

W Sexual violence and its health consequences for female children in Swaziland: a cluster survey study

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Summary

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Methods We obtained data from a nationally representative sample of girls and women aged 13–24 years from selected households in Swaziland between May 15, 2007, and June 16, 2007, with a two-stage cluster design. The questionnaire examined demographics, type of sexual violence that took place before the respondent was 18 years of age, circumstances of the incident, and health-related conditions. Information was gathered from 1244 women and girls (response rate 96·3%), of whom 1242 provided retrospective responses to questions about sexual violence. We used regression models adjusted for relevant demographics to estimate the odds ratios for the associations between sexual violence and health-related conditions.

Findings 33·2% (95% CI 29·9–36·7) of respondents reported an incident of sexual violence before they reached 18 years of age. The most common perpetrators of the first incident were men or boys from the respondent's neighbourhood (32·3% [28·8–36·1]) and boyfriends or husbands (26·2% [22·2–30·7]). The first incident most often took place in the respondent's own home (26·1% [21·6–31·2]). Sexual violence was associated with reported lifetime experience of sexually transmitted diseases (adjusted OR 3·69 [95% CI 1·78–7·66]), pregnancy complications or miscarriages (3·54 [1·47–8·55]), unwanted pregnancy (2·92 [1·87–4·55]), and self-report of feeling depressed (2·30 [1·70–3·11]).

Interpretation Knowledge of the high prevalence of sexual violence against girls in Swaziland and its associated serious health-related conditions and behaviours should be used to develop effective prevention strategies.

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Introduction

Sexual violence against girls—defined as female children younger than 18 years of age—is a substantial global health and human-rights problem, and a growing concern in sub-Saharan Africa. According to WHO, about 150 million girls had experience of sexual violence with physical contact in 2002.¹ In parts of South Africa and Tanzania, up to a third of adolescent girls reported that their first sexual experience was forced.^{2–4} A nationally representative study⁵ done in 1998 showed that 1·6% of South African girls and women aged 15–49 years reported that they had been raped before 15 years of age. Understanding the prevalence and nature of sexual violence is important because it has devastating short-term and long-term mental, reproductive, and physical health consequences. Some common consequences are pregnancy and gynaecological complications, infection with HIV and other sexually transmitted diseases, mental health problems (such as depression and post-traumatic stress disorder), and social ostracisation.⁶ Sub-Saharan Africa is the region most heavily affected by HIV worldwide—accounting for 67% of people living with HIV in 2007—and sexual violence might be an important route of HIV transmission.⁷ In particular, Swaziland is disproportionately affected; the country has

the highest prevalence of HIV in girls and women aged 15–24 years of 22·6%.⁷

Previous studies of sexual violence against children in Swaziland have been limited to the school setting. For example, the global school-based student health survey⁸ showed that 9·8% of girls aged 13–15 years and 21·1% of girls aged 16 years and older reported having been physically forced into sexual intercourse. In select primary and secondary school students who had been abused, physical abuse (49·5%) and sexual abuse (19·2%) were most common, with those aged 10–15 years most vulnerable.⁹ Additionally, in a study of patterns of sexual behaviour,¹⁰ 13% of secondary school students described their first sexual experience as involuntary. However, these school-based studies are not nationally representative because not all Swazi children attend school. About 9·4% of children of primary school age do not attend school.¹¹ Moreover, children who are exposed to sexual violence at school might be more likely to drop out.¹²

To assess the prevalence, epidemiological patterns, and potential risk factors associated with sexual violence against children, the Swaziland office of UNICEF and the US Centers for Disease Control and Prevention administered a national survey to assist programme and policy development. We report the results of this survey.

Methods

Participants

National prevalence of sexual violence in girls younger than age 18 years was calculated from a household survey of Swazi girls and women aged 13–24 years between May 15, 2007, and June 16, 2007. We used a two-stage cluster survey design. The sampling frame was compiled by the Central Statistics Office of Swaziland for the national population census in 1997, which was the most reliable and recent source of population estimates available for the country. Women aged 18–24 years were included to assess the prevalence of sexual violence in those who had lived the full age range of interest (under 18 years), at a young enough age for recall bias to have a negligible effect.

Assuming a design effect of two we estimated that a sample size of 1024 households would result in a 95% CI of 1·9% precision around an estimated 5% prevalence of forced sexual intercourse against female youth.¹³ A household was defined as a person or group of persons who were related or unrelated, or both, who lived together and shared meals.¹⁴ In Swaziland, about 68% of households include a girl or woman aged 13–24 years,¹¹ and therefore we increased the household sample size to 1505. The final sample size was adjusted to 1881 households to account for a potential 20% non-response rate. We selected a sample of 40 enumeration areas—geographical subdivisions of the country determined by the census department—from a total of 1758 with probability of selection proportional to size. We then took a systematic sample of households (n=48) in each enumeration area with a random start, generating a sample of 1920 households nationally, which exceeded the final sample size estimated to be required. All enumeration areas were accessible, but in three areas, a sample of 48 households was not available because of the small community size (two areas had 47 households and one area had 29 households).

We visited 1900 households, of which 68% (n=1292) had an eligible girl or woman. The team presented the survey to the head of the household as an opportunity to learn more about the health needs of girls and young women without referring to the issue of sexual violence to obtain permission to speak with the study participant. When more than one girl or woman was eligible per household, the interviewers randomly selected one participant according to the Kish method.¹⁵ If the participant was not available after three attempts to contact her, the household was omitted and not replaced, irrespective of whether or not other household members were eligible. Information was gathered from 1244 girls and women (response rate 96·3%), of whom 1242 provided retrospective responses to questions about sexual violence. Non-response was caused by unavailability and only 14 (1·1%) of the selected participants refused to answer the survey. The distribution of our study sample by region and age is very similar to the 2007 census in Swaziland.

Informed oral consent was given and interviews were done in private. All participants were offered a list of organisations that specialised in services for children and women who were the victims of violence. WHO guidelines on ethics and safety in studies on violence against women¹⁶ were followed during the survey.^{17,18} The US Centers for Disease Control and Prevention's institutional review board supplied ethical approval for the study.

Procedures

The survey was administered in SiSwati, the main language in Swaziland, by Swazi staff who had received extensive training. The questionnaire was translated from English into SiSwati and then back into English. The translation was reviewed and revised by survey team members who were fluent in both SiSwati and English. The questionnaire was developed with standardised and previously tested survey methods.^{13,19–22} Survey questions were further modified to align with cultural attitudes, behaviours, and terminology in Swaziland on the basis of interviews with key informants (from government ministries, agencies, and departments; UN agencies; and non-governmental and local organisations), and findings from a pilot study in a randomly selected enumeration area that was not included in our survey. We assessed lifetime and 12-month prevalence of sexual

Panel: Questions used to define sexual violence*

Forced intercourse

Was there a time when a man or boy physically forced you to have sexual intercourse against your will?

Coerced intercourse

Was there a time when a man or boy persuaded or pressured you to have sexual intercourse against your will? In other words, have you ever given in to sexual intercourse with a man or boy because you felt overwhelmed by continual arguments and pressure?

Attempted unwanted intercourse

Was there a time when a man or boy tried to make you have sex when you did not want to but he did not succeed in doing this?

Unwanted touching of respondent

Was there a time when a man or boy touched you against your will in a sexual way such as unwanted touching, kissing, grabbing, or fondling, but he did not try to force you to have sex?

Forced touching of perpetrator

Was there a time when a man or boy forced you to touch his private parts against your will but he did not try to force you to have sex?

*The terms "sex" and "sexual intercourse" were defined as any time a man put his penis in the respondent's vagina or anus.

	Participants (n=1244)*
Age-group	
13–17 years	575 (46·4% [42·4–50·4])
18–24 years	669 (53·6% [49·6–57·6])
Community setting	
Urban	201 (14·9% [7·1–28·4])
Rural	1043 (85·1% [71·6–92·9])
Orphan status	
Biological mother died	125 (9·6% [8·0–11·4])
Biological father died	241 (18·4% [16·0–21·1])
Death of both biological parents	83 (7·6% [6·0–9·5])
Death of at least one biological parent†	449 (36·0% [32·5–39·8])
Marital status	
Married	127 (9·7% [7·1–13·1])
Not married	1112 (90·3% [86·9–92·9])
Data are absolute number (weighted % [95% CI]). *Absolute numbers do not perfectly correspond to percentages because percentages are weighted. †Death of at least one biological parent before 18 years of age. ‡This is consistent with the definition used for orphan status in Swaziland.	

Table 1: Demographic data for girls and women aged 13–24 years

	Participants aged 13–24 years, lifetime prevalence (n=1242)*	Participants aged 13–17 years, 12-month prevalence (n=573)†‡
Any sexual violence	418 (33·2% [29·9–36·7])	92 (16·0% [12·7–20·1])
Forced intercourse	59 (4·9% [3·7–6·6])	6 (·)
Coerced intercourse	117 (9·0% [6·9–11·6])	15 (3·3% [1·7–6·1])
Attempted unwanted intercourse	232 (18·8% [16·5–21·3])	45 (8·0% [5·8–11·1])
Unwanted touching of respondent	177 (13·9% [11·7–16·5])	46 (7·4% [5·4–10·0])
Forced touching of perpetrator	18 (1·3% [0·8–2·2])	3 (·)

Data are absolute number (weighted % [95% CI]). *Too few cases to produce stable estimates. †Absolute numbers do not perfectly correspond to percentages because percentages are weighted. ‡Data are missing for two respondents.

Table 2: Prevalence of sexual violence (lifetime or past 12 months) in girls younger than 18 years, reported by girls and women aged 13–24 years

violence, defined in the World Report on Violence and Health⁶ as “any sexual act, attempt to obtain a sexual act, unwanted sexual comments or advances, or acts to traffic, or otherwise directed, against a person’s sexuality using coercion, by any person regardless of their relationship to the victim, in any setting, including but not limited to home and work”. The types of sexual violence examined were forced intercourse, coerced intercourse, attempted unwanted intercourse, unwanted touching of the respondent, and forced touching of the perpetrator (panel).

The participants provided demographic data (age, community setting, orphan status, and marital status), descriptions of the circumstances of their first incident of sexual violence before 18 years of age (age, type of sexual violence, relationship with the perpetrator, location of the incident, alcohol or drug use by the respondent, and suspected alcohol or drug use by the perpetrator), and self-reports of lifetime health-related

conditions and health-risk behaviours. In 13% of girls and women who had had experience of sexual violence before they were aged 18 years, we could not identify which incident was first because they had two or more incidents that happened at the same age. For these participants we randomly selected one of these incidents to represent the first incident. Circumstantial data was also gathered for the most recent incident for those girls and women who had had more than one incident of sexual violence.

Statistical analysis

Data were entered into Epi Info (version 6.04b). We undertook double-data entry for 20% of randomly completed questionnaires; data-entry error was 0·3% and we investigated and corrected erroneous data entries. Since data-entry error for this sample was less than 1%, we decided that all questionnaires would not need double-data entry. SAS (version 9.1.3) was used for data management and SAS-callable SUDAAN (version 9.01) was used for analysis to accommodate sample weights and the complex sample design. We calculated weighted percentages to generate estimates that were representative of the national population, but we also included the unweighted absolute number of participants. Consequently, the percentages and absolute numbers do not perfectly correspond in the tables, and weighted percentages without absolute numbers are presented in the text. The stability of prevalence estimates was established according to the analytical guidelines for the US national survey on health and nutrition.²³

We examined associations between sexual violence and selected health-related conditions and behaviours with simple logistic-regression models. The crude model was also adjusted for potential confounders (age, community setting, socioeconomic status, and orphan status). In Swaziland, orphan status is defined as the death of at least one biological parent before 18 years of age.²⁴

Role of the funding source

The sponsor of the study participated in study design, data collection, and data interpretation, but did not have a lead role. The sponsor did not participate in data analysis or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

Almost half the girls and women studied were aged 13–17 years and the proportion who were living in rural communities was almost six-fold higher than those in urban areas (table 1). More than a third were orphans (table 1) and only 9·7% were married.

A third of participants aged 13–24 years reported that they had had experience of some form of sexual violence before 18 years of age (table 2); the prevalence was 37·8%

(95% CI 33·1–42·6) for those aged 18–24 years. The most common incidents were attempted unwanted intercourse, unwanted touching of the respondent, and coerced intercourse. Almost one in 20 girls and women aged 13–24 years reported that forced intercourse had occurred before they were 18 years old (table 2). About a sixth of girls aged 13–17 years reported that they had had experience of sexual violence in the past 12 months (table 2). From these reports, the most common incidents were attempted unwanted intercourse, unwanted touching of respondent, and coerced intercourse.

Just under 90% of the first incidents of sexual violence that occurred before age 18 years, happened when the respondents were aged between 13 and 17 years (table 3). Most of these incidents were attempted unwanted intercourse and unwanted touching of the respondent or perpetrator. Sexual violence was most commonly perpetrated by men or boys from the respondent's neighbourhood, boyfriends or husbands, and male relatives other than a father, stepfather, or husband. Sexual violence mostly occurred in the respondent's own home, in a public area or veldt (mainly open grassland in southern Africa), or in the house of a friend, relative, or neighbour. In more than a quarter of cases, the respondent suspected that the perpetrator had used drugs or alcohol before the incident (table 3).

On further examination of these data, the circumstances of the first incidents of sexual violence clustered around two predominant patterns. In the first pattern, accounting for almost a third of cases, incidents were perpetrated by boyfriends, husbands, or other male relatives in the home. For incidents perpetrated by a boyfriend or husband, at the time of the event the youngest victim was 12 years of age and the mean respondent age was 15·9 years (95% CI 15·6–16·2). In the second pattern, accounting for about 20% of cases, incidents were perpetrated by men or boys from the respondent's neighbourhood in public areas, on the way to or from school, in school buildings, or on school grounds. Of the incidents associated with schools, at the time of the incident 42·9% (95% CI 30·4–56·3) of girls were enrolled in primary school and 57·1% (43·7–69·6) were enrolled in secondary school.

At least 42·8% (36·0–49·8) of girls and women who reported any incident of sexual violence had had two or more incidents before they reached 18 years of age. Examination of available circumstantial information on the most recent incident for these individuals showed that nearly half the perpetrators of the additional incidents were boyfriends or husbands (48·3% [39·1–57·6]) and 42·4% (31·1–54·6) took place in the respondent's own home. The most common circumstance of sexual violence was at home with either boyfriends or husbands (38·2% [27·8–49·9]) or male relatives, other than husbands or stepfathers (17·3% [11·0–26·0]).

Sexual violence was associated with significantly increased probability of reporting of lifetime experience

	Participants (n=418)*
Age-group (years)	
<13	52 (11·9% [9·0–15·6])
13–17	366 (88·1% [84·4–91·0])
Type of sexual violence	
Forced intercourse	46 (10·5% [7·7–14·3])
Coerced intercourse	62 (14·9% [10·9–20·0])
Attempted unwanted intercourse	176 (42·7% [37·7–47·8])
Unwanted touching of respondent or perpetrator	134 (31·9% [27·2–37·0])
Perpetrators of sexual violence	
Father	1 (..)
Other male relative†	52 (14·0% [10·0–19·2])
Family friend or lodger	11 (3·0% [1·5–6·2])
School teacher or principal	14 (2·7% [1·5–4·8])
Man or boy from neighbourhood	132 (32·3% [28·8–36·1])
Stepfather or mother's boyfriend	1 (..)
Boyfriend or husband	112 (26·2% [22·2–30·7])
Stranger	59 (13·2% [10·2–17·1])
Recent acquaintance	5 (..)
Other	28 (7·1% [4·5–10·9])
Location of sexual violence	
Home	101 (26·1% [21·6–31·2])
House of friend, relative, or neighbour	89 (20·2% [16·0–25·1])
School building or school grounds	53 (13·3% [10·3–17·0])
Journey to or from school	53 (11·8% [8·9–15·4])
Public area or veldt	95 (22·6% [18·6–27·2])
Car, combi, or bus	8 (..)
Other	18 (3·9% [2·2–6·6])
Suspected alcohol or drug use by perpetrator	
Yes	118 (29·1% [23·8–35·0])
No	282 (67·0% [61·3–72·4])
Unknown	18 (3·9% [2·2–6·8])
Alcohol or drug use by respondent	
Yes	2 (..)
No	416 (99·5% [97·9–99·9])

Data are absolute number (weighted % [95% CI]). ..=too few cases to produce stable estimates. *Absolute numbers do not perfectly correspond to percentages because percentages are weighted. †Excluding father, stepfather, or husband.

Table 3: Circumstances of first incidents of sexual violence in girls younger than 18 years, reported by girls and women aged 13–24 years

of ever feeling depressed, thoughts of suicide, attempted suicide, unwanted pregnancy, pregnancy complications or miscarriages, sexually transmitted diseases, difficulty sleeping, and alcohol consumption (table 4). These associations were significant after adjustment for age, community setting, socioeconomic status, and orphan status for all health-related conditions except attempted suicide, for which weak evidence of an association remained. Childhood sexual violence was not associated with increased probability of women reporting sexual violence at 18–24 years of age after adjustment (adjusted OR 0·77 [95% CI 0·54–1·08]).

	Never had experience of sexual violence (n=639)*	Had experience of sexual violence (n=418)*	Odds ratio	p value	Adjusted odds ratio†	p value
Feeling depressed	346 (54.0% [48.3-59.6])	338 (80.6% [75.4-85.0])	3.54 (2.73-4.59)	p<0.0001	2.30 (1.70-3.11)	p<0.0001
Suicidal ideation	74 (10.2% [8.0-13.1])	118 (25.3% [20.4-30.9])	2.97 (2.05-4.29)	p<0.0001	2.31 (1.57-3.40)	p=0.0001
Attempted suicide	16 (2.3% [1.3-4.0])	32 (6.0% [4.0-9.1])	2.75 (1.35-5.59)	p=0.0066	2.03 (0.97-4.25)	p=0.0583
Unwanted pregnancy	105 (16.2% [12.3-21.1])	174 (40.4% [35.4-45.7])	3.54 (2.35-5.32)	p<0.0001	2.92 (1.87-4.55)	p<0.0001
Pregnancy complications or miscarriages	8 (1.3% [0.5-3.5])	23 (5.4% [3.4-8.6])	3.73 (1.28-10.87)	p=0.0175	3.54 (1.47-8.55)	p=0.0061
Sexually transmitted diseases	12 (1.7% [0.9-3.2])	30 (7.6% [5.3-10.8])	4.76 (2.22-10.20)	p=0.0002	3.69 (1.78-7.66)	p=0.0009
Difficulty sleeping	170 (26.8% [23.5-30.2])	200 (45.3% [38.6-52.1])	2.27 (1.78-2.88)	p<0.0001	1.78 (1.32-2.40)	p<0.0004
Cigarette use	11 (1.6% [0.8-3.2])	12 (2.7% [1.4-5.3])	1.68 (0.85-3.30)	p=0.1314	1.22 (0.58-2.57)	p=0.5860
Alcohol consumption‡	37 (5.4% [3.6-7.9])	68 (17.3% [12.5-23.4])	3.67 (2.07-6.52)	p=0.0001	3.02 (1.68-5.44)	p=0.0005

Data are absolute number (weighted % [95% CI]) or odds ratio (95% CI). *Absolute numbers do not perfectly correspond to percentages because percentages are weighted.
†Adjusted for age, community setting, socioeconomic status, and orphan status. ‡More than a few sips.

Table 4: Self-reports of lifetime experience of health-related conditions and behaviours reported by girls and women aged 13–24 years, who had or had never had experience of sexual violence before age 18 years

Discussion

This study documents that sexual violence against girls younger than 18 years of age affected one in three women aged 13–24 years in Swaziland and has serious health consequences. About 5% of girls had forced intercourse and 9% had coerced intercourse before 18 years of age. About three-quarters of the perpetrators of sexual violence against girls were men or boys from the respondent's neighbourhood, boyfriends or husbands, or male relatives.

Thus, perpetrators of sexual violence are either partners or well known to the girl, which is common across many cultures.⁶ This pattern could indicate the vulnerability of girls to victimisation and the importance of cultural factors that influence relationships between men, women, and children. Future strategies should focus on prevention of perpetration by men of sexual violence against girls, and since sexual and intimate partner violence might have common roots, local and national initiatives could be reviewed, adapted, and potentially scaled up for this purpose. One such programme is Stepping Stones, which aims to produce gender-equitable relationships and improved communication between partners.^{25,26}

Other prevention strategies focus on children—for example, Lihlombe Lekukhalela (Shoulder to Cry On) is a community-based programme that was launched in 2001 to protect children from all forms of abuse.²⁷ So far more than 6000 child protectors have been trained and they are becoming recognised nationally as a point of call for at-risk or abused children in rural areas. Educational programmes have also been used to impart messages to children (and their parents) about how to identify abuse, react to reports of abuse, prevent reoccurrence of childhood sexual violence, and promote disclosure by the victim.^{28,29} Furthermore, since nearly half those who had an experience of sexual violence had more than one incident before 18 years of age, prevention strategies should be designed to keep children safe even after an incident has been reported.

Our data suggest that prevention of perpetration of sexual violence by boyfriends, husbands, and other male relatives is especially important to reduce the number of incidents of sexual violence during childhood.

We also showed that sexual violence tended to take place in the home of the respondent or a friend, relative, or neighbour, and was also common in public areas, on the journey to or from school, and in school buildings or on school grounds. The frequency of sexual violence in the home emphasises the hidden nature of sexual violence, and presents one of the largest challenges to prevention efforts in Swaziland. This finding is similar in many other cultures. In Africa schools are reportedly a common place for sexual violence;⁶ the findings of our study support this occurrence and suggest that prevention strategies should target travel to and from schools and the school environment itself.

Our findings suggest that sexual violence is associated with feelings of depression, suicidal thoughts, unwanted pregnancy, pregnancy complications or miscarriages, sexually transmitted diseases, difficulty sleeping, and alcohol consumption. Previous research in the neurobiological, behavioural, and social sciences suggests that early childhood exposure to violence can affect brain development and subsequently increase vulnerability to a broad range of mental and physical health problems ranging from anxiety disorders and depression to cardiovascular disease and diabetes.³⁰⁻³² The true extent and severity of the effect on participants in this study from exposure to violence in early childhood is unknown, but the magnitude of the problem and the documented consequences of this type of violence is cause for great concern.

The association between sexual violence and both mental health and reproductive health problems, for example, also has important implications for developing prevention programmes and policies. Prevention strategies directed towards violence against children could be integrated into other public health strategies to

build on common underlying risk factors. Integration into a well established prevention infrastructure capable of supporting surveillance, prevention programmes, and health-communication activities should accelerate results since the infrastructure to address violence against children is presently inadequate.

Our study provides nationally representative estimates of childhood sexual violence in sub-Saharan Africa. Additionally, interviewers obtained a very high response rate from eligible participants. We were concerned that a household study might exclude most participants who were attending school, but interviewers were able to survey a substantial proportion of them. Therefore we are confident that the sample surveyed was representative of girls and women aged 13–24 years in Swaziland.

However, we suspect that the true prevalence of violence against girls was underestimated. Previous research has suggested that some adult survivors who were sexually abused as children have no memory of the abuse.³³ Younger girls who were abused by someone they knew are less likely to recall the abuse than those who are older, and some girls and women might be less likely to disclose an incident if the perpetrator is known to them than if it is a stranger. Furthermore, we included respondents aged 13–17 years in our estimation of the prevalence of sexual violence in female children younger than 18 years. Since these respondents had not yet reached their eighteenth birthday they were at risk of further violence in the specified age-group.

Another limitation of our study is that we did not ascertain the temporal relation between incidents of sexual violence and health-related conditions and behaviours, and therefore the recorded associations do not necessarily show a causal relation. Furthermore, the nature of the questionnaire prevented a distinction between sexual violence perpetrated by boyfriends and that perpetrated by husbands. However, less than 10% of study participants were married, which suggests that more sexual violence was perpetrated by boyfriends than by husbands. Additionally, the circumstances of sexual violence were taken from the first incident that each participant had, which is not representative of all incidents of sexual violence against girls. Nevertheless, we believe that these circumstances provide useful information about the nature of the problem. Last, exclusion of boys was not a methodological limitation of the study, but it prevents the magnitude and nature of sexual violence against boys from being estimated.

Despite these limitations, this survey provides information about the magnitude and characteristics of sexual violence against girls in Swaziland, which will be useful for health-care professionals, policy makers, educators, and community-based child protectors among others, both in Swaziland and internationally. This study will help to continue efforts to break the silence around violence against girls and establish a stronger foundation for prevention.

Contributors

AR, MJB, JG, JAM, CB, ZM, LLD, and MA participated in the study conception and development, and AR, MJB, JG, ZM, and SB participated in the implementation of the study. AR, MJB, JAM, CB, LLD, and MA participated in analysis of the data, and AR, MJB, JAM, and CB wrote the manuscript. JG, ZM, and SB reviewed the data, and JG, ZM, SB, LLD, and MA reviewed the manuscript. All authors saw and approved the final version of the manuscript.

Conflicts of interest

We declare that we have no conflicts of interest.

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