

Intimate partner violence, contextual factors and under-5 mortality: a multilevel analysis of cross-sectional surveys from 20 Sub-Saharan African countries

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ABSTRACT

Background Under-5 mortality remains a public health concern in low-income and middle-income countries. Africa contributes about one-fifth of the burden of global under-5 mortality; intimate partner violence (IPV) and polygyny, which are highly prevalent on the continent, have been linked to under-5 mortality at the individual level. This study examined the relationship between IPV and polygyny as contextual factors and the experience of under-5 mortality among women in Sub-Saharan Africa (SSA).

Methods We used data from the Demographic and Health Surveys (DHS) of 20 African countries with available data between 2010 and 2018 as of April 2020. We defined the experience of under-5 mortality as a woman's loss of at least one child before their fifth birthday. The DHS primary sampling unit was used to define contextual factors. The study involved a multilevel logistic regression analysis of 227 121 women of childbearing age (15–49).

Results A quarter (24.5%) of women have lost at least one child under 5 years old, more than two-thirds (40.1%) have experienced at least one form of IPV, and about two-thirds of women were in polygynous union. Our multilevel logistic regression showed that parity, polygynous union and experience of IPV were strongly associated with women's experience of under-5 mortality. The results showed that 39.9% and 19.2% of variances in odds of a woman losing a child before their fifth birthday are attributable to community-level and country-level factors, respectively. Contextual prevalence of IPV, polygynous union and gender equity attenuate the strength of associations observed at the individual level. The interaction between contextual prevalence of polygyny and IPV exacerbates the risk of under-5 mortality. Women in SSA countries with higher Human Development Index were less likely to experience under-5 mortality.

Conclusion This study established that beyond individual-level effects, contextual prevalence of IPV and polygyny and their interactions shape women's experience of under-5 mortality in Africa. In designing policies and interventions to address under-5 mortality, contextual factors, especially those linked to culturally laden social norms and practices, must be considered to ensure effectiveness and sustainable impact.

Key questions

What is already known?

- ▶ Under-5 mortality remains unacceptably high in Sub-Saharan Africa (SSA) and is one of the key 2030 agenda of the Sustainable Development Goals.
- ▶ Evidence on how medically related risk factors, such as preterm birth and diarrhoea, and individual-level mother and child characteristics influence under-5 mortality is well documented.

What are the new findings?

- ▶ In SSA, women's loss of children before their fifth birthday is strongly associated with individual and contextual exposure to intimate partner violence and polygyny.
- ▶ In addition, 39.9% and 19.2% of variances in odds of a woman losing a child under 5 years old are attributable to community-level and country-level factors, respectively.

What do the new findings imply?

- ▶ The study suggests that effective interventions aimed at reducing under-5 mortality in SSA must give attention to factors which are contextually derived from traditional norms and cultural values, including intimate partner violence and polygyny.
- ▶ Efforts must include designing and implementing interventions targeting poor socioeconomic and sociocultural contexts that encourage intimate partner violence and polygynous practices as this will accelerate SSA's progress towards reducing child mortality to 25 per 1000 live births by 2030.

BACKGROUND

Under-5 mortality remains a public health concern in Sub-Saharan Africa (SSA), and reducing it is one of the major development goals—from the World Summit for Children of 1990 to the most recent Sustainable Development Goals.^{1 2} This is largely due to the high prevalence of under-5 mortality, particularly in the low-income and middle-income

countries (LMICs). On the global scale, the rate of under-5 mortality reduced from 90 per 1000 live births in 1990 to 39 per live births in 2018.^{3 4} Despite the huge progress made, there are still about 5.3 million under-5 deaths in 2018, and more importantly the prevalence in LMICs is 14 times higher (68 deaths per 1000 live births) than in high-income countries (5 deaths per 1000 live births).³ Therefore, under-5 mortality remains a health and development indicator of concern for many developing countries.

The WHO African Region, especially the SSA, has the highest rate of under-5 mortality with about 78 per 1000 live births, which is eight times higher than the WHO European Region.^{5 6} One-fifth of global under-5 mortality is accounted for by just seven African countries alone, namely Nigeria, Somalia, Angola, Central African Republic, Mali, Sierra Leone and Chad.^{4 5} A lot of work has been done to provide evidence on the determinants of under-5 mortality over the years; mother-child characteristics such as maternal age, maternal age at first marriage, religion, educational attainment and place of residence have been identified in the literature.⁷⁻⁹ Also, medically related risk factors, such as delivery by caesarean section, preterm birth, vaccination, respiratory infections, diarrhoea and birth size, and health system-related factors, such as poor availability and accessibility of quality health services (which is predominant in many SSA countries), have all been established as strong determinants.¹⁰⁻¹³ All these have shaped the policy and implementation direction towards addressing the high level of under-5 mortality in SSA. Considering the gap between the current prevalence of under-5 mortality in Africa and the target of the Sustainable Development Goals, to reduce under-5 mortality to 25 deaths per 1000 live births by 2030, there is a need for more evidence-based and policy relevant research to identify gap and hidden risk factors to drive more effective policies and interventions.

The term 'hidden' risk factors is usually used in health research to describe under-rated risk factors that affect health outcomes. A growing body of literature has identified intimate partner violence (IPV) and polygyny as hidden risk factors for poor maternal and child health (MCH) outcomes, including under-5 mortality.¹⁴⁻¹⁶ Broadly, there has been increased focus on how family structures (monogamy, polygyny or single parenthood) and household characteristics influence health outcomes. Studies have shown that children from polygynous family structures and large households are more likely to have poor health outcomes,¹⁷⁻¹⁹ including morbidity and mortality. Literature also shows that women and children are mostly the victims of gender-based violence or IPV in polygynous union.^{20 21} Further, IPV is linked to sexual and reproductive health problems among women, including low birth weight.^{16 22}

These two risk factors are common features of many SSA countries; the average prevalence of polygyny is about 40% and that of IPV is about 35%, and both have wide variations between regions and communities.²³

However, most studies on their interlinkages with health outcome treat them as individual-level or family-level risk factors alone. In reality, both IPV and polygyny are usually underpinned and influenced by social and cultural constructs.^{18 21 24 25} In epidemiology, cultural norm is a well-established concept used to identify hidden risk and pattern of diseases and also to understand and explain the mitigating impact of interventions.¹⁴ A recent study affirms that resources such as education, wealth and employment do not protect women against abuse at the individual level, but women living in more equal areas are less likely to experience IPV.²⁶ In addition to this, huge gender inequalities have been shown to be prevalent in settings characterised by polygynous practice.²⁷ All these suggest that evidence on the contextual prevalence, impact of IPV, polygyny and gender inequality would perhaps be useful in understanding the pattern of under-5 mortality in SSA.

In this paper, we hypothesised that the risk of under-5 mortality among women in SSA is associated with IPV and polygynous union. We also hypothesised that the contextual prevalence of IPV and polygyny will explain these associations even when gender equity index is adjusted for, and finally that the risk of experiencing under-5 mortality among women will be exacerbated in IPV-prevalent and polygyny-prevalent settings.

Some theoretical perspectives on IPV, polygyny and child survival

A clear theoretical perspective is needed on how IPV, polygyny and under-5 mortality, as well as other underlying factors, may interrelate. Hence this study is guided by two theories: the social ecological theory (SET) and the gender and power theory (GPT). SET provides understanding on the interrelationships of factors at multiple levels, including individual, household, neighbourhood (the economic and social structure of the individual's community) and the society at large.²⁸ It provides explanation on how characteristics at different levels may influence social behaviours such as polygyny and IPV. SET advances that, at the individual level, women in a marital dyad tend to experience domestic violence due to the community contextual gender norms that are prevalent in the larger society. The theory posits that behaviours such as IPV are a product of familial and social context.^{29 30} Lending credence to SET, GPT postulates that unequal gender relations between men and women are the basis of gender-based violence within a societal structure.³¹⁻³³ This may have negative health outcomes, such as poor MCH.

In applying these theories, prior studies postulate a number of hypotheses for understanding the relationship between polygyny and child survival. For instance, previous studies^{18 34} argued that the resource constraint hypothesis asserts that large family size, which is a feature of polygynous family system, may reduce per-capita resources and negatively affect the uptake of essential life-saving healthcare services for women and children.

Besides, polygyny may bring about strife and domestic violence against women and children due to poverty and economic hardship orchestrated by the dilution of household resources.

Based on the theoretical insights drawn from SET and GPT, the present study hypothesised that child health/survival in SSA is somewhat a product of community influences and attributes such as IPV and polygyny, which are largely contextually derived from traditional gender norms and cultural values, respectively.^{18 22 24}

METHODS

Study design

This is a multicountry secondary analysis study using the most recent data set from the Demographic and Health Surveys (DHS). The DHS collects identical and nationally representative data on demographic, environmental, socioeconomic, nutritional and health indicators from about 90 developing countries every 5 years. In addition, it uses the same three-stage, stratified, cluster sampling approach across all these countries such that it makes data set suitable to be pooled together from various countries. Details of data collection procedure have been published elsewhere.³⁵

In this study, we selected women as our unit of analysis largely due to the outcome variable, women's experience of under-5 mortality, and also because it is one of

the key independent variables found in women's files. Only 20 SSA countries had complete and recent data set on under-5 mortality, family structure and IPV and were thus included in this study. Data collection involved face-to-face interviews of women from households randomly selected from clusters within a location. Based on the inclusion criteria, a total of 227 121 women pooled from the 20 countries were included in this study. See [table 1](#) for detailed information on countries, survey year and key variables used in this study.

Dependent variable

The dependent variable for this study was women's experience of at least one under-5 mortality. In every DHS, women were asked for the survival status of every child they have had and age at death if the child had died. Therefore, women's experience of under-5 mortality was defined as a binary outcome; women who reported at least one under-5 child death were coded as 1 and 0 if otherwise.

Independent variables

At the individual level, we have two main independent variables of interest, namely experience of IPV and family structure. By taking a cue from previous research on IPV,^{20–22 36 37} experience of IPV was measured based on 13 different indicators and questions from the DHS. Experience of IPV was determined by the respondent

Table 1 Description of DHS data by country, survey year and percentage of IPV and polygyny

| S/N | Country | Year | Total | Experience of under-5 mortality | Intimate partner violence | Polygynous union |
|-----|------------------------------|------|-------|---------------------------------|---------------------------|------------------|
| 1 | Angola | 2016 | 10757 | 19.44 | 26.31 | 17.41 |
| 2 | Benin | 2018 | 11232 | 25.50 | 14.99 | 35.04 |
| 3 | Burkina Faso | 2010 | 12452 | 37.00 | 11.41 | 40.11 |
| 4 | Cameroon | 2011 | 10384 | 28.51 | 19.29 | 23.26 |
| 5 | Chad | 2015 | 13182 | 35.23 | 7.81 | 35.03 |
| 6 | Comoros | 2012 | 2838 | 13.85 | 7.54 | 17.72 |
| 7 | Democratic Republic of Congo | 2014 | 13427 | 29.24 | 21.29 | 19.80 |
| 8 | Gabon | 2012 | 6098 | 17.53 | 33.58 | 13.79 |
| 9 | Gambia | 2013 | 6602 | 18.65 | 14.30 | 37.22 |
| 10 | Kenya | 2014 | 22602 | 16.13 | 8.42 | 5.84 |
| 11 | Malawi | 2016 | 18281 | 22.05 | 11.41 | 10.98 |
| 12 | Mali | 2018 | 7762 | 27.53 | 17.01 | 32.94 |
| 13 | Mozambique | 2011 | 10129 | 26.43 | 23.56 | 21.02 |
| 14 | Namibia | 2013 | 7161 | 10.65 | 6.42 | 9.98 |
| 15 | Nigeria | 2018 | 28242 | 28.46 | 10.86 | 26.72 |
| 16 | Rwanda | 2015 | 8356 | 22.83 | 8.35 | 5.66 |
| 17 | Senegal | 2017 | 10702 | 21.51 | 5.92 | 31.27 |
| 18 | Togo | 2014 | 6599 | 25.38 | 27.63 | 29.85 |
| 19 | Uganda | 2016 | 13205 | 26.66 | 30.08 | 22.79 |
| 20 | Zimbabwe | 2015 | 7110 | 15.32 | 33.87 | 8.45 |

DHS, Demographic and Health Surveys; IPV, intimate partner violence; S/N, Serial Number.

saying yes or no to any of the following questions: if their spouse ever punched them, slapped them, pushed them, kicked them, strangled them, threatened them with knife, attacked them with knife, humiliated them, insulted them, threatened them with harms, forced into unwanted sex and forced any other type of sexual acts. Based on the number of types of IPV ever experienced, we operationalised women's experience of IPV into tertiles (low, mild and severe) using principal component analysis. Furthermore, family structure was defined as binary variable: women in any polygynous union (marriage or cohabiting with other wives) were coded as 1 and women who responded to be the only wife or partner as monogamous union. We also included a robust list of other independent and relevant variables informed by previous research on IPV, under-5 mortality women and child's health. Therefore, women's years of completed education, wealth index (tertile: poor average and rich), age at marriage (<18 years and ≥18 years) and decision-making power (tertile: low, middle and high) were included. Parity, which is defined as the number of births, was included as a categorical variable: primiparous (1 birth), multiparous (2–4 births) and grand multipara (more than 4 births).

We used the terms contextual and community interchangeably to explain clustering in the same geographical settings. Therefore, the DHS primary sampling unit (PSU) was used to define contextual or community-level factor. The census' sampling frames in each LMIC are usually used by the DHS to identify the PSU. We used PSU for this study because it is the most common measure of neighbourhood across all DHS surveys and also the sampling size at this level is more precise. Therefore, we computed contextual-level variables as the aggregate (%) of women who reported IPV, polygynous union and rural residence in each PSU. We also included contextual ratio of female to male educational attainment; this was computed by adopting the United Nations Gender Equity Index³⁶ (see table 2 for definitions). We introduced some cross-level interaction terms between the contextual prevalence of IPV, polygynous union and under-5 mortality;

Table 2 Brief description of contextual-level variables

| Variable | Description |
|--|---|
| Contextual prevalence of polygyny | The percentage of mother-child pair in each primary sample unit that reported living in a polygynous union. |
| Contextual prevalence, rurality | The percentage of mother-child pair in each primary sample unit that reported rural as their place of residence. |
| Contextual prevalence of intimate partner violence | The contextual percentage of mother-child pair in each primary sample unit that reported at least one experience of IPV. |
| Contextual prevalence of gender equality index | The ratio of female to male educational attainment in each primary sample unit. This was computed by adopting the United Nations Gender Equity Index. ³⁶ |

this is to further explore our third hypothesis. Finally, the Human Development Index (HDI) from the 2019 Human Development Report,³⁸ which is a composite and suitable variable used to assess countries' developmental progress, was included as the country-level variable.

Statistical analysis

In addition to table 1, which provided summary information on countries, survey year and key variables used in this study, we conducted a descriptive analysis involving all the descriptive variables at the individual, regional and country levels. As shown in table 3, they were stratified by women's experience of under-5 mortality and presented in percentages if categorical variables and as mean and SD if continuous variables.

We leverage on the hierarchical nature of the DHS data to conduct multilevel logistic regression analysis to examine and test our proposed hypotheses. Four different models were built and used to systematically explore these; we specified three-level model (individual, contextual and country levels) for the binary outcome, experience of under-5 mortality, for each of the four models built. Model 1 was without independent variables; this was done to examine if under-5 mortality significantly varies at the community level (level 2) and country level (level 3). In model 2, we examined the association between individual-level variables while controlling for survey year, age at marriage, years of mother's education and wealth index. In models 3 and 4, we included the contextual variables and adjusted for the control variables. The final and fully adjusted model involves all the individual and regional level variables; cross-interaction variables were included, as well as HDI as the country-level variable. OR and 95% CI were used to report the association between variables. All analyses were performed using the 'runmlwin' package in STATA 16.1.³⁹

Patient and public involvement

Patients and the public were not involved in the design and conduct of this research.

RESULTS

Descriptive

This study involved data from about 227 121 women (level 1), nested in 13 305 communities (level 2) from 20 SSA countries (level 3), ranging from 2838 women from Comoros to 23 242 women from Nigeria. Across the countries, about a quarter (24.5%) of women have lost at least one child under 5 years old, more than two-thirds (40.1%) have experienced at least one form of IPV, and finally about two-thirds of women were also in polygynous union. Table 1 provides an overview of how much each country contributed to this prevalence. The box plot in figures 1 and 2 further shows the distribution and variation of IPV and polygyny at the community level. At the community level, the average prevalence of IPV varies from about 15% in Gabon to as low as 1% in Senegal; also, the average prevalence of polygynous union at the

Table 3 Descriptive statistics with the pooled sample of characteristics of DHS data in Sub-Saharan Africa

| Variables | Overall | No | Yes | P test |
|--------------------------------------|----------------|---------------|---------------|--------|
| Total | 227 121 | 171 548 | 55 573 | |
| IPV=1 (%) | 35 791 (40.6) | 25 955 (39.3) | 9 836 (44.3) | <0.001 |
| Polygyny=1 (%) | 49 971 (28.2) | 32 475 (24.8) | 17 496 (37.8) | <0.001 |
| Parity (%) | <0.001 | | | |
| Primipara | 44 243 (19.6) | 42 076 (24.6) | 2 167 (3.9) | |
| Multiparous | 107 903 (47.7) | 89 700 (52.5) | 18 203 (32.8) | |
| Grand multipara | 74 133 (32.8) | 38 930 (22.8) | 35 203 (63.3) | |
| Age at marriage ≥18 (%) | 88 319 (41.7) | 70 634 (44.9) | 17 685 (32.6) | <0.001 |
| Wife's years of education, mean (SD) | 4.17 (2.22) | 4.18 (2.23) | 4.12 (2.18) | <0.001 |
| Wealth (%) | <0.001 | | | |
| Lowest | 82 303 (36.2) | 57 500 (33.5) | 24 803 (44.6) | |
| Middle | 77 311 (34.0) | 57 951 (33.8) | 19 360 (34.8) | |
| Highest | 67 507 (29.7) | 56 097 (32.7) | 11 410 (20.5) | |
| Maternal decision-making power (%) | <0.001 | | | |
| Lowest | 42 958 (48.0) | 31 052 (47.7) | 11 906 (48.9) | |
| Middle | 43 177 (48.3) | 31 739 (48.7) | 11 438 (47.0) | |
| Highest | 3 328 (3.7) | 2 335 (3.6) | 993 (4.1) | |
| Contextual factors | | | | |
| Prevalence of IPV, mean (SD) | 12.55 (10.86) | 12.31 (10.77) | 13.30 (11.09) | <0.001 |
| Prevalence of polygyny, mean (SD) | 17.85 (15.82) | 16.41 (15.05) | 22.31 (17.25) | <0.001 |
| Prevalence of rurality, mean (SD) | 64.10 (47.97) | 61.14 (48.74) | 73.27 (44.26) | <0.001 |
| Gender index, mean (SD) | 1.73 (1.66) | 1.81 (1.69) | 1.48 (1.52) | <0.001 |

DHS, Demographic and Health Surveys; IPV, intimate partner violence.

community level varies widely from as high as about 37% in Burkina Faso to as low as 2% in Kenya. Nevertheless, there are outliers observed which suggest there were few communities in Gabon with as high as 100% report of IPV and few communities in Nigeria where 80% of women were in polygynous union.

Table 3 shows further descriptive analysis conducted with key independent variables and stratified by women's

experience of under-5 mortality. A higher percentage of women (44.3%) who have experienced at least one form of IPV have also reported losing a child before they were 5 years old; 37.8% of women who have reported under-5 mortality were in polygynous union, 63.3% have given birth to more than five children (grand-multipara), 44.6% were in the lowest wealth quintile and 48.9% with the lowest maternal decision-making power. At the contextual level, women who

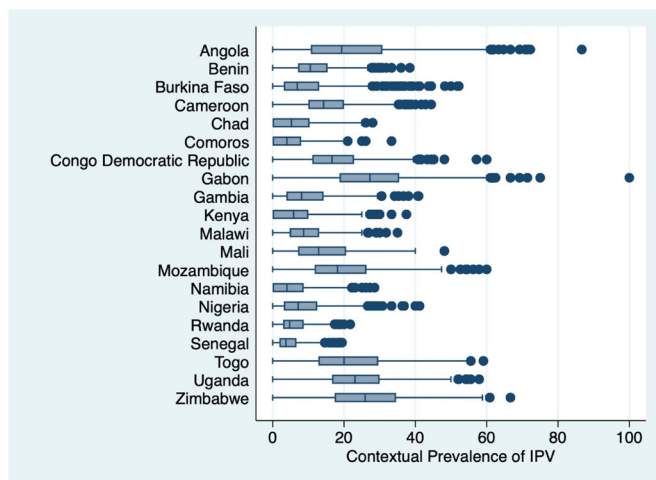


Figure 1 Distribution of contextual percentage of women that have ever experienced intimate partner violence (IPV) across the 20 Sub-Saharan African countries.

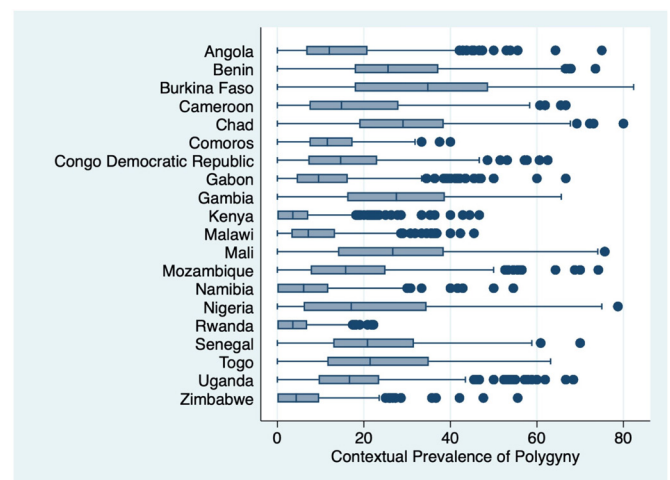


Figure 2 Distribution of contextual percentage of women in polygynous union across the 20 Sub-Saharan African countries.

reported under-5 mortality were from communities with 71.27% rurality, 22.2% prevalence of polygynous union and 13.30% prevalence of IPV. Finally, women who have ever experienced under-5 mortality were also more likely to come from communities with lower gender equality index.

The estimates from the multilevel logistic analysis of the risk of women experiencing under-5 mortality are presented in [table 4](#). Model 1 is an empty model, meaning it contains no independent variable; it shows that there is significant variation in the risk of experiencing under-5 mortality among women between communities (1.406 (1.383, 1.429)) and across countries (1.113 (1.041, 1.189)). Furthermore, the results from the intracommunity and intracountry coefficients show that 43.3% and 19.2% of variance in risk of women experiencing under-5 mortality might be linked to community-level and country-level factors, respectively.

In model 2, our results showed that when survey year and other sets of control variables at the individual level were adjusted for, the risk of women experiencing under-5 mortality is strongly associated with mild and severe experience of IPV (1.019 (0.929, 1.118) and 1.208 (1.122, 1.301), respectively), but only significant in severe experience. Also living in polygynous union (1.190 (1.101, 1.285)) and having more children (14.91 (12.83, 17.33)) were significantly associated. In model 3, the results also showed that the risk of a woman experiencing under-5 mortality is associated with community-level prevalence of IPV (1.008 (1.005, 1.011)), polygynous union (1.011 (1.009, 1.013)) and rural residence (1.001 (1.001, 1.002)). Even though estimates of the associated risk at the community level are smaller than the individual level, and the fact that the average prevalence of IPV and polygynous union at the community level varies from 1% to 35% and from 2% to 37%, respectively, the magnitude of the estimates and impact at the contextual level are substantial.

In the fully adjusted model, we simultaneously control for the control variables, the independent variables (at all levels), and introduced interaction terms in order to explore the third hypothesis. The risk of a woman experiencing under-5 mortality remains significantly associated with IPV (1.191 (1.057, 1.342)) and polygynous union (1.158 (1.073, 1.250)). However, in comparison with model 1, the level of associated risk with severe experience of IPV was attenuated from 0.208 to 0.191 and from 0.230 to 0.158 for polygynous union. This suggests the possible influence of the contextual and country-level factor and the interaction terms as the fully adjusted model showed significant association between women's risk of under-5 mortality and prevalence of IPV and polygyny. The result also showed that an increase in unit of gender equity index will reduce the risk of women experiencing under-5 mortality by 4.3%. We also observed a positive interaction between the contextual prevalence of IPV and polygyny, and this suggests that the risk of a woman experiencing under-5 mortality associated with experience of IPV is aggravated by being in polygynous union and vice versa. Our result also indicated that parity seems to be the individual-level factor with the strongest association with the risk of under-5 mortality among SSA women. Having children more

than five increases the risk of under-5 mortality by over 100% even when all other independent variables were adjusted for. Finally, women in countries with high HDI were also found to be at lesser risk of under-5 mortality by 27.1%. Our finding from the intracommunity and intracountry coefficients of the fully adjusted model shows that 39.9% and 19.2% of variance in risk of a woman experiencing under-5 mortality associated with contextual and country-level factors, respectively.

DISCUSSION

In this study, we investigated the risk of experiencing under-5 mortality among women in selected SSA countries. We explored individual-level, community-level and country-level factors associated with the risk of ever experiencing under-5 mortality among women aged 15–49, with specific interest on IPV and polygyny as key risk factors. Building on evidence that both risk factors reflect sociocultural and socioeconomic constructs of a setting, we further explored whether their contextual prevalence and interactions associate with risk of under-5 mortality.

In our descriptive analysis, we found that the contextual prevalence of IPV varies widely among the SSA countries included in this study. Senegal, Rwanda, Comoros and Namibia had the lowest prevalence and variation across their communities, while Gabon, Zimbabwe, Uganda, Angola and Togo had the highest prevalence across their communities, with an average above 20%. The most recent multicountry estimate of IPV showed that about 37% of women in the WHO African Region experience IPV.^{26 40} This is higher than the average estimate (17%) observed in our study, perhaps because these reports measured IPV experience of women aged 15–69 years, while our study focused on women aged 15–49. Nevertheless, we found that some SSA countries, such as Gabon, Uganda and Zimbabwe, had IPV above 30%. Furthermore, we found that the prevalence of polygyny was highest in Burkina Faso, Mali, Chad and Benin, and they also had the widest variation across their communities. These findings accord with results of previous studies which established higher prevalence of polygyny in West African countries compared with other subregions in SSA.^{21 34} The differences in prevalence of IPV across countries and subregions perhaps reflect differences in traditional gender norms in various countries and contexts.

Our results from the multilevel analysis confirm the study's first hypothesis. Building on evidence from a prior study,²² which analysed the joint influence of polygynous family structure and domestic violence on under-5 mortality, our study found that both IPV and polygynous union were independently associated with women's experience of under-5 mortality.^{41 42} A WHO report highlights that violence during pregnancy, which is also found to be as high as 40% in some African settings, is associated with preterm birth, fetal injury, low birth weight, diarrhoea, respiratory tract infection and poor child development and growth.^{21 22 43} All these have been identified as risk factors for under-5 mortality^{43–46} and are perhaps the pathways through which IPV influences under-5 mortality. A study conducted in Nicaragua explained the possible pathways through which IPV influences MCH

Table 4 Multilevel analysis results of the risk of under-5 mortality experience of women in Sub-Saharan Africa

| | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|------------------------------------|-------------|-------------------------|---------------------------|--|---------------------------|--|---------------------------|--|
| | OR (95% CI) | | OR (95% CI) | | OR (95% CI) | | OR (95% CI) | |
| Fixed effect | | | | | | | | |
| Survey year | | | 1.086 (0.833 to 1.414) | | 1.045 (0.785 to 1.389) | | 1.063 (0.856 to 1.320) | |
| Age at marriage | | | 0.855 (0.803 to 0.911)*** | | 0.717 (0.686 to 0.749)*** | | 0.880 (0.825 to 0.938)*** | |
| Educational attainment | | | 0.978 (0.963 to 0.994)** | | 0.992 (0.981 to 1.003) | | 0.978 (0.962 to 0.994)** | |
| Wealth (first quartile as ref) | | | | | | | | |
| Second quartile | | | 0.904 (0.837 to 0.976)* | | 0.919 (0.869 to 0.972)** | | 0.942 (0.868 to 1.023) | |
| Third quartile | | | 0.651 (0.600 to 0.707)*** | | 0.704 (0.658 to 0.753)*** | | 0.740 (0.670 to 0.818)*** | |
| Maternal decision-making power | | | | | | | | |
| Second quartile | | | 0.946 (0.880 to 1.017) | | 1.037 (0.988 to 1.089) | | 0.975 (0.907 to 1.049) | |
| Third quartile | | | 0.709 (0.536 to 0.937)* | | 0.867 (0.719 to 1.046) | | 0.681 (0.511 to 0.908)** | |
| IPV (low as ref) | | | | | | | | |
| Mild | | | 1.019 (0.929 to 1.118) | | | | 1.038 (0.903 to 1.193) | |
| Severe | | | 1.208 (1.122 to 1.301)*** | | | | 1.191 (1.057 to 1.342)** | |
| Polygynous union | | | 1.230 (1.145 to 1.321)*** | | | | 1.158 (1.073 to 1.250)*** | |
| Parity (primipara as ref) | | | | | | | | |
| Multipara | | | 3.704 (3.220 to 4.261)*** | | | | 3.797 (3.292 to 4.379)*** | |
| Grand multipara | | | 14.53 (12.61 to 16.74)*** | | | | 14.84 (12.85 to 17.15)*** | |
| Contextual factors | | | | | | | | |
| Contextual IPV | | | | | 1.008 (1.005 to 1.010)** | | 1.011 (1.006 to 1.016)*** | |
| Contextual polygyny | | | | | 1.011 (1.009 to 1.013)*** | | 1.014*** | |
| Contextual rurality | | | | | 1.001 (1.001 to 1.002)*** | | 1.000 (1.000 to 1.001) | |
| Gender index | | | | | 1.008 (0.988 to 1.028) | | 0.957** | |
| Cross-interaction terms | | | | | | | | |
| Contextual polygyny*mild IPV | | | | | | | 0.996 (0.990 to 1.003) | |
| Contextual polygyny*severe IPV | | | | | | | 0.998 (0.993 to 1.004) | |
| Contextual polygyny*contextual IPV | | | | | | | 1.000* | |
| Middle HDI | | | | | | | 0.857 (0.666 to 1.103) | |
| High HDI | | | | | | | 0.729 (0.551 to 0.965)* | |
| Random effect | | | | | | | | |
| Country level | | | | | | | | |
| Variance (95% CI) | | 1.113 (1.041 to 1.18)** | 1.086 (1.026 to 1.149)** | | 1.107 (1.037 to 1.182)** | | 1.050 (1.013 to 1.088)** | |
| VPC (%; 95% CI) | | 19.2 (18.2 to 20.1) | 19.6 (18.9 to 20.3) | | 19.7 (18.8 to 20.6) | | 19.1 (18.8 to 19.5) | |
| MOR (95% CI) | | 2.74 (2.65 to 2.83) | 2.7 (2.63 to 2.78) | | 2.73 (2.64 to 2.82) | | 2.66 (2.61 to 2.70) | |

Continued

Table 4 Continued

| | Model 1 | Model 2 | Model 3 | Model 4 |
|-------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| | OR (95% CI) | OR (95% CI) | OR (95% CI) | OR (95% CI) |
| Contextual level | | | | |
| Variance (95% CI) | 1.406 (1.383 to 1.429)*** | 1.156 (1.097 to 1.218)*** | 1.211 (1.173 to 1.250)*** | 1.148 (1.090 to 1.210)*** |
| VPC (% , 95% CI) | 43.3 (42.4 to 44.3) | 40.5 (39.2 to 41.8) | 41.3 (40.2 to 42.5) | 40.0 (39.0 to 41.1) |
| MOR (95% CI) | 3.10 (3.07 to 3.13) | 2.79 (2.71 to 2.87) | 2.86 (2.81 to 2.91) | 2.78 (2.71 to 2.86) |

* 0.05, ** 0.01, *** 0.00

HDI, Human Development Index; IPV, intimate partner violence; MOR, median OR; ref, reference; VPC, Variance Partition Coefficient.

outcomes.⁴⁷ The study revealed that exposure to violence during pregnancy increases maternal stress, as indicated by their increased cortisol level, which in turn has adverse effect on the birth size of the baby.⁴⁸ Low birth weight is a well-established risk factor of childhood mortality, and similar pathways and findings on this interrelationship have been explored and reported in other settings.^{49 50}

Further, literature indicates higher risk of adverse health outcomes among children who grew up in polygynous family structures.^{18 19} Our results support the dilution of resources hypothesis¹⁷; it asserts that large households, even when they are rich, dilute their per head capita, which in turn can lead to IPV, children malnutrition, increased susceptibility to infectious diseases such as diarrhoea and even poor access to essential health services.^{51 52} Similar findings as it relates to under-5 mortality in polygynous union within the African context have been reported.^{34 53}

One of the unique aspects of our study is that these two determinants of under-5 mortality were simultaneously considered in the present study, unlike in past studies which either focused on polygyny and under-5 mortality or IPV and under-5 mortality. The significance of the two risk factors on under-5 mortality, either jointly or independently, highlights the importance of these determinants within the African context. It also shows the need for context-specific policies and programmes that address the two determinants in the bid to improve child health outcomes in SSA. The interventions targeted at addressing IPV are largely underpinned by theories such as the GPT, feminist, resource, exchange, power, social bonding, and biological and psychological theories. Having so many theories to explain IPV alone suggests that its risk factors are multisectorial.

As hypothesised in this study, we also found that the strength of association between under-5 mortality, IPV and polygyny was reduced by 3% (IPV) and 7% (polygyny) when contextual factors and interactions between contextual factors were introduced into our models. This strongly supports our second and third hypotheses, and this is one of the key aspects of this study. In the fully adjusted model, we found that with every 1% increase in the contextual prevalence of IPV and polygynous practice at the community level, the risk of women experiencing under-5 mortality increases by 1.1% and 1.4%, respectively. These findings contribute to evidence and discussions that the impact of IPV and polygynous practice is beyond individual or familial levels; they are usually deeply rooted and entrenched in sociocultural and contextual norms that vary across regions and countries.^{18 22 34} As postulated in the SET and GPT, traditional patriarchal norms and gender imbalances, which are contextually derived from societal structures, may engender strifes and domestic violence against women and their children, and these are important pathways through which IPV may affect under-5 mortality.

Studies have linked lower utilisation of MCH services such as immunisation (which is usually free in most African countries) to polygyny.^{54 55} This strongly suggests that refusal to use these services is not only determined by wealth but also other contextual factors that might be linked to beliefs

and cultural norms and practices. In addition, a previous study found that women may not use MCH services until they receive permission from their partners/spouses, thus stressing the influence of gender imbalance and IPV on MCH outcomes.⁵⁶ Finally, previous research has shown that settings with prevalent polygynous practice have been shown to reflect unequal society especially in the context of gender inequalities.^{27 57 58} In this study, we observed that with every unit increase in gender equity index, the risk of experiencing under-5 mortality by women reduced by 4%. Resources such as education, wealth and employment have been reported not to protect SSA women against abuse at the individual level, but living in more equal areas is protective against women's experience of IPV.²⁶ Therefore, it is not surprising to observe the positive interaction between contextual prevalence of IPV and polygynous practice, therefore suggesting that the risk of under-5 mortality worsens in communities with higher prevalence of IPV and polygyny. At the household or individual level, the effect of severe experience of IPV and living in communities where polygynous practices are prevalent was not significantly associated with under-5 mortality. The associations with gender equity are clear and well established in the literature; however, findings on the two risk factors which are the focus of this study probably highlight the socioeconomic and sociocultural complexities in which IPV and polygyny exist.⁵⁹ Our findings were further strengthened by the computation of the median OR (MOR). Aside from the ICC reported in our results, the MOR highlights the significance of between-community and country variance in experience of under-5 mortality among women in SSA; if a woman moved to a community and SSA country with higher prevalence of under-5 mortality by women, the odds of experiencing under-5 mortality increase by 2.78% and 2.66%, respectively.

Strengths and limitations

This study involves a large data set from 227121 women from 20 SSA countries. The DHS data are usually nationally representative and use the same data collection procedure; therefore, findings from this study can be generalisable. The main limitation of our study is the use of cross-sectional study design, which does not permit measurement of causality due to the nature of DHS data. Also, the use of PSU to compute contextual variables might create some bias due to possible misclassification of respondents to wrong administrative units. The survey used were from different years; nonetheless, we controlled for year of survey as a variable, along with other key determinants at the individual level. Inclusion of factors such as wife's rank, experience of depression and birth weight would have provided some interesting insights, although these variables were not available in the DHS data.

CONCLUSIONS

This study showed that the significant variations in women's experience of under-5 mortality across SSA are driven not just by individual-level factors but also by contextual factors. At the individual level, women are more likely to lose at least one child under 5 years old if they were exposed to severe IPV

and in polygynous union. More importantly, the prevalence of these two factors within their neighbourhood contributes significantly to this outcome. This study concludes that interventions that aim to effectively reduce under-5 mortality in SSA must give considerable attention to factors such as IPV and polygyny, which are contextually derived from traditional norms and cultural values. Addressing these contextual variables may accelerate SSA's progress towards reducing child mortality to 25 per 1000 live births by 2030.

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