



Research article

Association between domestic violence and unintended, terminated pregnancy and complications during pregnancy among Indian women: Findings from nationally representative survey

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ABSTRACT

Background: Women experiencing domestic violence might have restrictions in the pregnancy-related decision-making and care-seeking process leading to adverse pregnancy outcomes. We explored the association between domestic violence and undesirable pregnancy events.

Methods: 63,796 women aged 18–49 years covered under the domestic violence module of National Family Health Survey-5, 2019-21. Stratification and clustering in the complex sampling design of the survey were accounted in analysis. Using Poisson regression, prevalence ratio (PR) was reported to provide association of domestic violence with undesirable pregnancy events.

Results: Prevalence of undesirable pregnancy events was 25.0% (95%CI: 24.4%–25.7%) amongst women aged 18–49 years. Prevalence of unintended, terminated pregnancy and complications during pregnancy was 3.2%, 5.1% and 20.9%, respectively. Women aged ≥ 35 years, educated, unemployed, primi or multi parity, intimate partner/husband being uneducated, facing problem with access to healthcare, belonging to large number of household members (≥ 4) and poorest or poorer quintile had significantly higher chance of having undesirable pregnancy events. Sexual violence (aPR: 1.11, $p = 0.02$) had higher chance of having undesirable pregnancy events.

Conclusion: One-fourth of reproductive-age group women had undesirable pregnancy events. Sexual violence was significantly associated with these events. Effective policy should protect women from domestic violence to promote maternal well-being.

1. Introduction

Domestic violence is the commonest form of gender-based violence against women [1]. Most countries including India face this issue, which is essentially a major public health problem and human rights violation against women [2]. This is because domestic violence during pregnancy is known to cause serious adverse pregnancy outcomes such as spontaneous abortions, preterm deliveries,

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birth injuries, stillbirth, and maternal, neonatal, infant or under-five mortality [3]. Women subjected to domestic violence might face various restrictions such as pregnancy-related decision-making process, seeking care during pregnancy, etc. [4].

Abbreviations

CEB	Census Enumeration Blocks
CMRHI	Comprehensive Model of Reproductive Health Impact
DHS	Demographic Health Survey
NFHS	National Family Health Survey
OBC	Other backward castes
PR	Prevalence ratio
PSU	Primary Sampling Unit
PPS	Probability Proportional to Size
SC	Scheduled Castes
ST	Scheduled Tribes

Domestic violence can happen in any manner, physical, emotional or sexual form of violence, with each of them having its impact and consequences. Each form can act through direct or indirect mechanisms. Physical violence can directly impact pregnancy-related outcomes, and emotional and sexual violence follow an indirect pathway, leading to undesirable pregnancy events [3]. Identifying the impact of violence on undesirable pregnancy events along with other possible determinants will help to classify the target groups and take relevant corrective measures.

Despite the importance of the problem, it is one of the lesser-explored topics in India, with only limited studies conducted on this issue [5–8]. However, most of these studies focussed primarily on physical violence and only few studies have reported the determinants and impact of physical violence during pregnancy [9]. There has not been any attempt made to identify the impact of domestic violence on undesirable pregnancy events, which consists of unintended, terminated pregnancy, and complications during pregnancy. National Family Health Survey-5 (NFHS-5) datasets provide this opportunity to assess the impact of various forms of domestic violence and pregnancy outcomes [10]. Hence, this study was done to determine the association between domestic violence and undesirable pregnancy events (a composite index developed by including unintended, terminated pregnancy, and complications during pregnancy) using a nationally representative sample in India.

2. Material and methods

2.1. Study design and study participants

This study was conducted as a cross-sectional secondary data analysis of NFHS-5 data. NFHS-5 was conducted in two phases: June 2019 to January 2020 and January 2020 to April 2021. The survey covered about 28 states and 8 union territories (UT) which included 707 districts (administrative units) throughout India [10]. Study participants were women aged 18–49 years for the study analysis.

2.2. Sampling design

NFHS surveys follow a uniform sampling design to obtain a representative sample from national, state/UT, and district levels. In NFHS-5 survey, two-stage stratified sampling was followed. For choosing the primary sampling unit (PSU), census 2011 was used as the sample frame. First, the districts were divided into rural and urban. Each rural stratum was divided into six substrata by crossing three substrata—accounting for village's population—and two substrata—accounting for percentage of scheduled castes (SC) and tribes (ST) population. Using the probability proportional to size (PPS) method, villages were chosen as PSUs within each specified rural sample stratum [10]. SC are communities historically marginalized and subjected to social discrimination and untouchability in India, ST are indigenous communities and other backward castes (OBC) are social groups that are economically and educationally disadvantaged but do not fall under the SC or ST as per the Constitution of India [12].

PSUs with fewer than 40 households were connected to the PSU closest to them. Before PSU selection, they were arranged according to the percentage of women older than 6 years who were literate. A sample of census enumeration blocks (CEBs) was chosen as PSUs using the PPS technique inside each explicit urban sampling stratum. Before PSU selection, they were arranged according to the proportion of SC/ST people. A specified number of households (22 per cluster) were randomly chosen with equal probability in the second stage of the selection process from a newly produced household list in the chosen PSUs [10].

Of 30,456 PSUs selected from 707 districts, fieldwork was completed in 30,198 PSUs. In total, NFHS-5 has gathered information from 636,699 households (response rate 98%), 724,115 women aged 15–49 years (response rate 97%), and 101,839 men aged 15–54 years (response rate 92%). Among 724,115 women, 72,320 women (10%) were selected and interviewed for the domestic violence module of the NFHS-5 survey taking into consideration of only one eligible women per household was randomly selected for domestic violence module [10]. And the response rate of the domestic violence module was 96% where the 4 percent women had privacy and other reasons for not responding. Finally, we included 63,796 women aged 18–49 years who had all the information necessary for the

current study [10].

2.3. Data variables and operational definitions

Independent variables in the model consisted of socio-demographic characteristics of the woman such as age, educational qualification, current employment, marital status, and parity; intimate partner/husband characteristics such as educational qualification, current employment and coercive/controlling behaviour; access to healthcare facilities for medical advice or treatment; and household characteristics such as household members count, geographical region, place of residence, social class, religion and wealth index. Information on the primary independent variable, domestic violence inflicted by intimate partner/husband in 12 months preceding the survey was obtained using structured questions in NFHS-5 survey (**Supplementary appendix**).

The development of the composite index in this study was guided by an extensive review of relevant literature, focusing on methodologies for constructing composite indices in the context of public health [12]. This process enabled us to identify critical variables that are instrumental in measuring undesirable pregnancy events, which were then extracted from the National Family Health Survey (NFHS-5).

Our composite index is structured around three principal dimensions, each representing a distinct aspect of undesirable pregnancy events:

Unintended pregnancy: Women who have reported unwanted pregnancy events in the five years preceding the survey (including the current pregnancies) were classified as having unintended pregnancy.

Terminated pregnancy: Women who have reported to have history of abortion or miscarriage or stillbirth in the five years preceding the survey were classified as having terminated pregnancy.

Complications during pregnancy: Women who have reported to have history of vaginal bleed or convulsions or prolonged labour or severe abdominal pain or high blood pressure in the five years preceding the survey were classified as having complications during pregnancy.

Undesirable events during pregnancy: Defined as presence of *unintended pregnancy* (unwanted pregnancy) or *terminated pregnancy* (abortion/miscarriage/stillbirth) or *complicated pregnancy* (vaginal bleed/convulsions/prolonged labour/severe abdominal pain/high blood pressure).

The composite index developed in this study is a multifaceted tool designed to measure the spectrum of undesirable pregnancy events. Each component of the index – unintended pregnancy, terminated pregnancy, complications during pregnancy, and other undesirable events during pregnancy – plays a crucial role in capturing the comprehensive nature of maternal health challenges.

Each dimension was carefully chosen based on its relevance and frequency in existing research, as well as its potential impact on maternal health outcomes [12]. The variables were then statistically combined into a single index. In constructing this index, we assigned equal weightages to each indicator to ensure a balanced and comprehensive assessment of maternal health challenges. The weightage system was developed to ensure that each component of the index accurately reflects its significance in influencing maternal health.

2.4. Development of conceptual framework

We have developed a conceptual framework, titled “The Comprehensive Model of Reproductive Health Impact (CMRHI)” for our study analysis.

Central Theme: The CMRHI framework is designed to examine the impact of domestic violence on reproductive health of women, considering a range of influencing factors including access to healthcare.

2.5. Primary independent variable

Domestic Violence Exposure: This encompasses reported incidents of physical, emotional, and sexual violence by an intimate partner/husband in the 12 months preceding the survey.

2.6. Secondary independent variables

Socio-Demographic Factors: These include the age, educational qualification, employment status, marital status, and parity.

Intimate Partner/Husband Characteristics: This covers the education, employment status, and coercive/controlling behavior of the partner.

Access to Healthcare: The problem in access to healthcare facilities for medical advice or treatment, considered as a critical factor in the model.

Household Characteristics: These include the number of household members, geographical region, urban or rural residence, social class, religion, and wealth index.

2.7. Dependent variables

Adverse Reproductive Health Outcomes: The framework focuses on outcomes such as unintended pregnancy, terminated pregnancy, complications during pregnancy, and other undesirable events during pregnancy.

Table 1
Sociodemographic characteristics of the study participants, N = 63,796.

Variable	Frequency, n (Unweighted proportion, %)		Weighted proportion (95% CI)	
Characteristics of the women				
Age of women (in years)				
≤19	1000	(1.6)	2.4	(2.1–2.6)
20 to 34	32,686	(51.2)	47.6	(46.8–48.3)
≥35	30,110	(47.2)	50.1	(49.3–50.9)
Educational level				
No education	18,771	(29.4)	28.6	(27.6–29.5)
Primary	9297	(14.6)	13.9	(13.4–14.5)
Secondary	28,906	(45.3)	46.3	(45.4–47.2)
Higher	6822	(10.7)	11.2	(10.6–11.9)
Current employment				
Unemployed	44,825	(70.3)	70.0	(69.1–70.9)
Employed	18,971	(29.7)	30.0	(29.1–30.9)
Marital status				
Currently married	60,426	(94.7)	94.0	(93.5–94.4)
Widowed/Separated/Divorced	3370	(5.3)	6.0	(5.6–6.5)
Parity				
Null	4789	(7.5)	8.3	(7.9–8.8)
Primi	11,436	(17.9)	18.3	(17.6–19.0)
Two and more	47,571	(74.6)	73.4	(72.7–74.1)
Husband Education Level				
No education	11,850	(18.6)	19.6	(18.8–20.4)
Primary	9260	(14.5)	15.1	(14.5–15.7)
Secondary	33,872	(53.1)	51.1	(50.2–52.0)
Higher	8814	(13.8)	14.3	(13.6–15.0)
Husband employment				
Unemployed	12,462	(19.5)	18.4	(17.7–19.2)
Employed	51,334	(80.5)	81.6	(80.8–82.3)
Coercive or controlling behaviour				
Absent	35,179	(55.1)	53.9	(52.8–55.0)
Present	28,617	(44.9)	46.1	(45.0–47.2)
Access to healthcare facility				
No problem	37,097	(58.2)	60.1	(59.0–61.2)
Problem	26,699	(41.9)	39.9	(38.8–41.0)
Characteristics of the household				
Household members				
≤3	14,436	(22.6)	19.9	(19.2–20.5)
4–6	39,325	(61.6)	58.8	(58.0–59.5)
≥7	10,035	(15.7)	21.3	(20.6–22.1)
Place of residence				
Urban	15,477	(24.3)	30.7	(28.9–32.7)
Rural	48,319	(75.7)	69.3	(67.3–71.1)
Social class				
Schedule case	12,149	(19.0)	21.1	(20.2–22.0)
Schedule tribe	12,215	(19.2)	8.9	(8.3–9.5)
Other backward class	24,645	(38.6)	42.0	(40.8–43.1)
Others	14,787	(23.2)	28.1	(27.0–29.3)
Religion				
Hinduism	48,509	(76.0)	79.1	(77.9–80.3)
Islam	7576	(11.9)	16.0	(14.8–17.3)
Christianity	4568	(7.2)	2.6	(2.3–2.9)
Others	3143	(4.9)	2.3	(2.0–2.6)
Geographical region				
North	11,060	(17.3)	7.1	(6.6–7.6)
South	10,806	(16.9)	24.9	(23.4–26.5)
East	10,984	(17.2)	29.8	(27.9–31.7)
West	6544	(10.3)	21.7	(19.9–23.5)
Central	14,825	(23.2)	11.1	(10.4–11.8)
Northeast	9577	(15.0)	5.5	(5.0–6.0)
Wealth index				
Poorest	14,129	(22.2)	19.4	(18.5–20.4)
Poor	14,485	(22.7)	21.2	(20.4–22.0)
Middle	13,257	(20.8)	21.3	(20.6–22.0)
Rich	11,840	(18.6)	20.7	(19.8–21.5)
Richest	10,085	(15.8)	17.5	(16.4–18.6)
Domestic Violence				
Emotional Violence				
Yes	8005	(12.6)	14.1	(13.4–14.7)

(continued on next page)

Table 1 (continued)

Variable	Frequency, n (Unweighted proportion, %)		Weighted proportion (95% CI)	
No	55,791	(87.5)	85.9	(85.3–86.6)
Physical Violence				
Yes	17,229	(27.0)	28.3	(27.3–29.2)
No	46,567	(73.0)	71.7	(70.8–72.7)
Sexual Violence				
Yes	3519	(5.5)	6.1	(5.7–6.6)
No	60,277	(94.5)	93.9	(93.4–94.3)

2.8. Operational dynamics of CMRHI

Direct Impact Pathway: The framework proposes a direct relationship between domestic violence and adverse reproductive health outcomes.

Influence of Secondary Variables: Socio-demographic factors, intimate partner characteristics, access to healthcare, and household factors are posited to independently and collectively influence the impact of domestic violence on adverse reproductive health outcomes.

Integrated Analysis: The combined influence of these variables is assessed to understand their cumulative effect on the specified adverse reproductive health outcomes.

2.9. Statistical analysis

Analysis was performed using STATA v14.2 (StataCorp, College Station, TX, USA). First step was to declare the dataset as survey data by adjusting for the sampling weights and clustering in the sample design using “svyset” command package. Descriptive results were summarized as proportions for categorical variables.

Prevalence of undesirable pregnancy events and its components (unintended, terminated pregnancy and complicated pregnancy) were reported with 95% confidence interval (CI). Poisson regression was performed to determine the factors associated with the outcome (undesirable pregnancy). Poisson regression model with robust error variance, which provides prevalence ratio (PR) was performed in place of commonly applied logistic regression to determine the association between domestic violence and undesirable pregnancy events. Because the odds ratio is difficult to infer for cross-sectional studies causing confusion between risk and odds, leading to a flawed interpretation of data [13]. Variables with a p-value <0.20 in univariable model were considered in multivariable model. Unadjusted and adjusted PR (aPR) with 95%CI was reported. P-value ≤0.05 was considered statistically significant. Spatial distribution of state-wise undesirable pregnancy events along with its components was generated and reported using QGIS v3.28.1 software.

2.10. Ethical statement

The NFHS-5 survey dataset was retrieved after obtaining the necessary authorization from the Demographic Health Survey (DHS) program [11]. Following the approval process, a de-identified dataset was obtained. Informed consent from all participants was obtained during the primary survey. Ethical approval was not applicable for this secondary data analysis of NFHS-5 data which is available in public domain.

3. Results

3.1. Characteristics of study participants

In total, 63,796 women aged 18–49 years were included in study analysis. Table-1 provides sociodemographic details of the study participants. There was equal distribution across all age intervals; about one-fourth (28.6%) of women had no formal education; nearly three-fourths (70%) were unemployed; 73.4% had a parity of two or more. Distribution of the intimate partner/husband’s educational status was fairly similar to that of the women. But, in contrast, about 81.6% were intimate partner/husband employed; nearly 46.1% have coercive or controlling behaviours over their spouses. About 39.9% women faced problem in access to healthcare facilities for her health needs. Regarding household characteristics, around two-thirds (69.3%) belonged to the rural areas; about 42.0% belonged to other backward castes (OBC) and 79.1% follow Hinduism; nearly one-third of women belonged to Eastern region (29.8%) followed by Southern (24.9%) and Western (21.7%) regions of India.

3.2. Undesirable pregnancy events and its components

About 3.2% (95%CI: 2.9%–3.5%) of women aged 18–49 years had unintended pregnancy; 5.1% (95%CI: 4.8%–5.5%) women had ever terminated pregnancy and 20.9% (95%CI: 20.2%–21.5%) women had complications during pregnancy. Overall, prevalence of undesirable pregnancy events was 25.0% (95%CI: 24.4%–25.7%) amongst women aged 18–49 years, covered under domestic violence

module of NFHS-5 survey (Table-2).

Supplementary Figs. 1–3 shows spatial distribution of components of undesirable pregnancy events across the states and UTs in India. Women in Northern and Central states such as Haryana, Delhi, Uttar Pradesh had maximum prevalence of unintended and terminated pregnancy, while women in Southern states had lower prevalence of unintended and terminated pregnancy. Pregnancy complications were predominant in the Northern, Central and Eastern states such as Jammu & Kashmir, Ladakh, Chhattisgarh, Odisha etc. Figure-1 shows spatial distribution of the composite index of undesirable pregnancy events. Odisha and Meghalaya had the highest prevalence of undesirable pregnancy events followed by Uttar Pradesh.

3.3. Factors contributing to undesirable pregnancy events

Table-3 shows the determinants of undesirable pregnancy events amongst the study participants. Age, education, occupation, marital status, parity, intimate partner/husband occupation, coercive behaviour of intimate partner/husband, number of household members, religion, geographical region, and wealth index, each of the three domestic violence forms had p-value <0.20 and were included in the multivariable model.

Women aged ≥ 35 years had significantly lower proportion (aPR-0.14; $p < 0.001$) of undesirable pregnancy events than teenage women aged ≤ 19 years. Women with secondary (aPR-1.32; $p < 0.001$) and higher secondary (aPR-1.70; $p < 0.001$) had higher chance of facing undesirable pregnancy events than women with no formal education. Women with employment had a significantly lower chance of experiencing undesirable pregnancy events (aPR-0.73; $p < 0.001$). Widowed/separated/divorced women had significantly lower proportion of undesirable pregnancy events (aPR-0.50; $p < 0.001$) than the currently married women. Compared to nulliparous women, primipara (aPR-5.04; $p < 0.001$), and multiparous women (aPR-3.72; $p < 0.001$) have experienced significantly higher proportions of undesirable pregnancy events.

Women whose intimate partner/husband with primary education (aPR-0.91; $p = 0.04$) had a higher chance of encountering undesirable pregnancy event than those without employment. Women with limited or faced problem in access to healthcare facility for her sickness (aPR-1.07; $p = 0.01$) had a higher chance of encountering undesirable pregnancy.

Women with 4–6 household family members (aPR-1.35; $p < 0.001$) and ≥ 7 household family members (aPR-1.64; $p < 0.001$) had a higher chance of having undesirable pregnancy event than those with ≤ 3 household members. Women from Central India (aPR-1.05; $p = 0.05$) had a significantly higher proportion, while the women from South (aPR-0.86; $p < 0.001$), East (aPR-0.86; $p < 0.001$) and West (aPR-0.88; $p = 0.01$) regions had experienced significantly lower proportion of undesirable pregnancy events than the women from Northern region. Women belonging to richest (aPR-0.74; $p < 0.001$) and richer (aPR-0.82; $p < 0.001$) wealth quintiles had a significantly lower chance of experiencing undesirable pregnancy events than the women belonging to poorest quintile (Table-3).

After adjusting for all the above-mentioned covariates, the model showed that women facing sexual violence (aPR-1.11; $p < 0.001$) had significantly higher chance of having undesirable pregnancy events than those women who do not face any form of violence (Table-3).

Determinants of components of the undesirable pregnancy events such as unintended, terminated pregnancy and complications during pregnancy were tabulated in Supplementary Tables 1, 2 and 3. Amongst the components, physical and sexual violence was associated with terminated pregnancy, while the other components physical violence was associated with only unintended pregnancy and emotional violence was not associated with any components of undesirable pregnancy events.

4. Discussion

4.1. Main findings

This study was done to determine the association between domestic violence and undesirable pregnancy events using a nationally representative sample (i.e., NFHS-5) in India. Undesirable pregnancy events were a composite index developed by including unintended, terminated pregnancy and complications during pregnancy. Women of younger age, low level of schooling, being unemployed

Table 2

Prevalence of undesirable pregnancy events and its individual components among women aged 18-to-49-years surveyed under domestic violence module in NFHS-5, India, N = 63,796.

Variable	Frequency, n (Unweighted proportion, %)		Weighted proportion (95% CI)	
Unintended pregnancy				
Present	1981	(3.1)	3.2	(2.9–3.5)
Absent	61,815	(96.9)	96.8	(96.5–97.1)
Terminated pregnancy				
Present	3629	(5.7)	5.1	(4.8–5.5)
Absent	60,167	(94.3)	94.9	(94.5–95.2)
Complications during pregnancy				
Present	15,689	(24.6)	20.9	(20.2–21.5)
Absent	48,107	(75.4)	79.1	(78.5–79.8)
Unfavourable pregnancy events				
Present	18,397	(28.8)	25.0	(24.4–25.7)
Absent	45,399	(71.2)	75.0	(74.3–75.6)

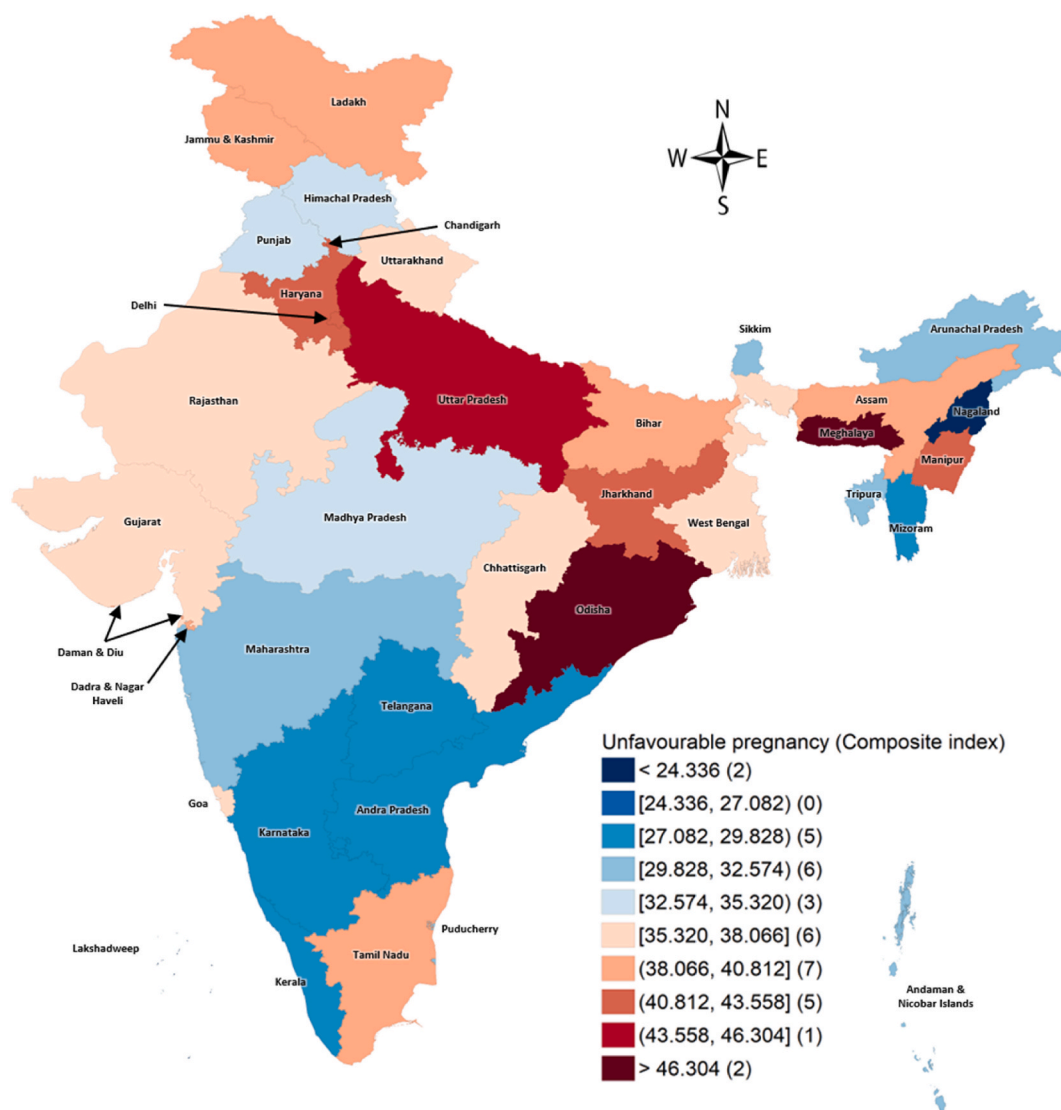


Fig. 1. State- and Union territory-wise geo-spatial prevalence of women aged 15–49 years with undesirable events (composite index) surveyed in NFHS-5 in India, N = 63,796.

and problem in access to healthcare were factors attributed to undesirable pregnancy events. The findings of this study highlight the devastating impact of domestic violence on women’s health during pregnancy. Women with children have more exposure to undesired pregnancy events which might be because of violence related to want of male child or gender preference. The study results suggest that women who experience physical and sexual violence are more likely to have undesirable pregnancy events in the form of unintended, terminated pregnancy and risks of complications during pregnancy. Amongst the individual components, terminated pregnancy had significant association with physical and sexual violence, while other components did not show any significant association.

4.2. Interpretation

In this study, we correlate the recent history of domestic violence (within the last 12 months) with adverse reproductive health outcomes observed over the past five years. This methodological choice is rooted in the understanding that recent experiences of domestic violence can be reflective of an ongoing or recurrent pattern of abuse, which may have significant implications for adverse reproductive health of women.

While the independent variable focuses on the most recent year to capture current and potentially ongoing experiences of domestic violence, the extended timeframe for the dependent variables acknowledges that the consequences of such violence on adverse reproductive health can manifest over a more extended period. This includes both immediate and delayed effects on aspects like unintended pregnancy, pregnancy terminations, and pregnancy complications.

Table 3
 Determinants of undesirable pregnancy events (composite index)^a among women aged 18-to-49-years surveyed under domestic violence module in NFHS-5, India, N = 63,796.

Variable	Unfavourable events, n (%)		Crude prevalence ratio, PR (95% CI)		aPR (95% CI)		P value
Domestic Violence							
Emotional Violence							
Yes	16,185	(29.0)	0.92	(0.85–0.99)	1.01	(0.94–1.08)	0.79
No	2212	(27.6)	Ref		Ref		
Physical Violence							
Yes	13,596	(29.2)	0.94	(0.89–0.99)	1.02	(0.97–1.07)	0.48
No	4801	(27.9)	Ref		Ref		
Sexual Violence							
Yes	17,369	(28.8)	1.03	(0.93–1.15)	1.11	(1.01–1.22)	0.02
No	1028	(29.2)	Ref		Ref		
Characteristics of the mothers							
Age of women (in years)							
≤19	383	(38.3)	Ref		Ref		
20 to 34	15,687	(48.0)	1.19	(1.03–1.39)	0.95	(0.84–1.07)	0.39
≥35	2327	(7.7)	0.15	(0.12–0.18)	0.14	(0.12–0.17)	< 0.001
Educational level							
No education	3683	(19.6)	Ref		Ref		
Primary	2345	(25.2)	1.33	(1.21–1.46)	1.07	(0.98–1.17)	0.11
Secondary	9666	(33.4)	1.92	(1.78–2.07)	1.32	(1.23–1.41)	< 0.001
Higher	2703	(39.6)	2.33	(2.11–2.56)	1.70	(1.55–1.87)	< 0.001
Current employment							
Unemployed	14,489	(32.3)	Ref		Ref		
Employed	3908	(20.6)	0.53	(0.49–0.56)	0.73	(0.69–0.77)	< 0.001
Marital status							
Currently married	18,170	(30.1)	Ref		Ref		
Widow/Separated/Divorced	227	(6.7)	0.24	(0.18–0.33)	0.50	(0.39–0.65)	< 0.001
Parity							
Gravid	514	(10.7)	Ref		Ref		
Primi	5604	(49.0)	4.47	(3.83–5.22)	5.04	(4.31–5.89)	< 0.001
Two and more	12,279	(25.8)	2.05	(1.76–2.39)	3.72	(3.17–4.36)	< 0.001
Husband Education Level							
No education	2627	(22.2)	Ref		Ref		
Primary	2383	(25.7)	1.18	(1.07–1.32)	0.91	(0.84–1.00)	0.04
Secondary	10,335	(30.5)	1.45	(1.34–1.56)	0.96	(0.90–1.03)	0.23
Higher	3052	(34.6)	1.59	(1.45–1.74)	0.99	(0.90–1.08)	0.79
Husband employment							
Unemployed	2782	(22.3)	Ref		Ref		
Employed	15,615	(30.4)	1.43	(1.32–1.54)	1.02	(0.96–1.09)	0.46
Coercive or controlling behaviour							
Absent	10,005	(28.4)	Ref		Ref		
Present	8392	(29.3)	1.03	(0.98–1.09)	0.99	(0.94–1.03)	0.53
Access to healthcare facility							
No problem	10,452	(28.2)	Ref		Ref		
Problem	7945	(29.8)	1.09	(1.04–1.16)	1.07	(1.03–1.12)	0.01
Characteristics of the household							
Household members							
≤3	2546	(17.6)	Ref		Ref		
4–6	11,580	(29.5)	1.76	(1.63–1.90)	1.35	(1.26–1.44)	< 0.001
≥7	4271	(42.6)	2.57	(2.36–2.80)	1.64	(1.52–1.77)	< 0.001
Place of residence							
Urban	4187	(27.1)	Ref		Ref		
Rural	14,210	(29.4)	1.12	(1.05–1.20)	0.98	(0.92–1.04)	0.52
Social class							
Schedule case	3652	(30.1)	Ref		Ref		
Schedule tribe	3663	(30.0)	1.00	(0.92–1.08)	1.04	(0.97–1.12)	0.26
Other backward class	6937	(28.2)	0.95	(0.89–1.02)	1.00	(0.94–1.06)	0.90
Others	4145	(28.0)	0.98	(0.90–1.06)	0.92	(0.86–0.99)	0.02
Religion							
Hinduism	13,581	(28.0)	Ref		Ref		
Islam	2652	(35.0)	1.33	(1.24–1.42)	1.22	(1.14–1.30)	< 0.001
Christianity	1315	(28.8)	0.88	(0.77–1.01)	1.05	(0.93–1.18)	0.46
Others	849	(27.0)	1.01	(0.78–1.31)	1.04	(0.89–1.21)	0.63
Geographical region							
North	3278	(29.6)	Ref		Ref		
South	2398	(22.2)	0.76	(0.71–0.81)	0.83	(0.78–0.89)	< 0.001
East	3434	(31.3)	1.01	(0.94–1.08)	0.86	(0.81–0.92)	< 0.001
West	1643	(25.1)	0.85	(0.77–0.93)	0.88	(0.82–0.96)	0.01

(continued on next page)

Table 3 (continued)

Variable	Unfavourable events, n (%)		Crude prevalence ratio, PR (95% CI)		aPR (95% CI)		P value
Central	4835	(32.6)	1.15	(1.09–1.22)	1.05	(1.00–1.11)	0.05
Northeast	2809	(29.3)	1.06	(0.99–1.14)	0.95	(0.89–1.03)	0.22
Wealth index							
Poorest	4530	(32.1)	Ref		Ref		
Poor	4200	(29.0)	0.97	(0.91–1.04)	0.95	(0.89–1.02)	0.15
Middle	3686	(27.8)	0.89	(0.82–0.95)	0.90	(0.84–0.97)	0.01
Rich	3267	(27.6)	0.84	(0.78–0.91)	0.82	(0.76–0.89)	< 0.001
Richest	2714	(26.9)	0.82	(0.75–0.89)	0.74	(0.67–0.81)	< 0.001

^a Composite index = Unintended pregnancy/Terminated pregnancy,^b/Complicated pregnancy^c

^b Terminated pregnancy = Abortion/miscarriage/stillbirth.

^c Complicated pregnancy = Vaginal bleed/convulsions/prolonged labour/severe abdominal pain/high blood pressure.

By analysing recent domestic violence in the context of adverse reproductive health outcomes over five years, the study aims to provide a comprehensive understanding of how current experiences of violence may be part of a broader pattern of abuse with long-term health consequences. This approach allows us to capture a more nuanced picture of the impact of domestic violence on adverse reproductive health, considering both the immediate and cumulative effects of such experiences.

There were no prior studies examining the impact of domestic violence on the composite index of undesirable pregnancy events in India. However, previous studies have analysed the role of domestic violence with individual components of the index using data from NFHS surveys [5–8,14–17]. The findings of these studies were in line with the current study findings, indicating that domestic violence especially sexual and physical violence has significant impact on the terminated pregnancy. The possible reasons for such association could be physical trauma, which is directly linked with the risk of abortion or miscarriage or stillbirth. Other possible reasons could be chronic stress, delayed or lack of antenatal care, and infections due to domestic violence incidents.

In contrast to previous studies, unintended pregnancy did not have significant association with any form of domestic violence [5, 15]. The possible reasons could be the increased uptake of contraceptive use (increase from 48% in NFHS-4 to 56% in NFHS-5) [10,18], as the women experiencing domestic violence may still have access to family planning services and use contraception to prevent unintended pregnancy. The covid-19 pandemic which overlapped with the NFHS-5 survey period showed an increasing domestic violence also [19]. Another reason could be the differential exposure as not all women experiencing domestic violence may be at risk of unintended pregnancy. For example, women who have completed their families may be less likely to become pregnant and therefore less likely to experience unintended pregnancy as a result of domestic violence. Other factors, such as social support, access to resources, and resilience, may mitigate the effects of domestic violence and reduce the risk of unintended pregnancy. These reasons highlight the complex and nuanced relationship between domestic violence and unintended pregnancy. Further research is needed to better understand the mechanisms by which domestic violence may or may not influence unintended pregnancy.

Along with domestic violence, characteristics of women, her intimate partner/husband and household were also explored. The study results showed that women of higher age (≥ 35 years), multiparous, large number of household members (≥ 7), belonging to poorest or poorer quintile and Northern region had significantly higher chance of having undesirable pregnancy events and its components. Age is an established risk factor as per the existing literature [20–22]. Women from poorer sections of society tend to have limited access to antenatal care or contraceptive services and poorer living conditions, making them vulnerable to undesirable pregnancy events [23,24]. Women in Northern region of the country face significantly higher burden of undesirable pregnancy events, especially when compared to Southern region. This might be due to the variations in sociocultural factors, disparities in financial status, availability and quality of reproductive and maternal health services. Single most important factor affecting the health of the women residing in the Northern region during their pregnancy would be differential access to the basic antenatal care and quality of obstetric care [25].

Amongst these factors, women with higher educational qualifications tend to have higher proportion of the components of undesirable pregnancy events when compared to women with no formal education which is due to better identification and reporting without any bias. Similar association was also found in the secondary data analysis of previous NFHS-4 survey [26]. Though the finding was counter-intuitive, the possible reasons could be the higher age of first pregnancy, as educated women tend to delay starting their families, thereby increasing the risk of such adverse events with advanced maternal age. Another possible reason could be the socio-cultural factor as women with higher levels of education may be exposed to cultural attitudes or expectations that may impact their decision-making around pregnancy and childbirth, such as pressure to pursue careers or have children later in life. These reasons highlight the importance of considering a range of factors when evaluating the impact of education on pregnancy outcomes.

Women who faced difficulties in accessing healthcare facilities for their sickness were found to have a higher probability of experiencing such outcomes. This pivotal finding emphasizes the critical role that access to healthcare plays in shaping reproductive health outcomes. In light of our findings, we advocate for the strengthening of healthcare infrastructure, particularly in underserved regions. The expansion of healthcare facilities, bolstered by adequate staffing and the provision of essential supplies, is imperative. By improving the physical accessibility and resource availability of healthcare services, we can directly address one of the fundamental barriers impacting reproductive health.

The study findings have important implications for policy development and implementation. It highlights the need for policies on domestic violence and promotes women's access to healthcare services during pregnancy. This includes the development of programs that provide women with the resources and support they need to access essential prenatal care and make informed decisions about

their health and the health of their newborn. Policies that provide protection and support for women who experience domestic violence are essential to ensure their safety and well-being during pregnancy and beyond. Healthcare providers, policymakers, and communities must work together to address the issue of domestic violence and ensure that women have safe and healthy pregnancies.

Our study underscores the need to identify and mitigate the barriers that hinder access to healthcare for women. Financial constraints, transportation issues, and socio-cultural factors often restrict the ability of women to seek timely medical attention. Addressing these barriers is crucial in ensuring equitable access to healthcare, which is a determinant of better reproductive health outcomes. We recommend the integration of comprehensive reproductive health services into primary healthcare systems. This would facilitate easier access to crucial services like family planning, antenatal care, and safe abortion services, thereby directly impacting women's reproductive health positively. Our findings highlight the importance of advocating for policies that ensure easy and affordable healthcare access for all women. This includes supporting health insurance schemes that cover adverse reproductive health services and advocating for legal and policy reforms that prioritize women's health and rights.

4.3. Strengths and limitations

The study has certain strengths. To the best of our knowledge, this is the first study to create a composite index for undesirable pregnancy events and assessed its association with domestic violence. The data source is from national-level representative survey across urban, rural and tribal regions. Participant recruitment using a complex sampling technique was accounted during the study analysis. Further, the response rate is high enough to generalise the study findings and large number of participants increases the power of the study. Finally, privacy and confidentiality of the information collected during the survey were maintained given the sensitive nature of the issue. If privacy was not ensured during the interview, their data was not considered during the final analysis. Looking at the limitations, study findings relied on self-reported data, which may be subjected to recall and/or social desirability biases. Being a sensitive issue, underreporting of the violence experienced and the undesirable pregnancy outcomes would be unavoidable. Endogeneity or simultaneity bias is possible between violence and the pregnancy outcomes, leading to reverse causality. The cross-sectional type of the NFHS surveys makes it difficult to infer any causal relationships between domestic violence and undesirable pregnancy outcomes.

5. Conclusions

To conclude, the study results provide evidence of the adverse impact of domestic violence on pregnancy outcomes among women in a nationally representative sample of India. Among the domestic violence physical and sexual violence had significant undesirable pregnancy outcomes. Other factors attributed were younger age, low literacy, and unemployment. It highlights the need for effective policies and programs to address domestic violence and promote maternal health. Further research is needed to validate these findings and to explore and obtain in-depth understanding about this association.

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Data availability statement

This study analyses a nationally representative survey database available freely in the public domain and can be accessed using standard protocols. The data is available in Demographic Health Survey website, <http://dhsprogram.com>.

Ethical statement

Ethical approval was not applicable for this secondary data analysis of the nationally representative survey NFHS-5 as the data is available in public domain; de-anonymized data was retrieved via standard protocols from Demographic Health Survey website, <http://dhsprogram.com>. The survey was performed as per the standard ethical guideline and informed consent was obtained from the participants.

CRedit authorship contribution statement

Premkumar Ramasubramani: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Yuvaraj Krishnamoorthy:** Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Conceptualization. **Karthika Ganesh:** Writing – review & editing, Validation, Methodology. **Lalithambigai Kathiresan:** Writing – review & editing, Validation, Supervision, Methodology. **Vinodhini Kadir:** Writing – review & editing, Writing – original draft, Validation, Supervision, Investigation, Data curation.

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.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e27158>.

References

- [1] Violence against Women Prevalence Estimates, 2018. Published 2021, <https://www.who.int/publications-detail-redirect/9789240022256>. (Accessed 4 February 2023).
- [2] Report of the special Rapporteur on violence against women, its causes and consequences, Rashida Manjoo (A/HRC/26/38, UN Women – Headquarters (2014). Published May 28,, <https://www.unwomen.org/en/docs/2014/5/special-rapporteur-on-violence-against-women-a-hrc-26-38>. (Accessed 5 February 2023).
- [3] J.L. Alhusen, E. Ray, P. Sharps, L. Bullock, Intimate partner violence during pregnancy: maternal and neonatal outcomes, *J Womens Health* 24 (1) (2015) 100–106.
- [4] R. Kabir, M. Haque, M. Mohammadnezhad, et al., Domestic violence and decision-making power of married women in Myanmar: analysis of a nationally representative sample, *Ann. Saudi Med.* 39 (6) (2019) 395–402.
- [5] P. Garg, M. Verma, P. Sharma, C.V. Coll, M. Das, Sexual Violence as a Predictor of Unintended Pregnancy Among Married Women of India: Evidence from the Fourth Round of the National Family Health Survey (2015–16), *BMC Pregnancy Childbirth*, 2022. Published online.
- [6] M. Das, C.G. Tóth, N. Shri, M. Singh, B. Hossain, Does Sexual Intimate Partner Violence (IPV) Increase Risk of Multiple High-Risk Fertility Behaviours in India: Evidence from National Family Health Survey 2015–16, *BMC Public Health*, 2022. Published online.
- [7] M. Bramhankar, R.S. Reshmi, Spousal violence against women and its consequences on pregnancy outcomes and reproductive health of women in India, *BMC Wom. Health* 21 (2021) 382.
- [8] Y. Krishnamoorthy, K. Ganesh, Prevalence and determinants of physical violence and its impact on birth outcomes during pregnancy in India: evidence from a nationally representative survey, *J. Interpers Violence* 37 (5–6) (2022) 2615–2632.
- [9] K. Showalter, C. Mengo, M.S. Choi, Intimate partner violence in India: abuse in India's Empowered action group states, *Violence Against Women* 26 (9) (2020) 972–986, <https://doi.org/10.1177/1077801219848500>.
- [10] International Institute for Population Sciences (IIPS) and ICF, National Family Health Survey (NFHS-5), 2019-21: India, IIPS, 2021.
- [11] The DHS Program - Quality information to plan, monitor and improve population, health, and nutrition programs. Accessed September 27, 2023. <https://dhsprogram.com/>.
- [12] D. Herman, K.Y. Lor, A. Qadree, D. Horn, R. D'Souza, Composite adverse outcomes in obstetric studies: a systematic review, *BMC Pregnancy Childbirth* 21 (1) (2021) 107, <https://doi.org/10.1186/s12884-021-03588-w>.
- [13] A.J. Barros, V.N. Hirakata, Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio, *BMC Med. Res. Methodol.* 3 (2003) 21.
- [14] S. Pengpid, K. Peltzer, Lifetime spousal violence victimization and perpetration, physical illness, and health risk behaviours among women in India, *Int J Environ Res Public Health* 15 (12) (2018) 2737.
- [15] Stephenson R, Koenig MA, Acharya R, Roy TK. Domestic Violence, Contraceptive Use, and Unwanted Pregnancy in Rural India.
- [16] A.K. Upadhyay, K. Kumar, K.S. James, L. McDougal, A. Raj, A. Singh, Association between intimate partner violence and contraceptive use discontinuation in India, *Stud. Fam. Plann.* 53 (1) (2022) 5–21.
- [17] P. Paul, D. Mondal, Association between intimate partner violence and contraceptive use in India: exploring the moderating role of husband's controlling behaviors, *J. Interpers Violence* 37 (17–18) (2021) NP15405–NP15433.
- [18] International Institute for Population Sciences (IIPS) and ICF, National Family Health Survey (NFHS-4), 2015-16: India, 2021. <http://rchiips.org/nfhs/index.shtml>.
- [19] K. Gopi, D.K. Pal, M. Taywade, B.K. Sahoo, Intimate partner violence in India: need for renewed corollary during COVID-19 pandemic, *J. Fam. Med. Prim. Care* 12 (1) (2023) 1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10071919/>. (Accessed 7 October 2023).
- [20] A.P. Frick, Advanced maternal age and adverse pregnancy outcomes, *Best Pract. Res. Clin. Obstet. Gynaecol.* 70 (2021) 92–100.
- [21] A. Khalil, A. Syngelaki, N. Maiz, Y. Zinevich, K.H. Nicolaidis, Maternal age and adverse pregnancy outcome: a cohort study, *Ultrasound Obstet. Gynecol.* 42 (6) (2013) 634–643.
- [22] D. Shan, P.Y. Qiu, Y.X. Wu, et al., Pregnancy outcomes in women of advanced maternal age: a retrospective cohort study from China, *Sci. Rep.* 8 (1) (2018) 12239.
- [23] N. Tanya Nagahawatte, R.L. Goldenberg, Poverty, maternal health, and adverse pregnancy outcomes, *Ann. N. Y. Acad. Sci.* 1136 (1) (2008) 80–85.
- [24] M.K. Kim, S.M. Lee, S.H. Bae, et al., Socioeconomic status can affect pregnancy outcomes and complications, even with a universal healthcare system, *Int. J. Equity Health* 17 (1) (2018) 1–8.
- [25] M. Hamal, M. Dieleman, V. De Brouwere, Social determinants of maternal health: a scoping review of factors influencing maternal mortality and maternal health service use in India, *Public Health Rev* 41 (1) (2020) 13, <https://doi.org/10.1186/s40985-020-00125-6>.
- [26] K.K. Patel, R.K. Saroj, M. Kumar, Prevalence and determinants of adverse pregnancy outcomes among women in India: a secondary data analysis, *Indian J Community Med Off Publ Indian Assoc Prev Soc Med* 46 (3) (2021) 434.