Gender, Power, and the Risk of Spontaneous or Induced Abortion in Zanzibar, Tanzania: A Causal Inference Approach

Divya Vohra[1], Caitlin Gerdts[2], Alison Norris[3]

[1]Division of Epidemiology, University of California, Berkeley; [2]Bixby Center for Global Reproductive Health, University of California, San Francisco; [3]Division of Epidemiology, College of Public Health, Ohio State University

Introduction and Theoretical Focus

Intimate partner violence (IPV) has long been recognized as a public health and human rights issue (1-4). Less is known, however, about how social environments that normalize IPV might independently contribute to poor reproductive health outcomes. Feminist scholars have hypothesized that social environments that restrict women's power and autonomy may normalize or promote IPV while simultaneously inhibiting women's ability to make decisions about their fertility (5). Links between IPV and adverse health outcomes, including miscarriage and induced abortion (4,6), have been identified, though this research considers broader social context in limited ways, or not at all.

Some scholars use multilevel modeling to evaluate the community context in which IPV takes place or have acknowledged that the relationship between IPV and health outcomes may vary depending on the extent to which IPV is seen as normal (7-10). Others have tested the relationship between gender and power norms and experience of IPV (11,12). Still others have hypothesized that community-level measures of women's autonomy or status might mediate or moderate the relationship between IPV and health outcomes (3). To our knowledge, however, little evidence exists with regard to whether women's attitudes and experiences related to autonomy and gender equity might independently affect their reproductive health.

Although feminist theory and the related public health literature on IPV suggest that lack of autonomy or power might increase women's risk of spontaneous as well as induced abortion, it is not known how these associations might relate to one another. Our study design allows us to examine whether, in a context which focuses exclusively on pregnancies that do not end in live birth, gender-based power inequities elevate the risk of induced abortion relative to spontaneous abortion, or vice versa.

The issues of IPV, empowerment, and abortion are especially important in Zanzibar, a semi-autonomous archipelago with a population of approximately 1 million that is part of Tanzania. Abortion is illegal in Tanzania except to save the life of the mother, yet despite criminal penalties and strong social stigma, the abortion rate is estimated to be relatively high, at 39/1,000 women (13). According to the 2010 Tanzania Demographic and Health Survey (TDHS), 10% of Zanzibari women have ever experienced IPV, and attitudes normalizing IPV are strong, with 23% of Zanzibari women believing that husbands are sometimes justified in beating their wives (14). Residents of Zanzibar are served by a network of local health facilities, connected through a referral system to one tertiary care hospital.

This study seeks to understand how women's autonomy and attitudes about IPV might affect their risk of induced abortion, relative to spontaneous abortion. Traditional regression techniques allow us to control for a number of covariates, thus estimating an association between our exposure and outcome of interest that is conditional on these covariates. To estimate instead the causal effect of women's autonomy and IPV attitudes on their risk of induced abortion, we use G-computation, a method of estimating a marginal structural model (MSM). Under certain assumptions, G-computation provides a flexible and intuitive way of using data obtained from an observational study to simulate what would have happened in a randomized trial (15). Though G-computation has been widely discussed and applied in epidemiology, this analysis represents one of the first attempts to apply it specifically in the context of reproductive health research.

Methods

Study Setting

We conducted a study among post-abortion care (PAC) patients in Mnazi Mmoja Hospital, the sole tertiary-level facility on the Zanzibar archipelago. Between July and November of 2010, all women over the age of 15 who sought PAC were invited to participate. Approximately 90% of eligible women consented to participate, resulting in a study population of 194 women. Study participants completed a questionnaire that addressed their sociodemographic characteristics as well as a range of questions about their reproductive health, family planning use, relationship history, and pregnancy history.

Exposure Measures

Our exposure measures include two classes of questions, modeled upon questions from the DHS Women's Questionnaire. The first class of questions asks, "Who is the decision maker on the following matters: you, your partner, someone else, or both of you?" followed by a series of categories. Women are scored according to the number of categories to which they respond "myself" or "both of us;" they are given 2 points for every category to which they respond "myself" and 1 point for every category to which they respond "both of us;" their total score across all categories is added and referred to as an index of their decision-making autonomy.

The second class of questions asks, "Sometimes a husband/male partner is annoyed or angered by things that his wife/female partner does. In your opinion, is a husband/male partner justified in hitting or beating his wife/female partner in the following situations:" followed by a series of situations. Women's score on this index of IPV attitudes is determined by the number of "yes" responses given to all of these situations.

Classification of Induced and Spontaneous Abortion

Women were asked to self-report whether the abortion that led them to seek PAC was induced or spontaneous. Only 14 women (7.2% of the sample) reported that they had attempted to induce an abortion, which is likely to be a substantial underestimate of the true proportion of PAC cases resulting from induced abortion.

Numerous techniques have been suggested for estimating the true incidence of induced abortion in settings where abortion is illegal or unsafe (16). With the data available to us, we attempt to estimate the true number of induced abortion cases using the classification protocol proposed by the World Health Organization (WHO), in which abortions are categorized as "certainly induced," "probably induced," "possibly induced," or "spontaneous" based on a woman's self-report, her experience of selected abortion-related sequelae, and her stated intention or level of happiness about the pregnancy in question (17). Although this method is likely to underestimate the true proportion of abortions that were induced (16,18), it provides a relatively straightforward way to reclassify study participants' likely abortion status and provide a rough estimate of the number of abortions in this population that were induced.

Covariates

We consider a woman's age, wealth, education, and marital status as confounders of the relationship between our exposures of interest and induced abortion. Furthermore, we consider the possibility that the intention or attitude toward the pregnancy may modify these exposure-outcome relationships.

Statistical Analyses

We will examine the relationship between each of our exposures (decision-making autonomy and IPV attitude) and a woman's experience of spontaneous or induced abortion. Our first set of analyses will examine this relationship using women's self-report of whether an abortion was spontaneous or induced as our outcome measure. A second set of analyses will use estimates (according to WHO categories) of whether a woman experienced an induced or spontaneous abortion as our outcome measure. For the purposes of this second set of analyses, all abortions classified as certainly, probably, or possibly induced will be counted as "induced," and all others will be counted as "spontaneous."

Both sets of analyses will first be conducted using logistic regression, examining participants with complete information on exposure, outcome, and relevant covariates. For each set of analyses, we will then use G-computation to estimate marginal associations between each exposure and induced abortion. By simulating the full range of counterfactual exposures that any given individual in our data set could experience, G-computation allows for estimation of parameters that average effects over different values of confounders or effect modifiers rather than providing effect estimates that are conditional on these nuisance parameters (19). G-computation requires that we model the relationship between the observed outcome and exposure, given any covariates, using traditional multivariable logistic regression. We then deliberately vary each woman's exposure status, and use our regression model to estimate counterfactual outcomes for each woman under each level of exposure. For example, if a given women has low autonomy and reports a spontaneous abortion, we use our regression model to estimate what her probability of reporting an induced abortion would be if we hold all other covariates constant but change her level of autonomy. This allows us to answer the hypothetical (counterfactual) question, how would this particular woman have reported the outcome of her pregnancy had she reported high autonomy, holding all other conditions constant? We then regress the outcome on our exposure of interest using this expanded data set, which contains the full range of counterfactual outcomes for each individual under each exposure level. This analysis yields a marginal estimate of the causal effect of autonomy or IPV attitudes on the risk of induced abortion.

Results

Most women in our population do not believe that IPV is ever acceptable, and most report moderate decision-making autonomy (Table 1).

Fourteen of the 194 (7.2%) women in our study population report having induced an abortion, with the remaining women reporting that their abortion was spontaneous. We will use the WHO algorithm described above to estimate and report the number of women who were likely to have induced, though they reported a spontaneous abortion.

We will then report the following statistical analyses: (1) the relationship between each exposure (autonomy and IPV attitudes) and self-reported abortion status using logistic regression; (2) the relationship between each exposure and self-reported abortion status using G-computation; (3) the relationship between each exposure and reclassified abortion status (from the WHO algorithm) using logistic regression; and (4) the relationship between each exposure and reclassified abortion status using G-computation.

Discussion

These analyses will contribute to an understanding of how decision-making power and IPV-related norms affect women's reproductive health. In particular, these findings can have important implications for PAC contexts, especially in settings where induced abortion is illegal or otherwise difficult to obtain. A better understanding of these causal pathways can help guide appropriate provision of PAC services.

To the best of our knowledge, this study is the first documented effort to apply causal inference techniques to the study of determinants of spontaneous and induced abortion. We were able to interview most women needing PAC services during the study period, and we utilize novel statistical techniques to estimate the causal effect of key elements of women's social context on their reproductive health.

Table 1. Selected characteristics of study population

	IPV never acceptable	IPV ever acceptable	Autonomy score low (<=6)	Autonomy score high (>6)	Total
N	139	55	68	126	194
Age (min, max)	27.3 (16, 49)	27.3 (17, 43)	26.4 (16, 49)	27.8 (16, 43)	27.3 (16, 49)
Literate	125 (91.2%)	45 (83.3%)	57 (86.4%)	113 (90.4%)	170 (89.0%)
Formally employed	32 (23.7%)	8 (14.5%)	13 (19.7%)	27 (22.0%)	40 (21.2%)
Never married	14 (10.1%)	4 (7.5%)	11 (16.4%)	7 (5.6%)	18 (9.4%)

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