in the intervention group were significantly less likely to fall short of recommended daily intakes from foods given as

breast milk supplements at various ages. For example, smaller proportions of children in the intervention group than of those in the control group failed to meet dietary requirements for iron at eight months (91% vs. 96%), nine months of age (93% vs. 99%) and 18 months of age (37% vs. 48%); and dietary requirements for zinc at nine months of age (77% vs. 87%).

In analyses of growth, the proportions of children in the intervention and control groups who had stunted growth (a length-for-age more than two standard deviations below the median for the reference population) were similar for about the first six months of life, but diverged sharply thereafter. By the age of 18 months, only 5% of children in the intervention group had stunted growth, compared with 16% of children in the control group. After adjustment for other factors possibly related to stunting, children in the control group had significantly higher odds of stunted growth than did their counterparts in the intervention group (odds ratio, 3.0). Also at this age, on average, children in the intervention group were 0.7 cm taller and weighed about 200 g more than those in the control group after adjustment for potentially confounding factors.

"The results," the investigators assert, "add to evidence that nutrition education without the provision of food supplements can improve the dietary intake of young children and improve growth." However, they caution, the sustainability of the intervention and its generalizability to other populations (including those in which access to nutritious foods is limited) are yet to be determined. Noting that the difference in growth between groups was greater than expected given the differences in feeding practices and dietary intake, the investigators speculate that the early age at intervention may have been crucial.

The new study's findings are "encouraging," the author of an accompanying commentary notes, because previous studies of supplementary feeding interventions in childhood have often had poor designs or negative results. "The positive results of the intervention give hope to policymakers that this strategy will be

effective elsewhere,"² she writes, but adds that wide coverage by health services of the population—particularly the most vulnerable groups—is required for the success of an intervention delivered through these services. —S. London

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In Kenya, Community Traits Affect Women's Decisions On Daughters' Circumcision

In Kenya, women's decisions to have their daughters circumcised are associated with various individual and community-level characteristics, such as education, media exposure and ethnicity, according to an analysis of data from a national survey.¹ Overall, 38% of women reported experiencing genital cutting, and 46% of circumcised women already had or planned to have their daughters circumcised. In multilevel regression analyses, the likelihood that a mother would decide to have her daughter circumcised decreased as her level of education and exposure to media rose, and increased with the proportion of circumcised women in the community. In addition, the likelihood that a daughter would be circumcised varied significantly by the dominant ethnic group in the community.

To assess the extent to which individual and community-level characteristics are associated with women's decisions to have their daughters circumcised, the analyst used data from the 1998 Kenya Demographic and Health Survey (DHS). For the descriptive analyses, the total DHS sample of 7,873 women aged 15–49 from 530 clusters was used; for the multilevel logistic regression analysis, the sample was restricted to the 1,406 circumcised women from 354 clusters whose oldest daughter was younger than age 20.

Overall, 38% of women aged 15–49 reported experiencing genital cutting. The proportion of women who had been circumcised increased with age and decreased with education and exposure to media. The relationship between genital cutting and household wealth was

less clear: Greater proportions of women in the third and fourth lowest quintiles of wealth (50% and 47%, respectively) than of those in the bottom quintile (31%) or top two quintiles (26–30%) had been circumcised. Forty-two percent of rural women reported having experienced genital cutting, compared with 23% of urban women. Finally, the proportion of circumcised women varied dramatically by ethnic group: For example, 97% of Kisii and 89% of Masai were circumcised, compared with 43% of Kikuyu and only 1% of Luo.

Among circumcised women, 46% planned to circumcise their daughters or had done so. Patterns in daughters' circumcision by education, media exposure and household wealth were similar to those for women overall; however, the proportion circumcised did not vary as much by area of residence or by ethnicity among daughters as it did among women overall. Also, no clear pattern was seen in the relationship between daughter's circumcision and daughter's age.

In the first logistic regression model, which included only individual characteristics, mothers' level of education and media exposure were negatively associated with the likelihood of deciding to have their daughters circumcised; daughters' age and household wealth were nonsignificant. When community characteristics were added to the model, urban residence was positively associated with the likelihood of daughters' circumcision. In addition, household wealth in the cluster was associated with an increased likelihood and mean media exposure in the cluster was associated with a decreased likelihood of daughters' circumcision. Mothers' level of education remained significant, but the level of media exposure became nonsignificant.

In the final model, which added variables for community norms regarding circumcision, being part of a cluster in which the dominant ethnicity was Kalenjin, Kamba, Kikuyu, Meru/Embu or Mijikendaa/Swahili was negatively associated with the likelihood of daughters' circumcision, whereas being part of a cluster where the dominant ethnicity was Kisii was positively associated with the practice. In addition, for every one-point increase in the proportion of circumcised women in the cluster, the likelihood of daughters' circumcision increased by nearly 3%. Level of mothers' education and urban residence remained significant, level of media exposure became significant again, and both the mean education of women and the mean household wealth

in the cluster became nonsignificant.

According to the researcher, the data suggest that "women's behavior resembles that of other women [who] live near them" and "respondents' decisions to circumcise their daughters vary significantly by ethnic group." She concludes that although individual influences on circumcision are possible, "decline in the prevalence of female genital cutting is likely to take place simultaneously across social groups, rather than as a result of isolated individual decisions."—J. Rosenberg

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Safe-Delivery Intervention In Rural Pakistan Reduces The Risk of Perinatal Death

In rural Pakistan, an intervention in which traditional birth attendants were trained in basic delivery care and were issued safe-delivery kits was associated with a 30% reduction in the odds of perinatal death when compared with usual pregnancy and delivery care.¹ The likelihood of maternal death was not significantly altered, but women cared for under the intervention had 30–80% reductions in the odds of spontaneous abortion, stillbirth, hemorrhage and childbirth-related infection relative to their counterparts who received usual care.

In the six-month, cluster-randomized controlled trial, three subdistricts of Larkana, a predominantly rural district, were assigned to an intervention and four were assigned to usual care, as a control group. All pregnant women in the subdistricts were eligible for the study. In the intervention subdistricts, traditional birth attendants were trained by medical staff, issued disposable safe-delivery kits and asked to visit women during pregnancy. They were instructed to refer women with complications to emergency care, and to inform Lady Health Workers about the women they were caring for. The Lady Health Workers acted as liaisons between the trained traditional birth attendants and the health services. In addition, obstetric teams held outreach clinics for antenatal care about once a month. In all of the districts, Lady Health Workers collected data from birth attendants, women and the women's families during pregnancy and for six weeks after delivery.

Analyses were based on 10,114 women in the intervention group and 9,443 women in the control group. Across subdistricts and across study groups, maternal characteristics were generally similar. On average, women were about 27 years old, had had 3–4 previous live births, lived 2–4 km from the nearest primary health care facility and were recruited to the trial in the fifth month of their pregnancy. The mean number of years of education was slightly higher in the control group (1.4) than in the intervention group (1.1).

In the subdistricts conducting the intervention, 91% of women received antenatal care from a trained traditional birth attendant, and 16% of women visited an outreach clinic for antenatal care at least once. In addition, the trained attendants used 8,172 safe-delivery kits.

Most of the women in both the intervention group and the control group gave birth at home (81–83%) and had a normal vaginal delivery (91% in each group). However, significantly smaller proportions of women in the intervention group than of those in the control group were cared for by a traditional birth attendant who was not trained according to the intervention protocol (6% vs. 76%) or whose training status was unknown (2% vs. 3%). Spontaneous abortion (fetal loss before six months of gestation) was significantly less common in the intervention group (2.5% vs. 3.3%).

In an analysis restricted to singleton pregnancies, the unadjusted perinatal death rate (number of deaths per number of stillbirths and live births) was about 85 per 1,000 in the intervention group and 120 per 1,000 in the control group. After adjustment for characteristics of the subdistricts, the difference corresponded to a significant reduction in the odds of perinatal death in the intervention group relative to the control group (odds ratio, 0.7). The intervention was associated with equally reduced odds of stillbirth (0.7) and neonatal death (0.7).

The odds of maternal death were reduced in the intervention group, but not significantly so. However, relative to their counterparts in the control group, women in the intervention group had reduced odds of hemorrhage after 28 weeks of gestation (odds ratio, 0.6) and markedly reduced odds of experiencing infection associated with childbirth (0.2). The odds of pregnancy- or childbirth-related convulsions and of spontaneous abortion with complications were not significantly affected, but few women experienced these events. Women in the intervention group had higher

odds than their control counterparts of experiencing labor lasting longer than 18 hours (1.3), and of being referred for emergency obstetrical care (1.5)—not surprising findings, according to the researchers, because the intervention promoted recognition of and referral for complications.

Training traditional birth attendants and integrating them into health services is feasible and improves perinatal outcomes, the investigators contend. They note that the study was too small to detect a meaningful reduction in maternal death, but the trend for this outcome seemed to parallel the reduction in perinatal death. The investigators point out that the benefits of the intervention were achieved by using the existing infrastructure; factors that may have contributed to the intervention's success included distributing the kits through primary care centers, which increased contact between the traditional birth attendants and health services, and some effect of the kits in elevating the attendants' standing in the community. They conclude, "This model could result in large improvements in perinatal and maternal health in developing countries." —S. London

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Skills-Based Approaches Affect STI Risk Behavior More Than Information

Interventions that emphasize STI risk reduction skills may be more effective at lowering the prevalence of risky behaviors and preventing infection among teenage women than programs that simply provide information about how to reduce risk.¹ In a randomized controlled trial conducted in Philadelphia, a city in the northeastern United States, participants in a skills-based STI prevention intervention reported less unprotected sex one year later than did a control group, who received a general health promotion intervention. They also had a lower STI incidence and reported less involvement with multiple partners and less unprotected sex while drunk or high than controls. Outcomes among young women who received an information-based STI prevention intervention did not differ from those among controls.

The interventions were part of a project designed to lower the risk of health problems among inner-city black and Hispanic teenage women. Using group discussions, videotapes, games and exercises in a single 250-minute session, the STI prevention programs addressed the high rates of HIV and other STIs among black and Hispanic young women, personal vulnerability, substance use, and condom use and negotiation skills. They differed only in that the skills-based intervention had participants practice putting condoms on anatomical models and engage in role-playing exercises to increase condom negotiation skills. The trial was open to sexually experienced, nonpregnant 12–19-year-olds obtaining family planning care at a hospital adolescent medicine clinic.

In all, 682 young women (463 blacks and 219 Hispanics) enrolled. Participants completed a self-administered questionnaire before the intervention, immediately afterward, and at three-, six- and 12-month follow-up visits; they also provided biological specimens for STI testing at enrollment and at the six- and 12-month visits. According to data from the baseline surveys, in the three months before entering the study, 87% of the teenagers had had intercourse, 52% had had unprotected sex and 16% had had multiple partners; two in 10 tested positive for gonorrhea, chlamydia or trichomoniasis at baseline. Women in the three study groups did not differ on these characteristics or on any of a range of variables that might mediate the effects of the interventions.

For the primary outcome measure, the reported number of days on which respondents had had unprotected sex in the previous three months, no differences were observed between groups at the three- and six-month follow-up visits. However, at 12 months, women in the skills-based intervention reported significantly fewer such days (2.3, on average) than those in the information-based intervention (4.0) or in the control group (5.1); the difference between the information-based group and the controls was not statistically significant.

Twelve-month follow-up results also showed that significantly lower proportions of teenagers from the skills-based program than of controls tested positive for an STI (11% vs. 18%) and reported having had multiple partners in the past three months (7% vs. 17%). In addition, the average number of partners in the past three months was lower among the former than among the latter (0.9 vs. 1.0). At the three- and six-month visits, women who had received skills training reported having had sex while high on

drugs or alcohol on fewer days than controls. At 12 months, this difference was no longer statistically significant, but the average number of days on which women reported having had unprotected sex while high was lower among skills-based intervention participants (0.1) than among controls (0.5). Again, no significant differences were observed between teenagers in the information-based intervention and controls.

After the intervention, participants from both STI prevention programs displayed greater knowledge than controls about condom use and risk reduction, as well as stronger intentions to use condoms and more beliefs and attitudes that would favor use. Teenagers who had participated in the skills-based intervention scored higher than those from the information-based program

on knowledge about how to use condoms.

The researchers contend that their study “provides some of the strongest evidence that enhancing skills should be a critical goal for interventions designed to reduce [risky] sexual behavior.” Pointing out that the intervention was delivered in a single session, they add that the results of this trial suggest the potential for effecting “significant long-term changes” in teenage women’s sexual behavior “without great expenditure of time and effort.”—*D. Hollander*

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Women in Some Sub-Saharan African Countries Are More Likely Than Men to Justify Wife Beating

In some Sub-Saharan African countries where wife beating is widely accepted as a response to women’s transgressing gender norms, men find less justification for the practice than do women.¹ An analysis of Demographic and Health Survey data from seven countries found that 36–89% of women justified wife beating in at least one of five specified situations; among men, who were included in six of the surveys, the proportions ranged from 25% to 75%. In multivariate analyses, both women’s and men’s acceptance of wife beating generally declined as income rose and was reduced among those with the most education; other results were less consistent across countries.

The data were collected between 1999 and 2001 in Benin, Ethiopia, Malawi, Mali, Rwanda, Uganda and Zimbabwe, low-income countries with strong patriarchal societies. All seven country surveys included nationally representative samples of 15–49-year-old women; all but Zimbabwe’s also included men aged 15–59. Each survey asked respondents if a husband is justified in hitting or beating his wife if she burns the food, neglects the children, argues with him, goes out without telling him or refuses to have sex with him. After assessing levels of acceptance of wife beating in each of these situations, the analysts used multivariate logistic regression to identify background characteristics that were associated with acceptance; separate analyses were conducted for men and women.

Among women, the proportion of respon-

dents who considered wife beating justifiable in at least one situation ranged from 36% (in Malawi) to 89% (in Mali); among men, the range was from 25% (in Malawi) to 75% (in Ethiopia). In general, women and men were least supportive of wife beating as a response to a woman’s having burned food or refused sexual relations with her husband; they most often considered the practice acceptable as chastisement for a woman who had neglected her children or gone out without informing her husband. In the six countries where both women and men were interviewed, women tended to consider wife beating justifiable in more circumstances than did men.

In the multivariate analysis, income (as measured by the number of household assets) and level of schooling had the most consistent associations with women’s acceptance of wife beating. With each increase in household assets, the odds of accepting wife beating were significantly reduced, by up to 15% in six countries and by 47% in Rwanda. Similarly, in each country, the likelihood of support was significantly, and often dramatically, lower among women with postsecondary education than among those with no schooling (odds ratios, 0.1–0.4); findings for women with primary or secondary schooling, however, did not show a clear pattern across countries.

Other variables were significant in only some countries. Urban residence was associated with reduced odds of accepting wife beating among women in Benin and Malawi; re-

sults for Rwanda, Uganda and Zimbabwe were in the same direction but only marginally significant. In four countries, adult women in two or all three 10-year age-groups studied were less likely than teenagers to justify wife beating, but in the other three, relationships were at best marginally significant. Never-married women in all countries except Malawi and Uganda had lower odds of accepting wife beating than did their counterparts in monogamous marriages, and the less decision-making power a woman in Rwanda, Uganda or Zimbabwe had at home, the greater her odds of accepting wife beating. In Benin, Malawi, Rwanda and Zimbabwe, paid employment, unpaid employment or both were associated with an elevated likelihood of support. Women in Uganda had elevated odds of accepting wife beating if they held a nonpaying job, and reduced odds if they were employed for pay.

Two variables—religion and contribution to household expenditures—yielded conflicting results across countries. In Benin and Mali, Muslims had twice the odds of Catholics of accepting wife beating; in Malawi, they had a one-third reduction in odds. And whereas Ugandan and Zimbabwean women who paid more than half of the household’s expenses were more likely than those who paid less than half to justify wife beating, their counterparts in Benin had reduced odds of doing so.

For men, as for women, income and education had the strongest associations with acceptance of wife beating. In every country except Rwanda, acceptance declined with increasing household assets (odds ratios, 0.8–0.9); in all but Malawi, support was reduced among those with the highest level of education (0.1–0.6). Compared with 15–19-year-olds, adult Rwandan men in each 10-year age-group had reduced odds of accepting wife beating, as did 30–59-year-olds in Malawi, those aged 40–59 in Ethiopia, and those in their 50s in Benin.

Other variables showed no clear patterns of association. In Malawi, Muslim men had reduced odds of accepting wife beating, but in Benin, they had elevated odds. In Ethiopia, Muslims and Protestants had marginally elevated odds, and adherents of other religions had significantly increased odds. Marital status was significant only in Malawi (odds ratio, 1.8 for polygamous men) and Ethiopia (3.4 for widowed or separated men), and employment was significant only in Uganda (0.5 for those engaged in unpaid work). Men who contributed half of household expenses had ele-

vated odds of justifying wife beating in Benin (1.4) and reduced odds of doing so in Uganda (0.6); the odds of support were reduced for Malian and Ugandan men who contributed more than half of expenses (0.5 for each).

The analysts contend that women's acceptance of wife beating "may be explained only by entrenched social and cultural learning processes that subjugate the position of women in the society, socially and collectively undermine their self-esteem and facilitate romanticisation of the 'ideal' gender role of women." They further argue that the first step toward eliminating this practice is to "build up a substantial amount of momentum" in opposition to the use of violence in conflict resolution and that, given its widespread acceptance in these societies, the development of a "new social consensus," albeit a slow process, will be crucial. —D. Hollander

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Study Design May Cause Underestimate of Condom Efficacy Against STIs

Studies that measure the role of male condoms in preventing STI transmission by comparing users with nonusers may underestimate the method's effectiveness because of differences between users and nonusers that are difficult to measure.¹ In a case-crossover analysis using data from women visiting an STI clinic in the U.S. state of Alabama, in which each participant served as her own control, consistent use of the method was associated with a significant reduction in the incidence of gonorrhea and chlamydia, particularly when condoms neither broke nor slipped off. A cohort analysis based on the same data set, however, in which patterns of condom use and infection status were compared across individuals, showed no reduction in risk associated with consistency of use.

Participants were 18–34-year-old women attending the clinic between 1992 and 1995, who were neither pregnant nor planning to conceive within the next six months. At their initial study visit, the women underwent STI testing, received an intervention that promoted consistent and correct use of condoms and

spermicides, completed a behavioral interview, and learned how to use a diary to record their sexual activity and use of barrier methods. Participants were scheduled for six monthly follow-up visits at which they discussed their diary entries with project staff, completed additional interviews, were again tested for STIs and received a six-week supply of their chosen barrier method.

Both analyses examined the incidence and predictors of gonorrhea and chlamydia in the one-month intervals between follow-up visits. The case-crossover analysis compared intervals in which no infection was diagnosed with intervals in which either infection was detected in the same woman (and included only women who had both kinds of intervals), thus making each woman her own control and eliminating potential bias from unmeasured factors that do not change over time. The cohort analysis also compared intervals with and without a diagnosis, but included all women, regardless of whether they became infected during follow-up.

Most of the 1,122 women who enrolled in the study were black (89%), were younger than 25 (53%), had no more than a high school education (70%) and were neither married nor living with a partner (89%). All but 9% had had sex in the month before entering the study; most (68%) had had only one partner during that time. Thirty-one percent of participants tested positive for gonorrhea or chlamydia at study entry.

The analyses are based on data from 919 participants who made at least one follow-up visit and reported on both their sexual activity and their frequency of condom use (categorized as consistent, or 100% use, with neither breakage nor slippage; consistent with breakage or slippage; inconsistent; or no use). For the case-crossover analysis, the researchers used data on 228 intervals in which gonorrhea, chlamydia or both were diagnosed and 743 matched intervals from the same women in which no infection was diagnosed. The cohort analysis included 245 intervals with a diagnosis (all of those from the case-crossover analysis plus 17 that were ineligible for that analysis) and 3,896 intervals in which no infection was detected.

In the case-crossover analysis, the risk odds ratio derived from conditional logistic regression indicated that the likelihood of infection with gonorrhea or chlamydia was significantly lower during intervals in which a woman had consistently used condoms than during in-

tervals in which she had never used them (odds ratio, 0.5). Additionally, the association was stronger for intervals characterized by consistent use with no breakage or slippage than for consistent use with either of these problems. This analysis also revealed that a diagnosis was significantly more likely in an interval when a woman had had multiple partners than in an interval when she had had only one (1.8), and that the likelihood of infection during a given interval increased significantly with the number of unprotected sex acts (i.e., occasions of nonuse of condoms or use with slippage or breakage).

By contrast, using unconditional logistic regression, the cohort analysis showed no difference in the incidence of infection by consistency of condom use and no trend toward greater risk of infection with an increase in unprotected sex. Having multiple partners was once again associated with an increased risk of infection (risk odds ratio, 2.1), as were being younger than 25 (1.5) and receiving a diagnosis of chlamydia or gonorrhea at enrollment in the study (1.5).

Given the strengths of their study—notably, the use of two analytic approaches, including one designed to "circumvent unmeasured confounding and reduce its impact"—the researchers contend that "epidemiologic studies of condom effectiveness are probably confounded by unmeasured differences between users and nonusers." Moreover, they conclude that "the likely result of such confounding is underestimation of the effectiveness of condoms." —D. Hollander

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Extensive Genital Cutting Elevates Risk of Infertility Among Sudanese Women

Infertile women in Khartoum, Sudan, are significantly more likely than fertile women to have undergone the most extensive form of genital cutting.¹ According to a clinical case-control study conducted in 2003–2004, the odds of primary infertility were significantly higher for women who had undergone cutting in which all or most of the external genitalia had been removed (odds ratio, 4.7), whether

or not the cut sides of the vulva had been stitched together (a practice called infibulation).

Study participants included 99 women seeking medical treatment for primary infertility and a control group of 180 women who were expecting their first child and had become pregnant within two years of having unprotected sexual intercourse on a regular basis. To be included in the study, infertile women had to be aged 35 or younger, to have had intercourse regularly for the last two years and to lack known risk factors for infertility. To avoid bias due to age differences between infertile women and controls, 89 of the 180 fertile participants were selected to match, within one year, the age of infertile participants; all others were recruited consecutively from outpatient clinics.

All participants provided, via an interview-administered questionnaire, social and demographic data and information on the age at which genital cutting was performed, if applicable, as well as on any subsequent health outcomes. A gynecologist performed a genital examination on each participant to determine the extent of genital cutting, and blood samples were taken to detect the presence of STIs that could cause primary infertility. The gynecologist also examined the internal reproductive organs of women with primary infertility

for tubal blockage, an indicator of previous inflammation. The majority of participants (80%) had experienced extensive genital cutting; only seven (3%) had not undergone any cutting. Slightly fewer than half of infertile participants (48%) had tubal blockage.

Both univariate and multivariate regression analyses revealed a strong correlation between extensive genital cutting and infertility. In the univariate model, the odds of having undergone extensive cutting were 3.6 times as high among infertile women as among controls; the odds were 4.7 times as high in the multivariate analysis. Further analyses showed that, whether or not women had tubal blockage, it was only the extent of cutting—not infibulation—that was associated with infertility.

Analysis of participants' social and demographic characteristics indicated that infertile participants who had tubal blockage were generally older, more socioeconomically disadvantaged and less educated than infertile women with no tubal blockage or women in the control group. However, these differences were not statistically significant in the multivariate analysis. Furthermore, the multivariate analysis controlled for the influence of STIs on the results.

In the univariate analysis, the odds of hav-

ing undergone extensive cutting were higher among infertile women with and without tubal blockage than among fertile women (odds ratios of 5.7 and 3.4, respectively); in the multivariate model, these associations were only marginally significant (6.9 and 3.7).

This last finding, the researchers point out, indicates that tubal blockage is not the only factor contributing to infertility in this sample. Therefore, they hypothesize, female genital cutting may promote reproductive tract infections that, while leading to infertility, may or may not lead to tubal pathology.

The researchers suggest that, given the premium set on fertility in Sudan, the main finding of this study—that female genital cutting is a likely cause of primary infertility—could help eradicate the practice by challenging widespread beliefs that genital cutting prepares a girl to become a wife and even increases fertility. In counterpoint to such beliefs, the researchers posit that “any alteration of the normal anatomy of the girl’s vulva could lead to structural and physiological changes, which in turn have negative effects on her reproductive health.”—*H. Ball*

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