Research article

Postpartum depression and associated factors among childbearing women from the recent Demographic and Health Survey data of Mozambique: Multilevel analysis

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ABSTRACT

Introduction: Postpartum depression is a non-psychotic depressive illness that affects women who have recently given birth. Symptoms of the illness include thoughts of suicide, low self-worth, guilt about not being able to care for their newborn, blaming themselves thoughts, and nervousness. Despite there being many studies conducted at the hospital level there are limited studies conducted at the national level to determine the individual and community level factors. Depression during childbirth can have several detrimental effects, including increased risk of complication and decreased satisfaction with birth, decreased trust in medical facilities, and decreased women's participation in maternity and newborn healthcare units.

Therefore, this study amid to reveal the prevalence of postpartum depression and associated factors at individual and community levels among women who give birth in Mozambique's recent data Demographic and Health Survey (DHS).

Method: Multilevel logistic regression analysis was carried out from the recent Demographic and Health Survey data. A total of 5,468 sample sizes of Mozambique DHS data were used for this secondary data analysis. At individual and community level factors were assessed to determine the burden of postpartum depression at a p-value of 0.05 with a 95 % CI with AOR.

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Results: The prevalence of postpartum depression among women who give birth from the recent Mozambique DHS data was 24.60 % with a CI of 23.47 %–25.75 %. No education [AOD = 1.37: 95 % CI; (1.26, 1.68)] at individual level and [AOR = 3.14:95 % CI; (2.39, 5.18)] at the community level, widowed/divorced [AOR = 1.73: 95%CI; (1.14, 3.61)], and No occupation [AOR = 1.35:95 % CI; (1.19, 1.64)] were the associated variables with postpartum depression.

Conclusion: Nearly three women out of ten women who give birth develop postpartum depression. Low education status, widowed/divorced, and no occupation were the associated factors with postpartum depression. Therefore, enhancing education, creating job opportunities, and keeping married will reduce the burden of postpartum depression. This study indicates maternal depression post-delivery should be given attention by the National Health Office and other police makers. Educational level should be improved to have a continuous and sharp change in maternal depression after delivery.

1. Introduction

According to estimations from the World Health Organization (WHO), depression will rank second in terms of primary causes of disability by 2030 and significantly increase the burden of disease [1]. According to the Diagnostic Statistical Manual of Mental Health Postpartum Depression (PPD) is a type of non-psychotic depression that happens after childbirth and it is one of the specifies for major depressive disorders [2,3]. Postpartum depression clinical features are similar to depression symptoms at any other point in a person's history [4]. The common signs and symptoms of postpartum depression include fatigue, sleeplessness, irritability, low mood, and diminished functioning [5]. Postpartum depression can lower a mother's quality of life and her contribution to the workforce, which can raise health care costs. Women who have postpartum depression may experience back discomfort, sleeplessness, suicidal thoughts, and inappropriate parenting [5,6].

Numerous possible prenatal and demographic factors could raise the likelihood of postpartum depression symptoms developing on a more severe track [7]. Postpartum depression increases the likelihood of malnutrition, poor physical and neurocognitive results, and behavioral and interpersonal problems in children of depressed women [2]. PPD is a well-known public health issue that not only has an impact on mothers' health but also harms the development of kids and family connections [8]. Depression, on the one hand, can lead to life-threatening issues in mothers, infanticide, and even suicide. However, it has been noted that children whose moms exhibit postpartum depression symptoms are more likely to experience emotional and behavioral issues for the children [9].

Postpartum depression is the negative outcome of giving birth and the most prevalent debilitating but treatable mental illness [10]. The most prevalent mental illness is depression, which affects 350 million individuals globally, according to estimates [11]. The prevalence of PPD among mothers after delivery in Indonesia was 4 % [12]. The Burden of PPD among women after delivery in developing countries was 14 % [13]. Postpartum depression among childbearing women after delivery in Sub-Saharan African countries was 12.2 % [4]. An estimated 10 %–15 % of adult mothers experience postpartum depression each year with depressed symptoms persisting longer than six months in 25 %–50 % of cases [14]. The prevalence of postpartum depression varies from place to place and its burden among women after giving birth in Nepal was 33.7 % [2]. The prevalence of postpartum depressive symptoms among Asian women after delivery is 31.8 % [15]. In Uganda, the prevalence of postpartum depression among women after delivery was 21.1 % [16].

Psychological variables, obstetric risk factors, biological factors, social factors, family support, intimate partner violence, satisfaction with health care during childbirth, high delivery costs, and lifestyle factors are among the many risk factors of postpartum depression [17–19]. Different variables that were associated with postpartum depression in the previous studies incorporated; age, sex of the household head, marital status, women's occupation, educational level, wealth status, mass media exposure, health facility distance, residency, the number of alive children, place of delivery, husband occupation and education [12,13,16]. Young age, divorced and widowed marital status, poor educational status, low partner education level, occupation of the respondent, delivery at home, and low wealth index were the most significantly associated factors in the previous studies. Postpartum depression following delivery risk factors have not been studied as much particularly variables at the individual level and community level are not studied worldwide.

The burden of depression among women after delivery affects not only the health and well-being of the woman herself but also that of her family including their children in Mozambique [20]. To the best of our knowledge, the burden of postpartum depression and variables at the individual and community level variables was not conducted in Mozambique. This study provided a clue for the national level of maternal depression that can create an informative picture since there is no study conducted yet, especially at the community level. Even though there are numerous prevalence studies conducted about postpartum depression in different places among childbearing women there are no multilevel studies employed in Mozambique. Therefore, this study amid to reveal the prevalence of postpartum depression and associated factors at individual and community levels among women from the 2022/2023 Demographic and Health Survey data of Mozambique at the national level.

2. Method

2.1. Study area

Recent Demographic Health Survey (DHS) data from Mozambique was used for this multilevel analysis. A cross-sectional study design was employed for the DHS data with survey techniques. Demographic and Health Surveys (DHS) are nationally representative household surveys that provide data for a wide range of monitoring and impact evaluation indicators in the areas of population, health, and nutrition. The two types of DHS Survey; Standard DHS Surveys have large sample sizes (usually between 5,000 and 30,000 households) and typically are conducted about every 5 years, to allow comparisons over time. Interim DHS Surveys focus on the collection of information on key performance monitoring indicators but may not include data for all impact evaluation measures (such as mortality rates). These surveys are conducted between rounds of DHS surveys and have shorter questionnaires than DHS surveys. Although nationally representative, these surveys generally have smaller samples than DHS surveys.

The broad range of goals includes self-reported health from Mozambique DHS self-reported data as well as indicators of self-reported health, mortality, nutrition, maternity and child health, and fertility. For this survey, the Mozambique DHS supplied data-sets on males, women, children, births, and households. The data utilized in this study was taken from the survey and was stored in the Individual Record dataset (IR file). The sample design for the 2022/23 DHS was two-stage and aimed to provide estimates for the national level, urban and rural areas, and each of the ten provinces. The first stage involved the selection of the cluster sample, consisting of enumeration areas (EA). A total of 613 enumeration areas were selected with probability proportional to size, with the measure of size being the number of households in each stratum. Of the 613 AEs, 230 were from urban areas and 383 from rural areas. In the second stage, 26 households were systematically selected with equal probabilities from each enumeration area. Based on this procedure, 16,045 households were selected for the 2022/23 DHS. A household listing operation was carried out in all selected enumeration areas before the main survey. All women aged 15–49 who were usual residents or visitors in the household on the night before the household interviews were included in the 2022/23 DHS and were eligible to be interviewed. In the process of selecting households for the interviews, only the population residing in households and visitors who had spent the night before the interview were included, excluding households and their members living in collective residences, such as hotels, hospitals, military barracks, student homes, etc., and the homeless, who represent less than 0.5 % of the country's total population. Study participants included women after giving birth from Mozambique country between the ages of 15 and 49 were considered as the source populations. A total of 5,468 sample size of Mozambique DHS for this secondary data analysis with women who give birth. The detailed data can be accessed comprehensively by clicking on the official link http://www.dhsprogram.com/, 12[21].

2.2. Variables of the study

2.2.1. Dependent variables

The outcome variable of this study is depression which was measured by a Patient Health Questionnaire (PHQ-9). PHQ-9 was used in different studies intensively and in the world including Mozambique [22,23]. The cut-off point for this screening tool is scoring five or more points after adding the Likert scale. The measurement tool has a Likert score of 0 not at all to 3 nearly every day [24]. The Mozambique DHS used this tool to measure to screen the presence of depression in the study participants who gave birth to be considered in this study participant for this study.

2.2.2. Independent variables

Independent variables were extracted from Mozambique from the recent DHS countries including household variables, wealth index, and reproductive-related variables. Mozambique DHS data include household variables, wealth index, and reproductive-related variables. The extracted independent variables incorporated in this study were; the sex of the household head, age, distance from the health facility, number of children, current marital status, ethnicity, religion, occupation of the respondent, and the parental, place of delivery were used as individual-level variables. Community-level variables used for this study included place of residency (urban and rural), educational level (low and high), wealth index (low and high), and media exposure (low and high). Media exposure was computed based on adding all the variables and used if they used at least one of the form measurements of media exposure such as newspaper reading, TV watching, and radio listening. The distribution of the proportion values that were computed for each community-level variable was examined using the histogram. Lastly, for dichotomously skewed and normally distributed variables, respectively, the median and mean values were employed.

2.2.3. Data management and analysis

The data extraction, coding, cleaning, and analysis were done using Stata version 14. Frequency and % were two of the descriptive facts that were entered into a table and text. Sample weight with cluster was used for the non-proportionate allocation of the analysis and the representativeness of the sample. To preserve the data's hierarchical structure, a mixed multilevel analysis was conducted. Multilevel bi-variable logistic regression analysis was carried out to determine which linked variables, with a p-value of less than 0.25, should be included in the multivariable analysis [25].

The variables with p-values less than 0.05 that were statistically significantly connected were found using multilevel multivariable logistic regression analysis. The next step involved calculating an Adjusted Odd Ratio (AOR) with a 95 % Confidence Interval (CI).

Four model analyses were conducted for the multivariable multilevel logistic regression investigation. The first model, sometimes called the null model, had no explanatory variables. Individual-level variables were only fitted in the second model; community-level

variables were fitted in the third model; and both individual and community-level variables were fitted in the fourth model. The models were compared, and each model's fitness was evaluated using the Deviance and Akaike Information Criterion (AIC); the model with the lowest score was considered to be the best fit. The degree of heterogeneity among women after giving birth to the clusters was also assessed by Intra-Class Correlation (ICC) $= \frac{VA}{VA+3.29}*100\%$. The percentage of each person's reported variance in postpartum depression may be ascribed to differences between clusters. To measure the variation in postpartum depression among clusters, the Median Odds Ratio (MOR) $= e^{0.95\sqrt{VA}}$ was employed [26]. Measurements of the odd ratio scale variation of postpartum depression in the cluster and the degree of homogeneity of the postpartum depression evaluation were conducted. Ultimately, the AOR with a 95 % confidence interval was computed based on variables that were statistically substantially associated with postpartum depression and had a p-value of less than 0.05.

Table 1
Descriptive characteristics of the study participants from the Mozambique DHS data of 2022.

Variables	Category	Weighted frequency (n = 17,7)	Percentage (%)
Age	15–19	878	16.06
	25–29	2,750	50.29
	30–39	1,467	26.83
	40–49	373	6.82
Maternal educational	No education	3,033	23.01
	Primary	5,426	41.16
	Secondary	4,259	32.31
	Higher	465	3.53
Household sex	Male	3,880	70.96
	Female	1,588	29.04
Partner educational level	No education	898	16.42
	Primary	1,651	30.19
	Secondary	1,241	22.70
	Higher	1,678	30.69
Religion	Catholic	1,283	23.46
	Islamic	1,228	22.46
	Pentecostal	1,544	28.24
	Zion	853	15.60
	Others religion*	560	10.24
Alive of child	Yes	5,122	93.67
	No	346	6.33
Mode of delivery	Cesarean Section	361	6.60
	Spontaneous Vaginal Delivery	5,107	93.67
Marital status	Never in union	403	7.37
	Married	1,726	31.57
	Live with partner	2,731	49.95
	Widowed/separated	608	11.12
Husband educational status	No education	898	16.42
	Primary	1,651	30.19
	Secondary	1,241	22.70
	Higher	1,678	30.69
Maternal occupation	Not working	3,440	62.91
	Working	2,028	37.09
Media exposure	Yes	2,723	49.80
	No	2,745	50.20
Wealth status	Poorest	1,063	19.44
	Poorer	1,033	18.89
	Middle	1,133	20.72
	Richer	1,221	22.33
	Richest	1,018	18.62
Place of delivery	Home	1,383	25.29
	Health facility	4,085	74.71
Current marital status	Married	6,321	85.57
	Separated	203	2.75
	Widowed/divorced	863	11.68
Residence	Urban	1,828	33.43
	Rural	3,640	66.57
Community-level Wealth index	High	279	45.51
	Low	334	54.49
Community-level Media exposure	High	308	50.24
	Low	305	49.76
Community-level Educations	High	292	47.63
	Low	321	52.37

Other religion* = Zion and evangelical/Pentecostal.

3. Results

3.1. Descriptive characteristics of respondents

A total of 5,468 study participants were included in this study among women who give birth at the age of 15–49 for this secondary data analysis from the recent Mozambique DHS data. Of the study participants, 50.29 % of them were between the ages of 25–29. Of the study participants, 41.16 % had a primary educational level and 30.69 % had a higher educational level. Of the study participants, 28.24 % were Pentecostal religion followers and 49.95 % were currently living with their parents. Of the study participants, 93.67 % had live children and 93.67 % had delivered in Spontaneous Vaginal Deliver (SVD). Of the study participants, 66.57 % were from rural areas and 50.20 % had no media exposure. Of the participants, 22.33 % had richer wealth status (Table 1).

3.2. Prevalence of postpartum depression

The prevalence of postpartum depression among women who give birth from the recent Mozambique DHS data was 24.60 % with a CI of 23.47 %–25.75 % (Fig. 1).

3.3. Model fitness and statistical analysis

Postpartum depression within the cluster was associated with 3.35 of respondents' changes in the ICC of the null model (model one). The MOR postpartum depression in the null model was 3.35 indicating that there was variation between the clusters. The odds of an individual experiencing postpartum depression were 3.35 times higher in the cluster with a higher risk of these disorders than in the cluster with a lower risk, assuming a single participant was randomly picked from each of the two clusters. Model IV was the well-fitting model for this investigation since it had the lowest AIC and deviation value (Table 2).

3.4. Associated factors with postpartum depression

In bi-variable multilevel analysis, the associated factors with postpartum depression were; sex of the household head, age, current marital status, education of participants, partner education, occupation of respondent, place of delivery, wealth index from at the individual level with a p-value of less than 0.25. In the multilevel multivariable analysis, the factors that were associated with postpartum depression at the individual level were widowed/divorced marital status, no educational status, not employed or job, and low educational level at the community level at a p-value of less than 0.05. The odds of experiencing postpartum depression are 1.37 times higher among respondents who have no education as compared to the other who have a high educational level [AOD = 1.37: 95 % CI; (1.26, 1.68)]. The development of postpartum is 1.73 times higher among widowed/divorced than other participants who have married [AOR = 1.73: 95%CI; (1.14, 3.61)]. Experiencing postpartum depression is 1.35 times higher among those who have no occupations as compared with the other respondents who have occupations [AOR = 1.35:95 % CI; (1.19, 1.64)]. The odds of low educational status in the community of 3.14 times higher than other participants who have high educational levels [AOR = 3.14:95 % CI; (2.39, 5.18)] (Table 3).

4. Discussion

The main aim of this study was to determine the burden of postpartum depression and its associated factors among women who give birth in Mozambique 2022 DHS data. This study is conducted for the first time at the individual and community level to reveal postpartum depression with its associated factors. The prevalence of postpartum depression among women who give birth from the recent Mozambique DHS data was 24.60 % with a CI of 23.47 %–25.75 %. This study finding is in line with other studies conducted in Ethiopia 23.7 %.
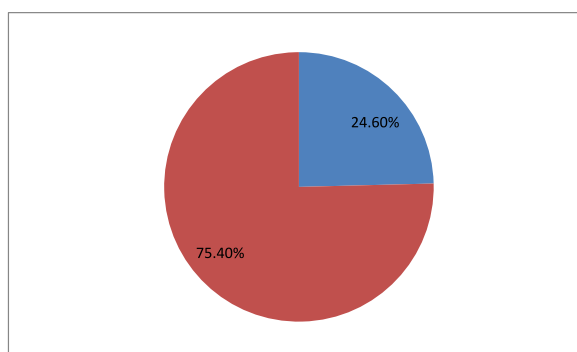

Fig. 1. The prevalence of postpartum depression among childbearing women in Mozambique.

Table 2
Model fitness and statistical analysis of the postpartum depression in Mozambique.

Likelihood ratio	−2884.148	−2845.7209	−249.60854	−228.59118
ICC	0.2515407	0.2620812		
Deviance	5768.2959	5691.4418	499.21708	457.18236
AIC	8959.21	8765.69	1028.81	1002.83
BIC	8945.865	8734.435	1090.243	1060.826
MOR	3.350			

*ICC: Intra-Class Correlation.
*MOR: Median Odds Ratio.
*AIC: Akaike Information Criterion.
*BIC: Bayesian Information Criteria.

Table 3
Multilevel multivariable logistic regression analysis from Mozambique's recent DHS data.

Variable	Null model/Model I	Model II	Model III	Model IV
Age				
15–19		1		1
25–29		1.13(0.92, 1.40)		1.72(0.77, 3.83)
30–39		1.06(0.83, 1.35)		0.79(0.14, 1.79)
40–49		0.85(0.60, 1.20)		0.18(0.32, 1.25)
Sex of the household				
Male		0.89(0.75, 1.07)		0.82(0.43, 1.58)
Female		1		1
Wealth index				
Poorest		1		1
Poorer		1.21(0.86, 1.70)		2.17(0.97, 4.86)
Medium		1.09(0.78, 1.52)		2.42(0.59, 3.82)
Richer		1.16(0.85, 1.59)		1.65(0.41, 3.51)
Richest		1.23(0.94, 1.60)		0.95(0.78, 3.15)
Maternal education				
No education		1.71(0.90, 3.25)		**1.37(1.26, 1.68)**
Primary		1.33(0.71, 2.49)		0.86(0.37, 1.99)
Secondary		1.37(0.74, 2.53)		0.88(0.42, 1.85)
Higher		1		1
Alive of child				
Yes		1		1
No		1,32(0.99, 1.76)		0.97(0.30, 3.07)
Current marital status				
Married		1		1
Separated		1.29(0.89, 1.87)		0.67(0.11, 3.87)
Widowed/divorced		2.05(1.48, 2.83)		**1.73(1.14, 3.61)**
Partner Education				
No education		1.49(1.11, 1.96)		0.88(0.24, 3.25)
Primary		1.01(0.78, 1.30)		0.55(0.15, 2.05)
Secondary		0.95(0.72, 1.26)		0.49(0.12, 1.94)
Higher		1		1
Occupation of participants				
Working		1		1
Not working		0.75(0.64, 0.89)		**1.35(1.19, 1.64)**
Place of delivery		1		1
Hospital		1.06(0.88, 1.28)		1.55(0.85, 2.82)
Home				
Community level variables				
Residence				
Urban			1	1
Rural			1.04(0.77, 1.39)	0.83(0.42, 1.63)
Media exposure				
High			1	1
Low			1.12(0.81,1.55)	0.80(0.43, 1.49)
Educations			1	1
High low			1.01(0.75, 1.37)	**3.14(2.39, 5.18)**
Wealth status			1	1
High low			0.88(0.64, 1.21)	1.04(0.54, 1.98)

Legend.

This finding is greater than other studies conducted in Nepal 33.70 % [27], Myanmar 31.80 % [15], and Egypt 26.6 % [28]. The possible reason for this discrepancy might be the effect of sample size difference our study used a large national sample and sounder to generalize but the other studies used a very small sample. The other major discrepancy might be because of the tool difference our DHS data was assessed with a measurement tool of Patient Health Questioner (PHQ-9). Other studies were conducted in other measurement tools for instance Edinburgh postnatal depression scale (EPDS) in Egypt study [28]. In other words, this finding is lower than other studies conducted in Uganda 21.10 % [16], India 20.4 % [29], and Ethiopia 20.9 % [30]. The probable reason for the discrepancy could be the effect of study design was the other factor that explained the difference in the pooled estimate; community-based and cross-sectional studies indicated a higher frequency at the community and individual level than other study types. The other reason for this discrepancy must be the effect of the difference the associated factors in this study might not be factors in other previous studies.

Regarding factors low educational status is one of the associated factors both at the individual level and at the community level with postpartum depression. This association is in concordance with other studies conducted in Turkey [31]. The possible reason for the association might be the effect that a higher educational status can lead to increased problem-solving skills, higher self-esteem, and less future anxiety. Patients with higher educational backgrounds may be more likely to seek professional assistance when dealing with Parkinson's disease-related issues [31]. Education can impact an individual's personal experience, awareness of oneself, or willingness to embrace depressive feelings. As a result, it might postpone the revealing of mental health symptoms and the actions associated with requesting treatment [32]. Education is vital for women to have a good attitude toward the pain related to the entire pregnancy and the labor, in other ways, education also brings a means to cope with the existing stress related to childbearing.

Another factor associated with postpartum depression was widowed/divorced current marital status. This association is in line with other studies conducted in Ethiopia [33] and China [34]. The possible reason for the association might also be the case that they experience unfavorable life circumstances, such as losing the person they love the most, which leads to loss on both social and financial issues [33]. This association is also because marriage frequently encourages husbands to be willing to spend even more time with their wives, which can reduce depressive symptoms [34]. The other reason could be the effect of the psychological impact of losing an intimate partner and not having support from their partners. This is due to the consensus may result from the fact that marriage has a positive impact on mental health, particularly in the postpartum phase [35].

The other associated factor with postpartum depression was no employment or occupation. This association is also consistence with other studies conducted in Nepal [36], The possible reason for the association could be the effect of being jobless, and postpartum depressive symptoms may be explained by the stigmatization and being alone at home at the time of pregnancy [36]. One plausible explanation could be that the mothers' mental health suffered as a result of encountering life-threatening incidents during the postpartum period, which became intolerable. This is because the effect of being jobless can lead to excessive worry about having no grown-up children. Failure to treat childbearing women's depression is a risk to the health of children and the whole family. As a result, the national health office should create awareness about maternal depression after delivery and as well educational levels should be enhanced. The healthcare system should improve the hospital or health facility delivery to have early treatment if they have depression. Preventing the occurrence of postpartum depression and early intervention should be implemented. The main implication of this study is to show the burden of postpartum depression for the healthcare system, policy-makers, and other stakeholders.

This multilevel study has a lot of strength including variables at the individual and community level in Mozambique's recent DHS data. Despite, the strength it has, this study have also its limitations like the cross-sectional nature of the study cannot show the temporal relationship of the predictor variables with outcome variables. The nature of the DHS data did not tell us the exact measurement tools for the independent variables. The social desirability bias and recall bias might be the limitation of this study that reduces to report their depression.

5. Conclusions and recommendations

According to this study result huge numbers of women were experiencing depression from who give birth. Low education status, widowed/divorced, and no occupation were the associated factors with postpartum depression. Therefore, enhancing education, creating job opportunities, and keeping married will reduce the burden of postpartum depression. This study indicates maternal depression post-delivery should be given attention by the National Health Office and other police makers to improve maternal depression after delivery. All the significant variables should be mitigated, particularly community-level variables should be considered through enhancing the educational level to get huge improvement is recommended to the health office, community leaders, and other national organizations in Mozambique. Future researchers are recommended to conduct an advanced model to predict the exact cause-and-effect relationship of variables related to postpartum depression.

CRediT authorship contribution statement

Mamaru Melkam: Methodology, Formal analysis. **Bezawit Melak Fente:** Software. **Yohannes Mekuria Negussie:** Investigation. **Zufan Alamrie Asmare:** Data curation. **Hiwot Altaye Asebe:** Supervision. **Beminate Lemma Seifu:** Validation. **Alemayehu Kasu Gebrehana:** Software. **Sintayehu Simie Tsega:** Writing – review & editing. **Meklit Melaku Bezie:** Validation, Supervision. **Angwach Abrham Asnake:** Writing – original draft, Software.

Ethical clearance

This study did not need ethical clearance since we used secondary data without direct contact with the study participants. Written

informed consent was given to study participants in exchange for their participation. The information was acquired from the DHS program's measure, and we have authorization to view it online by submitting a request to the program's measure at http://www.dhsprogram.com. The information is openly accessible to the public online. The Demographic and Health Surveys (DHS) program's ethical approval detail information allows the download of survey data to be approved.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analyzed during the current study are available in the measure of the DHS program repository, http://www.dhsprogram.com.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Abbreviation/acronyms

AIC   Akaike Information Criteria
AOR   Adjusted Odd Ratio
DHS   Demographic Health Data
CI   Confidence Interval
ICC   Intra-Class Correlation
IPV   Intimate Partner Violence
MOR   Median Odds Ratio
PCV   Proportional Change in Variance
WHO   World Health Organizations

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