Spatial Distribution and Predictors of Domestic Violence Among Women Aged 15-49 in Ethiopia: Analysis of EDHS 2016 Dataset.

Elias Ali Seid (eliasseid01@gmail.com)  
Jimma University  https://orcid.org/0000-0002-0213-557X

Tesfahun Melese  
University of Gondar College of Medicine and Health Sciences

Kassahun Alemu  
University of Gondar College of Medicine and Health Sciences

Research article

Keywords: Domestic violence, spatial distribution, EDHS, Ethiopia

DOI: https://doi.org/10.21203/rs.3.rs-92836/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License
Abstract

**Introduction:** Violence against women particularly that is committed by an intimate partner is becoming a social and public health problem across the world. Studies from different countries show that the spatial variation in distribution of domestic violence was commonly attributed by neighborhood level predictors. Despite the importance of spatial techniques, studies that employ it in Ethiopia are limited. Therefore, the aim of this study is to determine the spatial distribution and predictors of domestic violence among women aged 15-49 in Ethiopia by using EDHS 2016 dataset.

**Methods:** Secondary data from EDHS 2016 was used to determine the spatial distribution of domestic violence in Ethiopia. Spatial auto-correlation statistics (both Global and Local Moran's I) was used to assess the spatial distribution of domestic violence cases in Ethiopia. Spatial locations of significant clusters were identified by using Kuldorff’s Sat Scan version 9.4 software. Finally, binary logistic regression and generalized linear mixed model were fitted to identify predictors of domestic violence.

**Result:** The study found that spatial clustering of domestic violence cases in Ethiopia with Moran’s I value of 0.26, Z score of 8.26, and P-value < 0.01. The Sat Scan analysis found 24 significant locations of domestic violence clusters. Among this, 10 are primary clusters with RR 2.18, LLR of 39.55, and P-value < 0.01. The output from regression analysis identifies low economic status, husband/partner alcohol use, witnessing family violence as a child, marital controlling behaviors, and community acceptance of wife-beating as significant predictors of domestic violence.

**Conclusion and Recommendation:** There is spatial clustering of domestic violence cases in Ethiopia. Areas with a high burden of the problem should get priority for intervention. Comprehensive and collaborative action should be taken by involving stakeholders at different levels. Specific activities may include organizing media on awareness creation and continuous education on how to maintain a stable relationship between couples and employing long term and intensive effort for transforming culture and social norms that encourage violence against women are among the major ones.

1. **Introduction**

The term domestic violence mainly refers to violence committed by an intimate partner but it can also encompass abuse by any member of a household. In recent years, violence against women particularly that is committed by an intimate partner is becoming a social and public health problem across the world. According to the 2017 WHO report, 1 in 3 (35%) of women worldwide have experienced either physical or sexual intimate partner violence or non-partner sexual violence in their lifetime(1). Even though the burden of the problem varies across countries, existing studies show that the prevalence of the problem was higher in developing countries. A result from WHO global report on domestic violence shows that the prevalence of physical and/or sexual intimate partner violence is high in African and South-East Asian countries; where approximately 37% of ever-partnered women experienced physical and/or sexual intimate partner violence at some point in their lives(2). Similarly, individual studies from different
countries support this finding and demonstrate that the burden of the problem was still high in many Asian and African countries. For example, a study conducted in Iran shows that 62% of women experienced domestic violence by their husbands(3). This was explained by cultural and social norms that made men have a high position in their family was responsible for it.

Likewise, a high prevalence of domestic violence was observed in studies conducted in various African countries. A study conducted in Tanzania shows that 65% of ever-married women experienced lifetime intimate partner violence and 7% of women had ever physically abused their husband(4). Although the study tries to show the prevalence of domestic violence against women, it could not identify the predictors of domestic violence. Another study conducted on Demographic Health Survey in Ghana shows a relatively lower prevalence of domestic violence where 33.6% of women experience it at some point in their life(5). This result is comparable with a study conducted on the Zambian Demographic Health Survey where 43% of women experienced domestic violence(6).

In the Ethiopian context, violence against women and girls continues to be a major challenge and threat to women's empowerment. Even though the government of Ethiopia has been doing so many jobs to reduce the prevalence of violence against women, still substantial levels of women and girls are facing physical, emotional, and sexual violence. According to EDHS 2016 report, 34% of ever-married women age 15-49 have experienced either physical, sexual, or emotional spousal violence (7). A systematic review of 15 articles on domestic violence from 2000-2014 also shows the high prevalence of domestic violence in different parts of the country. The lifetime prevalence of domestic violence against women by husband or intimate partner ranged from 20 to 78% (8).

Evidence from studies shows that domestic violence causes serious short and long term health problems. Even though sufficient studies that show the consequence of domestic violence has not been conducted, the existing few studies show that physical injuries such as fractures of bones, sight and hearing damage, head injury, back and neck injury (9) and mental problems such as depression, anxiety, and suicidal attempts were significantly higher among women who have ever experienced intimate partner violence(1, 10, 11). Furthermore, intimate partner violence can lead to unintended pregnancies, induced abortions, gynecological problems, and sexually transmitted infections (12).

The social-ecological model is the most widely used model to determine factors associated with domestic violence. The model proposes that violence is the result of factors inter-relation at the individual, relationship, community, and societal levels(9). Previous studies use this model to identify factors associated with experiencing domestic violence. A study conducted in Brazil found individual-level variables such as excessive alcohol use by husband, marital controlling behavior, and having multiple sexual partnerships, and community level predictors such as economic deprivation were significantly associated with domestic violence(13). Another study conducted in Nigeria also finds that permissive state-level social norms toward spousal violence and acceptance of spousal violence by women are significantly associated with experiencing domestic violence(14). Similarly, a multilevel study conducted in the same area also finds that community norms that justified IPV against women increase
the Odds of experiencing domestic violence (15). In addition to this, previous studies identify that individual-level factors such as low level of education, witnessing family violence, harmful use of alcohol, having multiple partners, woman's attitude towards wife-beating, low level of wealth index and low level of women employment as factors for domestic violence (5, 8, 9, 16, 17).

Spatial statistical analysis is becoming a well-known tool to determine the distribution and predictors of health problems across the world. Studies are employing this technique to demonstrate the distribution of domestic violence cases in different countries. Most of the studies were from developed countries and very few were from less developed countries. For example, a study conducted in the USA shows that significant clustering of domestic violence was observed in areas where black American women reside. And this study also finds out that pregnant women living in this area were more likely to give birth to small gestational age infants as compared to women living in low prevalent areas (18). Another study in Canada identifies that clusters of gender-based violence were observed in the downtown and around entertainment areas (19). The clustering of cases in these areas was explained by high alcohol consumption and substance abuse around entertainment areas create favorable condition for the occurrence of violence cases. On the other hand, a study conducted in Spain indicates that Intimate partner violence risk was higher in neighborhoods with low educational and economic status, high levels of public disorder, and high concentrations of immigrants (20). Similarly, in a study conducted in Brazil, Spatial disparity in the distribution of intimate partner violence was observed. And socio-economical difference across the regions was responsible for this variation (21).

The spatial statistical technique gives importance for examining the geographical distribution of health problems specifically, by identifying areas with a high burden of health problems. Despite this, studies that employ this technique for demonstrating the distribution of domestic violence are limited. The existing few studies are also confined to developed countries. As far as my literature searching is concerned, no article was found that displays the distribution of domestic violence in Ethiopia using geo-spatial techniques. Therefore, the current study employs spatial analytic tools to demonstrate the spatial distribution and associated factors of domestic violence among women age 15-49 in Ethiopia by using the EDHS 2016 dataset. The results from this study could help to support the decision making of different stakeholders by identifying locations with a high burden of the problem.

2. Method And Materials

2.1 Study design and setting

The study uses secondary data from EDHS 2016 dataset. In EDHS 2016, a community-based cross-sectional study was conducted by the Central Statistical Agency (CSA) from January 18 to June 27, 2016, in Ethiopia. Ethiopia is the second populous country in Africa and located in the Horn of Africa from 30°N to 14°N and 33° to 48°E. Administratively, Ethiopia is divided into nine geographical regions and two city administrations.
2.2 Sample size and sampling technique

EDHS 2016 used two stages stratified cluster sampling technique where each region was stratified into urban and rural areas, yielding 21 sampling strata. In the first stage, a total of 645 EAs (202 in urban areas and 443 in rural areas) were selected with probability proportional to EA size and with independent selection in each sampling stratum (7). In the second stage, a fixed number of 28 households per cluster were selected and only one woman per household was randomly selected for interview. Finally, a total of 5860 women aged 15-49 were asked questions about domestic violence against women. All women aged 15-49 and who were either permanent residents of the selected households or visitors who stayed in the household the night before the survey were eligible to be interviewed(7).

2.3 Variables of the study

The dependent variable of the study is the experience of domestic violence by women aged 15-49. The independent variables are categorized into individual-level factors, household/relationship factors, and community-level factors. Individual-level factors include woman's age, educational status of woman and husband/partner, occupation, religion, perpetrator's alcohol use, experiencing family violence during childhood, and woman's attitude towards wife-beating. Household and Relationship level factors consist of wealth index, a number of live children, head of household, decision making power, marital controlling behaviors, and the educational difference between couples. Community-level factors include acceptance of wife-beating in community, level of female literacy in the community, early marriage in the community, place of residence, and region.

2.4 Data processing and analysis

Statistical analysis of the data was done on SPSS version 25. Cross-tabulation and summary statistics were performed to describe the populations according to their age, educational status, place of residence, and region. Binary logistic regression and a two-level generalized linear mixed model was employed to identify predictors of domestic violence. Finally, model comparison between the models was performed based upon the Log-likelihood ratio test to choose the best-fitted model.

2.5 Spatial analysis of domestic violence

ArcGIS 10.7 software was used for spatial analysis of the data. Spatial autocorrelation (Global Moran's I) statistics and Anselin local cluster analysis was done to display the spatial distribution of domestic violence among woman aged 15-49 in Ethiopia. Global Moran's I measure was used to verify whether domestic violence among women aged 15-49 is clustered, dispersed, or randomly distributed in Ethiopia.

Global Moran's I calculates Moran's I Index value, Z score & p-value. Moran's I index close to -1 means domestic violence cases are dispersed whereas, close to 1 indicates that domestic violence cases are clustered. Statistically significant Z-score and P-value ≤ 0.05 lead to rejection of the null hypothesis showing the existence of clusters of domestic violence. Statistically non-significant Moran's I value (if p-value > 0.05) will indicate domestic violence cases are randomly distributed throughout the country(23).
Anselin local Moran's I was used to identify local level clusters of domestic violence. A positive Local Moran's I indicate that the feature is surrounded by features with similar values and, such types of cases are called clusters. Whereas, a negative value for I indicates that the feature is surrounded by features with dissimilar values, and this was called an outlier(23).

Kuldorff’s Sat Scan version 9.4 software was used to identify the geographical locations of statistically significant clusters of domestic violence. Scan statistics use a scanning window that moves across the study area. Bernoulli model was fitted to identify statistically significant locations of domestic violence clusters. The Bernoulli model was selected because the structure of the data shows the binomial [0/1] distribution. Women who have experienced domestic violence were considered as case and labeled 1 whereas, those who do not experience as control and labeled 0. The default 50% of the population was used as an upper limit for cluster size; because it allows the detection of both small and large clusters of domestic violence. Statistically significant clusters were identified by P-value and likelihood ratio tests.

2.6 Multi-level logistic regression analysis

A two-level generalized linear mixed model was fitted by considering 4322 women aged 15-49 at level 1 nested within 645 clusters (communities) at level two. A multilevel analysis of the data takes three steps. The first step was fitting the null (intercept only) model without including predictor variables and the second step was a random intercept fixed coefficient model by including individual and relationship level variables. The last was fitting a random intercept and fixed coefficient model by incorporating community-level predictors.

2.7 Model Comparison

Model comparison between the two nested (null model and random intercept fixed coefficient model) and the logistic regression model was done in order to select the best-fitted model. The commonly used parameter for evaluation of model fitness is the Log-likelihood ratio test that compares the deviance (-log likelihood) of the models by subtracting the smaller deviance from the larger one. Deviance is an indicator that shows how well the model fits the data. A model with the lowest deviance is considered as the best-fitted model than with large deviance. In addition to the log-likelihood ratio test, Akaike's information criterion (AIC) and Bayesian information criterion (BIC) were also used as measures of model fitness to select the best one. Similar to the log-likelihood ratio test, the model with small AIC and BIC value is considered as the better model.

3. Results

3.1 Socio-demographic characteristics of respondents

After removing 398 missing cases, a total of 4322 (weighted) women aged 15-49 were included for analysis. Majority 3375 (82%) of the respondents were from the rural part of the country and 1732 (40%) of them were from the Oromia region. The mean age of the respondents was 27.76 ± 9.1SD years and the
majority, 2635 (61%) of the respondents do not attend formal education. Most of the respondents, 1832 (42.4%), were Orthodox by religion and 953 (22%) of them were from the richest family. Table 1 shows a cross-tabulation of the socio-demographic characteristics of the respondents with their experience of domestic violence.

3.2 Domestic violence

From women included in the analysis, 24% with 95% CI (22.9%, 25.4%), 23.7% with 95%CI (22.5%, 25%) and 10.1% with 95% CI (9.3%, 11.1%) of them have experienced emotional, physical and sexual violence by their husband/partners, respectively. In addition, 34% 95% CI (32.6%, 35.4%) women have experienced either of domestic violence by their husband/partner.

3.3 Spatial distribution of domestic violence in Ethiopia

The result from this study shows that the spatial distribution of domestic violence among women aged 15-49 in Ethiopia was non-random with Global Moran's I 0.26 (P-value < 0.01). The z score value of 8.29 indicating less than 1% likelihood that the observed clustering of domestic violence among women in Ethiopia is the result of random chance. The result from Anselin Local Moran's I indicates the existence of hot spot, cold spot, and outlier clusters in the study area. Hot spot clusters are observed in Amhara regions (East Gojam and West Gojam zones), in the Oromia region (West Arsi, Guji, Bale, and Jimma zones) and in SNNP (Sidama, Gedio, Dawro and Gamo Gofa zones). Cold spot clusters were observed in Benishangul Gumuz, Tigray (Eastern, Central, and Southern zones) and eastern part of the Somali region. Figure 3 shows Output from Anselin Local cluster analysis of domestic violence in Ethiopia.

3.4 Sat scan analysis of domestic violence in Ethiopia

A total of 24 significant locations of clusters were identified. Among these, 10 considered as are most likely (primary) clusters and the rest as a secondary cluster. The primary cluster was located in Oromia, Somalia, and some parts of SNNP regional states. In the Oromia region, specifically at (Guji, Borena, and Bale Zones), in Somalia region Liben and Afder zones and in SNNP Sidama zone were included. The secondary cluster was located in the Amhara region (in the Eastern Gojam zone) and in the Oromia region (Jimma zone). The primary cluster spatial window was centered at 5.203234 N, 40.019732 E with 187.83 Km radius with a relative risk (RR) of 2.18 and Log-Likelihood ratio of 39.55 at P-value <0.001. The spatial window of secondary cluster detected by Sat Scan analysis centered at 10.984556 N, 38.044450 E with 29.42 Km radius with RR of 2.96 and LLR of 28.56 with P-value of < 0.001. The bright red ring shown in figure 4 shows the primary significant cluster and the green ring shows the secondary cluster.

3.5 Result of Logistic regression

Binary logistic regression analysis was employed in order to see the association of predictor variables with domestic violence. According to the output from this model, age, education, religion, wealth index, husband/partner's education, husband/partner alcohol use, respondent's father ever beat mother,
respondent afraid husband/partner, marital controlling behaviors, region and community acceptance of wife-beating shows significant association with domestic violence.

The experience of domestic violence was increased with increasing in woman's age. The Odds of experiencing domestic violence were 2 times higher for women aged 20-24 with AOR 2.09 and 95% CI (1.36, 3.17) and 3 times higher for women aged 45-49 with AOR 3 and 95% CI (1.84, 5.15) when compared with those women aged 15-19.

Women from the richest family were 48% and those from richer families were 42% less likely to experience domestic violence when compared with those women from the poorest household with AOR and 95%CI 0.52 (0.36, 0.75) and 0.58 (0.45, 0.77), respectively.

Husband/partner education was also significantly associated with domestic violence. Women whose husband/partner's education is a secondary school were 42% and those with primary education were 19% less likely to experience domestic violence when compared to those with no education with AOR and 95% CI of 0.58(0.41, 0.82) and 0.81( 0.66, 0.97), respectively.

Women whose husband/partner drink alcohol were 2.6 times more likely to experience domestic violence when compared to those whose husband/partner does not drink alcohol with AOR 2.62 and 95%CI of (2.09, 3.29).

The Odds of experiencing domestic violence among women who witnessed family violence during childhood were 2.2 times higher than those who do not saw family violence with AOR 2.24 and 95%CI of (1.81, 2.58).

Women whose husband/partner exhibit at least one type of marital controlling behavior were 4.3 times more likely to experience domestic violence when compared to those whose husband/partner don't exhibit any kind of marital controlling behavior with AOR 4.26 and 95% CI (3.55, 5.11).

The Odds of domestic violence was 4.4 times higher among women who afraid their husband most of the time and 2.3 times higher among those who sometimes afraid their husband when compared to those who don't afraid their husband with AOR and 95% CI of 4 (3.45, 5.61) and 3.21 (1.83, 2.81), respectively.

Women who live in communities where wife beating is highly acceptable were 1.4 times more likely to experience domestic violence when compared to those who live in communities where wife beating is less acceptable with AOR 1.39 and 95% CI of (1.16, 1.66). Table 2 displays the output from the binary logistic regression analysis.

### 3.6 Result of multilevel logistic regression analysis

The null model is the first model in multilevel regression analysis in which only the intercept randomly varies across level two units without adjusting for predictor variables. The intercept only model intends to
verify the heterogeneity of communities for experiencing domestic violence. The result from the null model shows that the variance of random factor is .716 with its calculated Z statistics of 7.35 and p-value of 0.000. This shows that experiencing domestic violence among women aged 15-49 randomly varies across clusters. The ICC value shows that 21.4% of the variation in the outcome variable was explained by the grouping variable and the rest was by predictor variables.

The second model is a random intercept model that has a random intercept component and a fixed coefficient of individual and relationship level factors. The third model (full model) was developed by including community-level variables on model two. The output from this model shows that the experience of domestic violence was increased with increasing in women's age. The odds of experiencing domestic violence were 2.8 times higher among women whose age group was 30-34 and 4.2 times higher for those aged 45-49 when compared to women age 15-19 with AOR 2.8 and 95% CI of (1.05, 4.54) and 4.2 (1.82, 9.82), respectively.

Women from the richest family were 59% and those from richer families were 45% less likely to experience domestic violence when compared to those women from the poorest household with AOR and 95%CI of 0.41 (0.22, 0.77), 0.55 (0.36, 0.84), respectively.

Women whose husband/partner drink alcohol were 2.7 times more likely to experience domestic violence when compared to those whose husband/partner does not drink alcohol with 95%CI of (1.84, 4.01).

The Odds of experiencing domestic violence among women who witnessed family violence during childhood were 2.5 times higher than those who do not saw family violence with 95%CI of (1.86, 3.37).

Women whose husband/partner exhibit at least one type of marital controlling behavior were 4.2 times more likely to experience domestic violence when compared to those whose husband/partner don’t exhibit any kind of marital controlling behavior with 95% CI (3.09, 5.63).

The Odds of domestic violence was 5.4 times higher among women who afraid their husband most of the time and 2.5 times higher among women who sometimes afraid their husband when compared to those who don’t afraid their husband with 95% CI of (3.560, 8.132) and (1.652, 3.726) respectively. Table 3 shows the output from multilevel logistic regression.

### 3.7 Model Comparison

The logistic regression model and the two-level generalized mixed model were compared based upon their log-likelihood ratio and the two criterion measures (AIC and BIC). The model with small AIC and BIC measure was considered as the best-fitted model.

The output from the analysis shows that employing a two-level generalized mixed model could not improve the model fitness. Rather logistic regression analysis is considered as the best-fitted model since it has significantly lower AIC and BIC values. Table 4 shows AIC and BIC values for logistic regression and generalized mixed model.
4. Discussion

This study uses national representative sample EDHS 2016 data to determine the spatial distribution and determinant factors of domestic violence in Ethiopia. Almost one-third (34%) of women aged 15-49 experienced domestic violence in their lifetime. And 24%, 23.5% and 10.1% of women have experienced emotional, physical, and sexual violence by their husbands/partners, respectively. This finding is in line with WHO prevalence estimates of intimate partner violence for African countries (2), a study conducted in Ghana (5), and almost similar to the 2016 DHS national report (7). This high prevalence indicates that domestic violence remains as the major social and public health problem in the country.

The study also finds out that the spatial distribution of domestic violence cases was non-random in Ethiopia. The Global Moran's I value of 0.26 and Z score of 8.29 with p-value < 0.0001 indicates that there was significant clustering of domestic violence throughout the country. This means the distribution of domestic violence cases was more prevalent in some communities than the others. Community-level factors such as community norms towards wife-beating may have a significant role in the distribution of violent cases. The spatial clustering of domestic violence cases was also reported from a study conducted in Brazil (24), a spatial epidemiologic study conducted in Spain (20) and from a study conducted in Rwanda (22).

The result from Sat Scan analysis of the data identifies primary and secondary most likely clusters. The primary significant cluster was located in Oromia (Guji and Borena zones), Somali (Liben and Afder zones), and SNNP (Sidama zone) regions of the country. The secondary cluster was located in the Amhara region east Gojam Zone and in Oromia in the Jimma zone. Women who live in these clusters have a high risk of experiencing domestic violence when compared to those women who reside outside these clusters. The observed high clustering of domestic violence cases in these areas may be attributed to community and societal-level characteristics such as societal norms that encourage wife-beating, socio-economic status of communities, or weak legal and community sanction on aggressors (13-15, 20). The outcome from regression analysis supports this reflection since community-level factors specifically, community acceptance of wife-beating increases the likelihood of experiencing domestic violence. The results from previous studies conducted in foreign countries also find that spatial variation in the distribution of intimate partner violence clusters was mainly attributed to neighborhood-level characteristics (18, 19, 25). High risk of intimate partner violence was observed among socio-economically disadvantaged communities, high immigrant concentration, and a high level of public disorder (20). In the current study, sufficient community-level variables (neighborhood level) were not included. Therefore, future studies need to incorporate sufficient community-level predictors when conducting a similar study.

The result from logistic regression analysis shows that woman's age is significantly associated with domestic violence. As a woman's age increases, the likelihood of experiencing domestic violence was also increased. The reason why older age women have a high risk of experiencing domestic violence when compared to younger ones may be because younger women may hide their real status because of
different cultural influence or older women are more likely to be in a union for a longer time and this gives them more chance to encounter violent situation. This result is consistent with an ecological study conducted in Brazil (26) and in Nigeria (15). The socio-economic status of women shows a significant association with domestic violence. Women from the richest family were 48% and those from richer 42% lower risk of domestic violence than those from the poorest households. This finding suggests that living in poverty is a significant factor in experiencing domestic violence. The finding from this study is supported by studies from Brazil (13), Zambia (6), Rwanda (22), and Ethiopia (8). The relationship between low economic status and domestic violence may be explained by a husband/partner with low income might not be able to support the household expense properly and this might also be one cause for disputes.

This study also finds out that the respondent’s husband/partner alcohol use is significantly associated with experiencing domestic violence. A woman whose husband/partner drink alcohol was 2.6 times more likely to experience domestic violence when compared to those whose husband/partner does not drink alcohol. This finding is in line with a previous study conducted on 14 sub-Saharan countries (27), with a study conducted in Ghana (5), Nigeria (15), Zambia (6), a systematic review of 15 articles in Ethiopia (8) and a study conducted in Robe Hospital, southeast Ethiopia (28). The result of this study is lower than a study conducted in southeast Oromia (29) and in northwest Ethiopia (16). This difference may be due to differences in the study population (because the previous studies are conducted mainly among pregnant women) and sample size differences (the current study was employed on a large sample size). Despite this difference, harmful alcohol consumption by husband/partner is considered as the main risk factor for domestic violence against women. The main reason why women whose husband/partner drink alcohol have a higher risk of domestic violence could be because excessive alcohol drinking may affect the cognitive function of mind, reducing self-control and makes individuals incapable of peaceful resolution to conflicts (30).

Respondent witnessing family violence as a child was also show significant association with experiencing domestic violence. A woman who saw family violence as childhood was 2.2 times more likely to experience domestic violence. This finding was consistent with a previous study conducted in Nigeria (15), southeast Oromia (29), and North West Ethiopia (31) but, lower than a study conducted in Ghana (5). The difference of results between the current study and the study in Ghana may be due to population differences. The relationship between observing family violence and experience of domestic violence may be explained as a child who witnesses family violence may develop a behavioral or emotional problem in letter life and this could make him/her incapable to form stable relationship.

Marital controlling behaviors by husband/partner also show significant association with experiencing domestic violence. Women whose husband/partner exhibit at least one type of marital controlling behaviors were 4 times more likely to experience domestic violence when compared to those whose husband/partner do not exhibit any type of marital controlling behaviors. The relationship between marital controlling behaviors and experience of domestic violence can be explained as if a husband/partner exhibits repetitive marital controlling behaviors, good feeling and effective
communication with his wife will disappear and this will lead to disputes and occurrence of violent circumstances. The result of this study is in line with studies conducted in Brazil (32), Nigeria (33), and southwest Ethiopia (34).

Fearing of husband/partner by a woman also strongly associated with experiencing domestic violence. Women who sometimes afraid of their husband/partner were 2 times and those who most of the time afraid were 6 times more likely to experience domestic violence when compared to those who do not afraid of their husband/partner. This finding is consistent with a study from Nepal (35) and Uganda (36). Fear of husband/partner was considered as the consequence of many hostile behaviors and it is associated with many violent activities (36). This is explained as the husband's/partner's repetitive aggressive behaviors could make a woman fear him and obligated to stay in a relationship with a violent partner.

Social norms are community-level factors identified by previous studies to have a strong association with domestic violence. The analysis of social factors by different scholars shows that social norms can be manifested in two ways the first one is through gender norms and the second one is through gender norm perpetuating violence against women. Gender norms are informal social rules and expectations that distinguish males from females whereas gender norms perpetuating violence against women are norms that normalize violence within a specified community (37). The current study focus on the second type of social norm; community acceptance of wife-beating that shows a strong association with a woman's experience of domestic violence. Women who live in a community where wife-beating for husband is highly acceptable were 3.6 times more likely to experience domestic violence when compared to those who do not accept the beating of a wife. This result shows that the existence of a permissive social norm in the community plays a significant role in facing domestic violence by a woman. This finding is consistent with two previous studies from Nigeria (14, 15) and a study from Ethiopia (38).

This study has some strengths and weaknesses. The first strength of the study is it uses nationally representative data to show the magnitude and determinant factors of domestic violence in Ethiopia. Second, it demonstrates the spatial distribution pattern and displays significant locations of domestic violence clusters across the country. Finally, it employs both conventional and multi-level logistic regression analyses and compares model fitness parameters to choose the best-fitted model. Despite this, the study also has some limitations. The first one is due to the secondary nature of the data, the study could not incorporate sufficient community-level variables. Therefore, future studies should consider more community-level variables when conducting similar studies. The other limitation is in order to maintain the confidentiality of respondents, location data in EDHS 2016 was displaced by 2 KM for urban areas, and 5 KM for rural. Therefore, the study may not display the actual locations of domestic violence clusters.

5. Conclusion
This study finds out that nearly one-third of women have experienced domestic violence by their husbands/partners. The output from the spatial statistical analysis shows that the spatial distribution pattern of domestic violence cases was non-random in Ethiopia. The Global Moran's I statistics shows that there is significant clustering of domestic violence cases in Ethiopia. And the output from Sat Scan analysis identifies primary and secondary clusters of domestic violence. Primary clusters were observed in southern Oromia, Somali, and some parts of SNNP whereas, secondary clusters were observed in Amhara and Oromia regional states.

In this study, a strong association of domestic violence with an individual, relationship, and community factors were observed. The output from logistic regression shows that husband/partner's alcohol use, witnessing family violence as a child, marital controlling behaviors, being afraid of husband/partner and community acceptance of wife-beating were predictors of domestic violence. The strategy for prevention and control of intimate partner violence should follow a multi-sectorial approach. Comprehensive and collaborative action should be taken by involving stakeholders at all levels including health professionals, government officials, non-government organizations, community and religious leaders. Based upon this, specific activities may include Organizing media on awareness creation and continuous education on how to maintain a stable relationship between couples, taking strong action on controlling alcohol and other drugs, preparing standard limit of alcohol use across the country and Employing long term and intensive effort for transforming culture and social norms that encourage violence against woman is among the major ones.

**Declarations**

**Ethical consideration**

Ethical clearance letter that explains the appropriateness of the study was obtained from the University of Gondar Ethical Review Board. Written consent was obtained from DHS Program International Inc. to access the dataset. To ensure the confidentiality of respondents, in EDHS 2016 dataset, any personal information was well coded and location address was displaced by 2 KM for urban and 10 KM for a rural resident.

**Consent for publication**

Not applicable for this section.

**Availability of data and materials**

The datasets used for analysis are available from the corresponding author on reasonable request.

**Competing of interests**

"The authors declare that they have no competing interests" in this section.
Funding

The study was funded by Jimma University Medical Center, Jimma Ethiopia. The funding body has no any role in the design of the study, collection, analysis, and interpretation of data.

Authors’ contributions

ES designed the study, develop the proposal, worked in data extraction, performed analysis and interpretation of the results and prepared the manuscript. TM assisted the analysis and interpretation of result, approved the proposal, revised the manuscript. KA provided technical support on geospatial analysis of the data, assist in writing of proposal and approve the proposal. All authors read and approved the final manuscript.

Acknowledgments

We would like to thank to Measure DHS International organization for providing the data set and Jimma University Medical Center for their financial support in conducting this study.

6. References

1. WHO. Violence against women 2017 [Available from: https://www.who.int/news-room/fact-sheets/detail/violence-against-women.

2. WHO. Global and regional estimates of violence against women: prevalence and health effects of intimate partner violence and non-partner sexual violence. Italy: WHO press; 2013.

3. Mohammedan F, Hashemian A, Bagheri M, Direkvand-Moghadam A. Prevalence and Risk Factors of Domestic Violence against Iranian Women: A Cross-Sectional Study. Korean Journal of family medicine. 2016;37(4):253-8.

4. Kazaura MR, Ezekiel MJ, Chitama D. Magnitude, and factors associated with intimate partner violence in mainland Tanzania. BMC Public Health. 2016;16(1):494.

5. Adjah O, Agbemafle I. Determinants of domestic violence against women in Ghana. BMC Public Health. 2016;16(368):9.

6. Kusanthan T, Mwaba S, Menon A. Factors affecting domestic violence among married women in Zambia. British Journal of Education, Society & Behavioural Science. 2016;12(2):1-13.

7. Central Statistical Agency(CSA). Demographic and Health Survey 2016 Rockville, Maryland, USA; 2016.

8. Semahegn A, Mengistie BJRh. Domestic violence against women and associated factors in Ethiopia; a systematic review. Reproductive Health. 2015;12(1).

9. WHO. Understanding and addressing violence against women. In: Ramsay S, editor. Intimate partner violence. Jeneva2012.
10. Al Dosary AH. Health Impact of Domestic Violence against Saudi Women: Cross-Sectional Study. Int J Health Sci (Qassim). 2016;10(2):165-73.

11. Lacey KK, McPherson MD, Samuel PS, Powell Sears K, Head D. The Impact of Different Types of Intimate Partner Violence on the Mental and Physical Health of Women in Different Ethnic Groups. Journal of interpersonal violence. 2012;28(2):359-85.

12. Abraham M, Tastsoglou E. Addressing domestic violence in Canada and the United States: The uneasy cohabitation of women and the state. 2016;64(4):568-85.

13. Kiss L, Schraiber LB, Heise L, Zimmerman C, Gouveia N, Watts C. Gender-based violence and socioeconomic inequalities: Does living in more deprived neighborhoods increase women’s risk of intimate partner violence? Social Science & Medicine. 2012;74:1172-9.

14. Natalia Linos NS, S. V. Subramanian, Lisa Berkman, Ichiro Kawachi. Influence of Community Social Norms on Spousal Violence: A Population-Based Multilevel Study of Nigerian Women. American journal of public health. 2013;103:148–55.

15. Faith Owunari Benebo BS, Masoud Vaezghasemi. Intimate partner violence against women in Nigeria: a multilevel study investigating the effect of women’s status and community norms. BMC Women's Health. 2018;18.

16. Fekadu E, Yigzaw G, Gelaye KA, Ayele TA, Minwuye T, Geneta T, et al. Prevalence of domestic violence and associated factors among pregnant women attending antenatal care service at University of Gondar Referral Hospital, Northwest Ethiopia. BMC Women's Health. 2018;18(138).

17. Shanko W, Wolday M, Assefa N, Aro AR. Domestic violence against women in Kersa, Oromia region, eastern Ethiopia. BMC. 2013;16.

18. Felker-Kantor E, MA M, Wallace M. Living in Violence: Neighborhood Domestic Violence and Small for Gestational Age Birth. 2018.

19. Muldoon KA, A. GLR, M. LTH, SampselK. Geographies of Sexual Assault: A Spatial Analyses to Identify Neighborhoods Affected by Sexual and Gender-Based Violence. Journal of interpersonal violence. 2019:886260519851175.

20. Gracia E, Lopez-Quilez A, Marco M, Lladosa S, Lila M. The Spatial Epidemiology of Intimate Partner Violence: Do Neighborhoods Matter? American journal of epidemiology. 2015;182(1):58-66.

21. Fontes KB, Alarcão ACJ, Niheki OK, Pellelo SM, Andrade L, Carvalho MDdB. Regional disparities in the intimate partner sexual violence rate against women in Paraná State, Brazil, 2009-2014: an ecological study. BMJ Open. 2018;8(e018437).

22. Habyarimana F, Zewotir T, Ramroop S. Structured Spatial Modeling and Mapping of Domestic Violence Against Women of Reproductive Age in Rwanda. Journal of interpersonal violence. 2018:886260518757222.

23. Lentz J. Spatial Autocorrelation Statistics. 2009.

24. Kátia BF, Ana Carolina JA, Oscar KN, Sandra MP, Luciano A, Maria DdBC. Regional disparities in the intimate partner sexual violence rate against women in Paraná State, Brazil, 2009-2014: an ecological study. BMJ Open. 2017.
25. Ghazvineh Z, Saroukhani B, Shekarbigi A. Spatial Distribution of Domestic Violence in Kermanshah City. Geography and Sustainability of Environment. 2019;8(3):79-98.

26. Rodrigues NCP, O'Dwyer G, Andrade MKN, Flynn MB, Monteiro DLM, Lino VTS. The increase in domestic violence in Brazil from 2009-2014. Ciencia & saude coletiva. 2017;22(9):2873-80.

27. M. C. Greene JCK, W. A. Tol. Alcohol use and intimate partner violence among women and their partners in sub-Saharan Africa. global mental health. 2017;4(e13):11.

28. Tulu C, Kiflu E, Hirkisa D, Kedir Z, Abdurahim L, Ganfure G, et al. Prevalence of Domestic Violence and Associated Factors among Antenatal Care Attending Women at Robe Hospital, Southeast Ethiopia. Clinics Mother Child Health. 2019;16.

29. Yohannes K, Abebe L, Kisi T, Demeke W, Yimer S, Feyiso M, et al. The prevalence and predictors of domestic violence among pregnant women in Southeast Oromia, Ethiopia. BMC 2019;16(37).

30. WHO. Intimate partner violence and alcohol. 20 avenue Appia ch-1211 Geneva 27, Switzerland: World Health Organization; 2012.

31. Yimer T, Gobena T, Egata G, Mellie HJAiph. The magnitude of domestic violence and associated factors among pregnant women in Hulet Ejju Enessie District, Northwest Ethiopia. Advances in Public Health. 2014;8.

32. Kiss L, Blima L, Schraiber, Heise L, Zimmerman C, Gouvei N, et al. Gender-based violence and socioeconomic inequalities: Does living in more deprived neighborhoods increase women’s risk of intimate partner violence? ELSEVIER. 2012;74:1172-9.

33. Antai D. Controlling behavior, power relations within intimate relationships, and intimate partner physical and sexual violence against women in Nigeria. BMC Public Health. 2011;11.

34. Deribe, Beyene K, Kebede B, Anbessu T, Peter M, Sibhatu B, et al. Magnitude and correlates of intimate partner violence against women and its outcome in Southwest Ethiopia. Plose. 2012;7(4):e36189.

35. Jeong SGH-S. Intimate Partner Violence in Relation to Husband Characteristics and Women Empowerment: Evidence from Nepal. International journal of environmental research and public health. 2019;16.

36. Stephen Ojiambo Wandera BK, Patricia Ndugga, Allen Kabagenyi. Partners’ controlling behaviors and intimate partner sexual violence among married women in Uganda. BMC Public Health. 2015;15.

37. OXFAM. Understanding Social Norms Underpinning Domestic Violence in India. India; 2016.

38. Bosena Tebeje BS, Jeanette H.Magnus. Social-ecological factors and intimate partner violence in pregnancy. PLoS ONE. 2018;13(e0194681).

Tables

Table 1: cross-tabulation of socio-demographic characteristics of respondents with their experience of domestic violence.
| Variables                          | Domestic violence |       |       |
|-----------------------------------|-------------------|-------|-------|
|                                   |                   | No    | yes   |
| Age in 5-year groups              | 15-19             | 66.2% | 33.8% |
|                                   | 20-24             | 67.5% | 32.5% |
|                                   | 25-29             | 68.3% | 31.7% |
|                                   | 30-34             | 64.5% | 35.5% |
|                                   | 35-39             | 66.7% | 33.3% |
|                                   | 40-44             | 66.5% | 33.5% |
|                                   | 45-49             | 58.1% | 41.9% |
| Highest educational level         | No education      | 64.1% | 35.9% |
|                                   | Primary           | 65.5% | 34.5% |
|                                   | Secondary         | 72.8% | 27.2% |
|                                   | Higher            | 82.8% | 17.2% |
| Religion                          | Orthodox          | 64.3% | 35.7% |
|                                   | Catholic          | 75.0% | 25.0% |
|                                   | Protestant        | 66.8% | 33.2% |
|                                   | Muslin            | 68.4% | 31.6% |
|                                   | Traditional       | 40.5% | 59.5% |
|                                   | Other             | 44.4% | 55.6% |
| Wealth index combined             | Poorest           | 63.7% | 36.3% |
|                                   | Poorer            | 64.7% | 35.3% |
|                                   | Middle            | 62.1% | 37.9% |
|                                   | Richer            | 64.4% | 35.6% |
|                                   | Richest           | 74.0% | 26.0% |
| Type of place of residence        | Urban             | 72.1% | 27.9% |
|                                   | Rural             | 64.6% | 35.4% |
| Region                            | Tigray            | 65.9% | 34.1% |
|                                   | Afar              | 81.5% | 18.5% |
|                                   | Amhara            | 64.6% | 35.4% |
| Region     | Domestic Violence Rate | Non-Domestic Violence Rate |
|------------|------------------------|---------------------------|
| Oromia     | 61.5%                  | 38.5%                     |
| Somali     | 90.4%                  | 9.6%                      |
| Benishangul| 69.6%                  | 30.4%                     |
| SNNPR      | 70.6%                  | 29.4%                     |
| Harari     | 100.0%                 | 0%                        |
| Addis Ababa| 74.0%                  | 26.0%                     |
| Dire Dawa  | 75.0%                  | 25.0%                     |

Table 2: Output from the binary logistic regression analysis that shows factors associated with experiencing domestic violence among women age 15-49 in Ethiopia 2016.
| Variables                        | AOR | 95% CI   |          |          |
|---------------------------------|-----|----------|----------|----------|
|                                 |     | Lower    | Upper    |          |
| Intercept                       | *** | .024     | .012     | .050     |
| Age                             |     |          |          |          |
| 45-49                           | *** | 3.08     | 1.84     | 5.15     |
| 40-44                           | *** | 2.59     | 1.56     | 4.29     |
| 35-39                           | *** | 2.50     | 1.56     | 4.01     |
| 30-34                           | *** | 2.35     | 1.49     | 3.73     |
| 25-29                           | *** | 2.03     | 1.31     | 3.14     |
| 20-24                           | *** | 2.08     | 1.36     | 3.17     |
| 15-19                           | 1   |          |          |          |
| Highest Education               |     |          |          |          |
| Higher                          | .76 | .41      | 1.44     |          |
| Secondary                       | 1.07| .69      | 1.65     |          |
| Primary                         | **  | 1.28     | 1.04     | 1.58     |
| No education                    | 1   |          |          |          |
| Religion                        |     |          |          |          |
| Other                           | 1.88| .84      | 4.19     |          |
| Traditional                     | **  | 2.85     | 1.22     | 6.64     |
| Muslim                          | 1.28| 1.00     | 1.63     |          |
| Protestant                      | 1.24| .93      | 1.65     |          |
| Catholic                        | 1.99| .86      | 4.58     |          |
| orthodox                        | 1   |          |          |          |
| Wealth index                    |     |          |          |          |
| Richest                         | *** | .52      | .36      | .75      |
| Richer                          | *** | .58      | .45      | .77      |
| Middle                          | .80 | .62      | 1.03     |          |
| Poorer                          | .78 | .60      | 1.01     |          |
| poorest                         | 1   |          |          |          |
| Number of living children       |     |          |          |          |
| >6 children                     | 1.01| .64      | 1.59     |          |
| 4-6 children                    | .98 | .66      | 1.47     |          |
| 1-3 children                    | .99 | .69      | 1.429    |          |
| No child                        | 1   |          |          |          |
| Husband/partner's education | I don't know | .79 | .36 | 1.72 |
|---------------------------|--------------|-----|-----|------|
|                           | Higher       | .78 | .50 | 1.20 |
|                           | Secondary    | *** | .58 | .41 | .82 |
|                           | Primary      | **  | .81 | .66 | .97 |
|                           | No education | 1   |     |     |
| Husband/partner drinks alcohol | Yes  | *** | 2.62 | 2.09 | 3.29 |
|                           | No           | 1   |     |     |
| Respondent's father ever beat her mother | I don't know | 1.22 | .85 | 1.75 |
|                           | Yes          | *** | 2.16 | 1.81 | 2.58 |
|                           | No           | .1  |     |     |
| Respondent afraid of husband/partner | Sometimes | *** | 2.26 | 1.83 | 2.81 |
|                           | Most of the time | *** | 4.41 | 3.45 | 5.61 |
|                           | Don't afraid  | 1   |     |     |
| Number of unions          | More than once | 1.13 | .91 | 1.41 |
|                           | once         | 1   |     |     |
| Type of place of residence | Rural        | .85 | .57 | 1.26 |
|                           | Urban        | 1   |     |     |
| Marital controlling by husband/partner | I don't know | *** | 11.16 | 4.96 | 25.06 |
|                           | Yes          | *** | 4.26 | 3.55 | 5.11 |
|                           | No           | 1   |     |     |
| Attitude towards wife-beating | Justified | 1.11 | .92 | 1.33 |
|                           | Not justified | 1   |     |     |
| Decision-making power     | Yes          | 1.22 | .94 | 1.58 |
|                           | No           | 1   |     |     |
| Community acceptance of wife-beating | High | *** | 1.39 | 1.16 | 1.66 |
|                           | Low          | 1   |     |     |
| Region                    | Addis Ababa  | 1.08 | .49 | 2.39 |
|                           | SNNP         | .77 | .51 | 1.18 |
|                           | Somali       | .28 | .06 | 1.16 |
| Region   | Coefficient 1 | Coefficient 2 | Coefficient 3 |
|----------|---------------|---------------|---------------|
| Oromia   | 0.95          | 0.65          | 1.40          |
| Amhara   | 1.13          | 0.77          | 1.66          |
| Afar     | 0.00          | 0.00          | 0.00          |
| Tigray   | 1             |               |               |

*** P-value < 0.01    ** P value < 0.05

Table 3: output from a random coefficient multilevel logistic regression that shows factors associated with experiencing domestic violence among women age 15-49 in Ethiopia 2016.
| Variables                          | Individual and relationship level | Full model                  |
|-----------------------------------|-----------------------------------|-----------------------------|
|                                   | AOR     | 95% CI lower | 95% CI upper | AOR     | 95% CI Lower | 95% CI Upper |
| Intercept                         | *** .017 | .006         | .05          | *** .03 | .007         | .10          |
| Age                               |         |              |              |         |              |              |
| 45-49                             | *** 4.35 | 1.87         | 10.08        | *** 4.22 | 1.82         | 9.82         |
| 40-44                             | *** 3.89 | 1.50         | 10.08        | *** 3.82 | 1.45         | 10.04        |
| 35-39                             | ** 3.04  | 1.25         | 7.40         | ** 2.95  | 1.21         | 7.18         |
| 30-34                             | ** 2.78  | 1.18         | 6.53         | ** 2.74  | 1.16         | 6.45         |
| 25-29                             | ** 2.26  | 1.06         | 4.81         | ** 2.24  | 1.05         | 4.79         |
| 20-24                             | ** 2.19  | 1.05         | 4.55         | ** 2.18  | 1.05         | 4.54         |
| 15-19                             | 1        |              |              | 1        |              |              |
| Highest Education                 |         |              |              |         |              |              |
| Higher                            | .63      | .781         | .28          | .69      | .240         | 2.001        |
| Secondary                         | .82      | .922         | .44          | .85      | .404         | 1.824        |
| Primary                           | .33      | 1.19         | .82          | 1.19     | .822         | 1.728        |
| No education                      | 1        |              |              | 1        |              |              |
| Religion                          |         |              |              |         |              |              |
| Other                             | 1.72     | .22          | 13.37        | 1.86     | .22          | 15.47        |
| Traditional                       | 3.82     | .77          | 18.86        | 3.82     | .71          | 20.33        |
| Muslim                            | 1.09     | .69          | 1.72         | 1.17     | .71          | 1.92         |
| Protestant                        | 1.05     | .67          | 1.63         | 1.14     | .68          | 1.91         |
| Catholic                          | .82      | .27          | 2.50         | .88      | .28          | 2.75         |
| orthodox                          | 1        |              |              | 1        |              |              |
| Wealth index                      |         |              |              |         |              |              |
| Richest                           | ** .493  | .285         | .854         | *** .41  | .22          | .77          |
| Richer                            | ** .563  | .373         | .851         | *** .55  | .36          | .84          |
| Middle                            | .799     | .482         | 1.327        | .78      | .47          | 1.31         |
| Poorer                            | .794     | .549         | 1.147        | .78      | .54          | 1.13         |
| poorest                           | 1        |              |              | 1        |              |              |
| Number of living children         |         |              |              |         |              |              |
| More than 6                       | .89      | .42          | 1.88         | .92      | .44          | 1.94         |

Page 22/24
|                          | 4-6 children | 1-3 children | No child | Husband/partner's Education | Husband/partner drinks alcohol | Respondent's father ever beat her mother | Respondent afraid of husband/partner | Number of unions | Women involved in decision making | the attitude of a woman to WB | marital controlling behaviors | Place of residence |
|--------------------------|--------------|--------------|----------|-----------------------------|-----------------------------|----------------------------------------|-------------------------------------|------------------|----------------------------------|----------------------------|-------------------------|---------------------|
|                          | .83          | .42          | 1.62     | .84                         | .43                         | 1.63                                   |                                     |                  |                                  |                            |                         | .57                 |
|                          | 1.02         | .59          | 1.76     | 1.01                        | .58                         | 1.74                                   |                                     |                  |                                  |                            |                         |                     |
|                          | 1            | 1            |          |                             |                             |                                        |                                     |                  |                                  |                            |                         |                     |
| Husband/partner's        | Higher       | .68          | .120     | 3.956                       | .66                         | .12                                    | 3.66                                |                  |                                  |                            |                         |                     |
| Education                | Secondary    | .77          | .37      | 1.60                        | .79                         | .38                                    | 1.64                                |                  |                                  |                            |                         |                     |
|                          | Primary      | .55          | .29      | 1.02                        | .55                         | .29                                    | 1.04                                |                  |                                  |                            |                         |                     |
|                          | No           | 1            | 1        |                             |                             |                                        |                                     |                  |                                  |                            |                         |                     |
|                        | No education | 1            | 1        |                             |                             |                                        |                                     |                  |                                  |                            |                         |                     |
|                          | Yes          | *** 2.75     | 1.88     | 4.02                        | *** 2.71                    | 1.84                                   | 4.01                                |                  |                                  |                            |                         |                     |
| Husband/partner          | Yes          | *** 2.49     | 1.86     | 3.34                        | *** 2.51                    | 1.86                                   | 3.37                                |                  |                                  |                            |                         |                     |
| drinks alcohol           | No           | 1            | 1        |                             |                             |                                        |                                     |                  |                                  |                            |                         |                     |
|                          | I don't know | 1.35         | .642     | 2.87                        | 1.35                        | .641                                   | 2.87                                |                  |                                  |                            |                         |                     |
| Respondent's father      | yes          | *** 2.49     | 1.86     | 3.34                        | *** 2.51                    | 1.86                                   | 3.37                                |                  |                                  |                            |                         |                     |
| ever beat her mother     | No           | 1            | 1        |                             |                             |                                        |                                     |                  |                                  |                            |                         |                     |
|                          | Sometimes    | *** 2.42     | 1.62     | 3.61                        | *** 2.46                    | 1.63                                   | 3.72                                |                  |                                  |                            |                         |                     |
| Respondent afraid of      | Most of the  | *** 5.33     | 3.54     | 8.02                        | *** 5.39                    | 3.52                                   | 8.2                                 |                  |                                  |                            |                         |                     |
| husband/partner          | time         |              |          |                             |                             |                                        |                                     |                  |                                  |                            |                         |                     |
|                          | Don't        | 1            | 1        |                             |                             |                                        |                                     |                  |                                  |                            |                         |                     |
| afraid                   | 1            | 1            | 1        |                             |                             |                                        |                                     |                  |                                  |                            |                         |                     |
| Number of unions         | More than    | 1.07         | .74      | 1.55                        | 1.05                        | .72                                    | 1.55                                |                  |                                  |                            |                         |                     |
| once                     | 1            | 1            | 1        |                             |                             |                                        |                                     |                  |                                  |                            |                         |                     |
|                          | Yes          | 1.27         | .741     | 2.19                        | 1.27                        | .73                                    | 2.21                                |                  |                                  |                            |                         |                     |
| Women involved in        | No           | 1            | 1        |                             |                             |                                        |                                     |                  |                                  |                            |                         |                     |
| decision making          | Justified    | 1.27         | .953     | 1.69                        | 1.24                        | .91                                    | 1.67                                |                  |                                  |                            |                         |                     |
|                          | Not          | 23.6         | 10.31    | 54.01                       | 22.83                       | 9.97                                   | 52.24                               |                  |                                  |                            |                         |                     |
| justified                | I don't      | *** 4.17     | 3.10     | 5.62                        | *** 4.17                    | 3.09                                   | 5.63                                |                  |                                  |                            |                         |                     |
| marital controlling      | Yes          | *** 4.17     | 3.10     | 5.62                        | *** 4.17                    | 3.09                                   | 5.63                                |                  |                                  |                            |                         |                     |
| behaviors                | No           | 1            | 1        |                             |                             |                                        |                                     |                  |                                  |                            |                         |                     |
| Place of residence       | Rural        | .57          | .30      |                             |                             |                                        |                                     |                  |                                  |                            |                         |                     |

Page 23/24
| Urban | 1 |
|---|---|
| The community acceptance level of WB | |
| high | 1.30 | .92 | 1.85 |
| Low | 1 |
| Region | |
| Addis Ababa | .84 | .32 | 2.17 |
| SNNP | .78 | .42 | 1.47 |
| Somali | .26 | .06 | 1.16 |
| Oromia | .93 | .51 | 1.70 |
| Amhara | 1.04 | .58 | 1.85 |
| Afar | .00 | 00 | .01 |
| Tigray | 1 |
| Model comparison parameters | |
| AIC | 17645.41 | 17690.10 |
| BIC | 17651.60 | 17696.29 |
| -2log likelihood | 17643.41 | 17688.10 |

*** P-value < 0.01 ** P value < 0.05

Table 4: model comparison parameters of conventional logistic regression and multilevel logistic regression.

| Logistic regression | Null model | Random intercept multilevel model |
|---|---|---|
| -Log-Likelihood | 1813.74 | 18570.74 | 17688.10 |
| Akaike's Information Criterion (AIC) | 3709.49 | 18572.747 | 17690.10 |
| Bayesian Information Criterion (BIC) | 3963.22 | 18579.083 | 17696.29 |