Examining the rural-urban divide in predisposing, enabling, and need factors of unsafe abortion in India using Andersen’s behavioral model

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Abstract

Background: The prevalence of unsafe abortions significantly varies with geography; therefore, more research is needed to understand the rural-urban differences in unsafe abortion practices in India. The present study aims to explore the rural-urban differences in predisposing, enabling, and need factors of unsafe abortion in India.

Methods: The present study used the fourth round of the National Family Health Survey (2015–16) and included the women aged 15–49 who terminated pregnancies by induced abortion during the 5 years prior to the survey (N = 9113) as the study sample. Descriptive statistics, bivariate chi-square significance test and multivariate logistic regression model were used to accomplish the study objectives.

Results: The findings revealed that almost one-third of pregnancies were terminated through unsafe measures with sharp rural-urban contrast. The likelihood of unsafe abortions increases with decreasing women’s age and spousal level of education. Younger women in urban settings were more vulnerable to unsafe abortion practices. In rural settings, women with an uneducated spouse are more likely to have unsafe abortions (OR: 1.92). Poor households were more likely to undergo unsafe abortions, which were more common in rural settings (OR: 1.26). The unmet need for family planning was revealed to be a significant need factor for unsafe abortion, particularly in rural settings.

Conclusion: Although abortion is legal, India’s high estimated frequency of unsafe abortions reveals a serious public health issue. Due to socio-economic vulnerability, unmet family planning needs, and a lack of awareness, significant numbers of women still practice unsafe abortions in India.

Keywords: Unsafe abortion, Rural-urban, Andersen’s behavioral model, India

Background

Unsafe abortion is a serious public health concern, adversely linked to reproductive health issues [1]. In the short term, unsafe abortion accelerates the risk of maternal mortality, haemorrhage, and post-abortion sepsis [2]. Consequently, the long-term risk includes the risk of ectopic pregnancy, premature delivery, miscarriages in subsequent pregnancies, sterility, and other psycho-physical disabilities [1, 3, 4]. In cognizance of prevailing

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The proportion of teenage maternity, unwanted pregnancy, close-spacing pregnancy, and unmet need for family planning is more prevalent in rural areas, which upsurges the demand for induced abortions [22–24]. However, rural India's high illiteracy, poverty, and poor healthcare infrastructure constrain access to safe abortion facilities [23]. The Government of India (GoI) implemented the National Rural Health Mission (NRHM) to improve grass-root level healthcare facilities. Despite the progress in healthcare coverage, there are still disparities based on place of residence [25]. In tune with circumstances, the study hypothesized that rural and urban India might have different socio-demographic patterns and determinants of unsafe abortion.

However, available literature has focused on the prevalence, pattern, and predictors of unsafe abortions [7, 18–20]. Nevertheless, the rural-urban gap in determinants of unsafe abortion practices, particularly in the Indian context using national representative data, remains to be explored. Therefore, sorting out the marginalized sub-groups between rural and urban settings is necessary to ease the inequalities more rationally. In line with this purpose, the present study aims to fill the gap through two central questions: Firstly, what are the socio-economic determinants of self-reported unsafe abortion in India? Secondly, how does the socio-economic determinant vary over geographical dynamics regarding rural and urban settings?

Methods
Data source and participants
The data was drawn from the fourth round of the National Family Health Survey (NFHS-4), conducted in 2015–16. The NFHS, an Indian version of the Demographic and Health Survey (DHS), provides consistent...
### Table 1  Descriptive characteristics of the study population by place of residence, NFHS-4 India, 2015–16

| Region         | India   | Rural India | Urban India |
|----------------|---------|-------------|-------------|
|                | n   | %   | n   | %   | n   | %   |
| **Region**     |      |      |      |      |      |      |
| South          | 1920 | 21.1 | 969 | 18.1 | 951 | 25.4 |
| Central        | 2552 | 28.0 | 1716| 32.0 | 837 | 22.3 |
| Eastern        | 2001 | 22.0 | 1351| 25.2 | 650 | 17.4 |
| North-Eastern  | 531  | 5.8  | 422 | 7.9  | 109 | 2.9  |
| West           | 1109 | 12.2 | 435 | 8.1  | 674 | 18.0 |
| Northern       | 1001 | 11.0 | 475 | 8.8  | 526 | 14.0 |
| **Women’s age**|       |      |      |      |      |      |
| 40+            | 420  | 4.6  | 286 | 5.3  | 134 | 3.6  |
| 35–39          | 1117 | 12.3 | 606 | 11.3 | 511 | 13.6 |
| 30–34          | 2116 | 23.2 | 1168| 21.8 | 948 | 25.3 |
| 25–29          | 3115 | 34.2 | 1824| 34.0 | 1291| 34.5 |
| 20–24          | 2107 | 23.1 | 1300| 24.2 | 807 | 21.6 |
| 15–19          | 237  | 2.6  | 182 | 3.4  | 54  | 1.5  |
| **Caste/Class**|       |      |      |      |      |      |
| General        | 2769 | 30.4 | 1377| 25.7 | 1392| 37.2 |
| OBC            | 3882 | 42.6 | 2312| 43.1 | 1570| 41.9 |
| STs/SCs        | 2462 | 27.0 | 1678| 31.3 | 784 | 20.9 |
| **Women’s education** |       |      |      |      |      |      |
| Secondary/Higher | 6150 | 67.5 | 3243| 60.4 | 2908| 77.6 |
| Primary        | 1177 | 12.9 | 791 | 14.7 | 386 | 10.3 |
| No education   | 1786 | 19.6 | 1333| 24.8 | 453 | 12.1 |
| **Religion**   |       |      |      |      |      |      |
| Non-Muslim     | 7665 | 84.1 | 4705| 87.7 | 2960| 79.0 |
| Muslim         | 1448 | 15.9 | 662 | 12.3 | 786 | 21.0 |
| **Husband’s Education** |       |      |      |      |      |      |
| Secondary/Higher | 1240 | 13.6 | 688 | 12.8 | 552 | 14.7 |
| Primary        | 213  | 2.3  | 141 | 2.6  | 72  | 1.9  |
| No education   | 191  | 2.1  | 148 | 2.8  | 43  | 1.2  |
| Missing        | 7470 | –    | 4390| –    | 3080| –    |
| **Sex composition of children** |       |      |      |      |      |      |
| No child       | 899  | 9.9  | 484 | 9.0  | 415 | 11.1 |
| Daughter Only  | 2587 | 28.4 | 1504| 28.0 | 1083| 28.9 |
| Son Only       | 1851 | 20.3 | 955 | 17.8 | 895 | 23.9 |
| Both           | 3776 | 41.4 | 2423| 45.2 | 1353| 36.1 |
| **Wealth Status** |       |      |      |      |      |      |
| Rich           | 4307 | 47.3 | 1499| 27.9 | 2808| 75.0 |
| Middle         | 1971 | 21.6 | 1350| 25.2 | 620 | 16.6 |
| Poor           | 2836 | 31.1 | 2518| 46.9 | 318 | 8.5  |
| **Exposure to mass media** |       |      |      |      |      |      |
| Yes            | 6289 | 69.0 | 3262| 60.8 | 3027| 80.8 |
| No             | 2824 | 31.0 | 2105| 39.2 | 720 | 19.2 |
| **Women’s working status** |       |      |      |      |      |      |
| Yes            | 353  | 21.4 | 223 | 22.6 | 130 | 19.5 |
| No             | 1299 | 78.6 | 762 | 77.4 | 537 | 80.5 |
| Missing        | 7461 | –    | 4382| –    | 3079| –    |
and reliable data on fertility, mortality, family planning, child nutritional status, reproductive and child healthcare utilization, and other related indicators [26]. The cross-sectional survey adopts a multistage stratified random sampling design in rural and urban areas. The NFHS-4 survey includes a total sample of 699,686 women; only the women aged 15–49 who terminated their pregnancies by induced abortion in the 5 years prior to the survey (N = 9113) were included in the present study.

Outcome variable
The surveys collected information on abortion services using the following questions. In the pregnancy history section of the questionnaire, women were asked: Have you ever had a pregnancy that miscarried, was aborted, or ended in a stillbirth? The response was yes or no. Following that, a question was asked to the women who responded yes: When did the last such pregnancy end? The answers were: (a) the last pregnancy ended before January 2011, and (b) the last pregnancy ended in January 2011 or later. Lastly, a subsequent question was asked to the women who experienced only abortions, excluding miscarriage and stillbirth, of their last pregnancy in January 2011 or later: who performed the abortions? The responses were doctor, nurse, auxiliary nurse midwife (ANM)/lady health visitor (LHV), Dai, family member/relative/friend, self, and others. The responses were categorized into two categories in the present study: safe abortion (coded as 0)—which included induced abortions performed by doctors and nurses/ANM/LHV; and unsafe abortion (coded as ‘1’)—which included induced abortions performed by anybody other than skilled care providers [27].

Table 1 (continued)

|                      | India          | Rural India     | Urban India     |
|----------------------|----------------|-----------------|----------------|
|                      | n  | %           | n  | %           | n  | %           |
| **Women’s autonomy** |    |             |    |             |    |             |
| Yes                  | 7073 | 77.6       | 4084 | 76.1       | 2989 | 79.8       |
| No                   | 2040 | 22.4       | 1283 | 23.9       | 757  | 20.2       |
| **Unmet need for family planning** |    |             |    |             |    |             |
| No                   | 7073 | 77.6       | 4396 | 74.6       | 2294 | 76.8       |
| Yes                  | 2040 | 22.4       | 1495 | 25.9       | 693  | 23.2       |
| **Gestation week**  |    |             |    |             |    |             |
| ≤ 8 weeks            | 1784 | 19.6       | 1011 | 18.8       | 773  | 20.6       |
| 9–12 weeks           | 1047 | 11.5       | 676  | 12.6       | 372  | 9.9        |
| ≥ 13 weeks           | 6282 | 68.9       | 3680 | 68.6       | 2601 | 69.4       |
| **N**                | 9113 | –          | 5367 | –          | 3746 | –          |

Explanatory variables
Andersen’s behavioral model of healthcare utilization is a multilevel model that includes individual and contextual determinants of healthcare utilization [28, 29] and has been used as a conceptual framework in the present study. Using Andersen’s behavioral model of healthcare service utilization, the predictors were divided into three groups in the current study: predisposing, enabling, and need factors (Fig. 1). Predisposing factors included the place of residence (urban, rural), geographical region (north, central, east, northeast, south, and west), women’s age (15–19, 20–24, 25–29, 30–34, 35–39, 40+ years), women’s education level (no education, primary, secondary, or higher), husband’s education level (no education, primary, secondary, or higher), caste/class (general, other backward classes [OBCs], scheduled tribes and scheduled castes [STs/SCs]), religion (Muslim, non-Muslim), and sex composition of living children (no child, daughter only, son only, both) [7, 19]. Enabling factors included maternal wealth status (rich, middle, poor), mass media exposure (yes, no), working status (yes, no), and autonomy (yes, no) [14, 24, 29]. Need factors included the unmet need for family planning (yes, no) and gestational period (8 weeks, 9–12 weeks, ≥13 weeks) [22, 29].

Statistical analysis
Descriptive statistics were presented to understand the distribution of research participants. Further, the bivariate analysis with Pearson’s chi-square significant test was performed to demonstrate the patterns of unsafe abortions by background characteristics. Multivariate logistic regression was applied using “safe abortion practices” as the reference category to access the determinants of unsafe abortions. In multivariate models, three consecutive models were employed based on Andersen’s healthcare...
| Explanatory variables          | Unsafe abortions (%) | Rural-urban difference |
|-------------------------------|---------------------|------------------------|
|                               | India               | Rural India            | Urban India            |                             |
| Total                         | 27.3                | 30.3                   | 23.1                   | 7.2                        |
| Region                        |                     |                       |                       |                             |
| South                         | 9.5                 | 9.7                    | 9.2                    | 0.5                        |
| Central                       | 42.2                | 44.9                   | 36.7                   | 8.2                        |
| Eastern                       | 37.8                | 37.6                   | 38.3                   | −0.7                       |
| North-Eastern                 | 25.3                | 25.4                   | 24.7                   | 0.7                        |
| West                          | 9.5                 | 9.4                    | 9.6                    | −0.2                       |
| Northern                      | 23.5                | 22.1                   | 24.6                   | −2.5                       |
| Women's age                   |                     |                       |                       |                             |
| 40+                            | 29.0                | 30.2                   | 26.5                   | 3.7                        |
| 35–39                         | 27.8                | 34.7                   | 19.7                   | 15.0                       |
| 30–34                         | 25.8                | 29.4                   | 21.3                   | 8.1                        |
| 25–29                         | 27.5                | 30.5                   | 23.1                   | 7.4                        |
| 20–24                         | 27.1                | 28.6                   | 24.7                   | 3.9                        |
| 15–19                         | 36.4                | 31.8                   | 51.8                   | −20                       |
| Caste/Class                   |                     |                       |                       |                             |
| General                       | 26.4                | 27.1                   | 25.7                   | 1.4                        |
| OBC                           | 27.4                | 31.6                   | 21.3                   | 10.3                       |
| ST/SC                         | 28.3                | 31.1                   | 22.1                   | 9.0                        |
| Women's education             |                     |                       |                       |                             |
| Secondary/Higher              | 24.2                | 26.7                   | 21.4                   | 5.3                        |
| Primary                       | 32.9                | 34.4                   | 29.7                   | 4.7                        |
| No education                  | 34.6                | 36.7                   | 28.5                   | 8.2                        |
| Religion                      |                     |                       |                       |                             |
| Non-Muslim                    | 26.8                | 30.3                   | 21.2                   | 9.1                        |
| Muslim                        | 30.4                | 30.6                   | 30.2                   | 0.4                        |
| Husband's Education           |                     |                       |                       |                             |
| Secondary/Higher              | 28.7                | 28.1                   | 29.5                   | −1.4                       |
| Primary                       | 34.8                | 34.3                   | 35.8                   | −1.5                       |
| No education                  | 42.3                | 42.3                   | 42.4                   | −0.1                       |
| Sex composition of children   |                     |                       |                       |                             |
| No child                      | 19.2                | 19.6                   | 18.8                   | 0.8                        |
| Daughter Only                 | 27.2                | 30.2                   | 22.9                   | 7.3                        |
| Son Only                      | 19.6                | 21.0                   | 18.1                   | 2.9                        |
| Both                          | 33.2                | 36.2                   | 27.8                   | 8.4                        |
| Household wealth status       |                     |                       |                       |                             |
| Rich                          | 21.1                | 21.8                   | 20.8                   | 1.0                        |
| Middle                        | 28.2                | 28.2                   | 28.1                   | 0.1                        |
| Poor                          | 36.2                | 36.5                   | 33.7                   | 2.8                        |
| Exposure to mass media        |                     |                       |                       |                             |
| Yes                           | 24.7                | 28.0                   | 21.1                   | 6.9                        |
| No                            | 33.3                | 33.9                   | 31.6                   | 2.3                        |
| Women's working status        |                      |                       |                       |                             |
| Yes                           | 33.7                | 33.2                   | 34.6                   | −1.4                       |
| No                            | 30.5                | 30.7                   | 30.2                   | 0.5                        |
utilization model. First, we considered only predisposing factors (place of residence, geographical region, women's age, and level of education, husband's education level, caste/class, religion, sex composition of living children) in model 1; followed by enabling factors (wealth status, mass media exposure, working status, and autonomy) added in model 2; and finally, need factors (unmet need of family planning, and gestational period) have been included in model 3 to access the adjusted effects of selected explanatory variables. The \( p \leq 0.05 \) threshold for determining variables in the multivariate logistic regression model was considered. Before doing the multivariate analysis, we used the variance inflation factor (VIF) to check for multicollinearity across explanatory variables and found no sign of an issue. The odds ratio (OR), with a 95% confidence interval, is used to present the regression results. STATA version 14.0 was used for all statistical analyses (StataCorp LP, College Station, TX, USA).

### Results

#### Background characteristics of the sample

Table 1 presents the background characteristics of the study sample. The results show that more than half of the sample belonged to the south, central, and eastern regions, irrespective of place of residence. Most of the samples were from the middle reproductive age group (25–29 years) in rural and urban settings. The urban sample population was wealthier and more educated than their rural counterparts. In particular, the percentage of poor and illiterate women was almost two and five times higher in rural compared to urban counterparts. The percentage of uneducated spouses was also twofold higher in rural areas compared to urban counterparts. The unmet need for family planning was slightly higher in rural areas than urban ones.

#### The rural-urban difference in the prevalence of unsafe abortion

In India, the prevalence of unsafe abortion was found to be 7.2% higher in rural areas (30.3%) compared to its urban counterpart (23.1%) (Table 2). Geographical patterns showed that the rural-urban gap in the prevalence of unsafe abortion was highest in the central region (8.2%) and lowest in the west region (−0.2%). Except for the early reproductive age group (15–19 years), the prevalence of unsafe abortion was higher in rural areas compared to urban areas among all peers. However, the prevalence of unsafe abortion was 20% higher among early reproductive women in urban settings (51.8%) than in their rural counterparts (31.8%). Regarding social groups, the prevalence of unsafe abortion was almost 10% higher among socio-economically backward women (SCs/STs/OBCs) who reside in rural areas than their urban counterparts. The rural-urban gap in the prevalence of unsafe abortion was also significant among women who had an only female child and more prevalent in rural settings. Women with an unmet need for family planning in rural areas reported more unsafe abortions than their urban counterparts.

#### Rural-urban differences in predisposing, enabling, and need factors of unsafe abortion

The likelihood of unsafe abortion was found to be 17% more likely in rural areas compared to urban counterparts in India (Table 3, model 1). Women's age, geographical region, and sex composition of living children were significant predisposing factors to unsafe abortions in India, irrespective of place of residence. Household wealth status was found as a significant enabling factor for unsafe abortion in India, particularly in rural settings. The unmet need for family planning was found as a need
| Explanatory variables          | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|-------------------------------|---------------------|---------------------|---------------------|
| **Place of residence**        |                     |                     |                     |
| Urban (Ref)                   | 1.00                | 1.00                | 1.00                |
| Rural                         | 1.17** (1.05,1.3)    | 1.08 (0.96,1.21)    | 1.08 (0.96,1.21)    |
| **Geographical region**       |                     |                     |                     |
| South (Ref)                   | 1.00                | 1.00                | 1.00                |
| Central                       | 5.82*** (4.67,7.25)  | 5.73*** (4.67,7.14)  | 5.75*** (4.61,7.16)  |
| Eastern                       | 5.57*** (4.43,7.01)  | 5.28*** (4.19,6.67)  | 5.30*** (4.26,6.69)  |
| North-Eastern                 | 2.28*** (1.82,2.89)  | 2.16*** (1.72,2.75)  | 2.16*** (1.72,2.74)  |
| West                          | 1.13 (0.81,1.58)     | 1.11 (0.79,1.55)     | 1.12 (0.81,1.57)     |
| Northern                      | 2.68*** (2.11,3.41)  | 2.74*** (2.15,3.48)  | 2.76*** (2.17,3.51)  |
| **Women's age**               |                     |                     |                     |
| 40+ (Ref)                     | 1.00                | 1.00                | 1.00                |
| 35–39                         | 1.30* (1.01,1.66)    | 1.3* (1.01,1.67)     | 1.31*** (1.02,1.69)  |
| 30–34                         | 1.39** (1.1,1.76)    | 1.4** (1.1,1.77)     | 1.42*** (1.1,1.8)    |
| 25–29                         | 1.86*** (1.48,2.35)  | 1.88*** (1.49,2.37)  | 1.91*** (1.51,2.41)  |
| 20–24                         | 2.16*** (1.68,2.76)  | 2.13*** (1.67,2.73)  | 2.15*** (1.68,2.76)  |
| 15–19                         | 3.24*** (2.24,7.6)   | 3.07*** (2.09,4.53)  | 3.08*** (2.09,4.54)  |
| **Caste/class**               |                     |                     |                     |
| General (Ref)                 | 1.00                | 1.00                | 1.00                |
| OBC                           | 1.06 (0.94,1.2)      | 1.05 (0.93,1.19)     | 1.05 (0.93,1.19)     |
| ST/SC                         | 1.17*** (1.03,1.34)  | 1.14* (1.03,1.31)    | 1.15*** (1.02,1.31)  |
| **Women's education**         |                     |                     |                     |
| Secondary/Higher (Ref)        | 1.00                | 1.00                | 1.00                |
| Primary                       | 1.09 (0.95,1.27)     | 1.02 (0.88,1.19)     | 1.03 (0.88,1.19)     |
| No education                  | 1.11 (0.98,1.27)     | 1.01 (0.88,1.17)     | 1.02 (0.88,1.17)     |
| **Religion**                  |                     |                     |                     |
| Non-Muslim (Ref)              | 1.00                | 1.00                | 1.00                |
| Muslim                        | 0.95 (0.83,1.1)      | 0.95 (0.82,1.1)      | 0.96 (0.83,1.1)      |
| **Husband's Education**       |                     |                     |                     |
| Secondary/Higher (Ref)        | 1.00                | 1.00                | 1.00                |
| Primary                       | 0.99 (0.71,1.39)     | 0.98 (0.71,1.38)     | 0.99 (0.71,1.39)     |
| No education                  | 1.75*** (1.23,2.5)   | 1.69*** (1.18,2.42)  | 1.71*** (1.19,2.44)  |
| **Sex composition of children**|                     |                     |                     |
| No living child (Ref)         | 1.00                | 1.00                | 1.00                |
| Daughter Only                 | 1.63*** (1.32,2.02)  | 1.66*** (1.34,2.06)  | 1.62*** (1.30,2.01)  |
| Son Only                      | 1.15 (0.92,1.44)     | 1.18 (0.94,1.48)     | 1.15 (0.91,1.44)     |
| Both                          | 1.84*** (1.49,2.28)  | 1.85*** (1.49,2.3)   | 1.78*** (1.44,2.22)  |
| **Wealth Status**             |                     |                     |                     |
| Rich (Ref)                    | 1.00                | 1.00                | 1.00                |
| Middle                        | 1.12 (0.98,1.29)     | 1.12 (0.97,1.28)     | 1.12 (0.97,1.28)     |
| Poor                          | 1.23*** (1.06,1.42)  | 1.23*** (1.06,1.42)  | 1.23*** (1.06,1.42)  |
| **Exposure to mass media**    |                     |                     |                     |
| Yes (Ref)                     | 1.00                | 1.00                | 1.00                |
| No                            | 1.09 (0.97,1.21)     | 1.08 (0.97,1.21)     | 1.08 (0.97,1.21)     |
| **Women's working status**    |                     |                     |                     |
| Yes (Ref)                     | 1.00                | 1.00                | 1.00                |
| No                            | 0.93 (0.71,1.23)     | 0.93 (0.71,1.23)     | 0.93 (0.71,1.23)     |
factor for unsafe abortion in India, especially among rural dwellers (Tables 3, 4 and 5, model 3).

In particular, the likelihood of unsafe abortions was found to be more prevalent in the rural central and eastern regions than in the reference category, i.e., the southern part. The likelihood of unsafe abortions was found to be almost three times and five times more likely among the early reproductive age group (15–19 years) compared to the advanced reproductive age group (40+ years) in rural and urban areas, respectively (Tables 4 and 5, model 3). The likelihood of unsafe abortion was found to be significantly higher among women with only female children compared to only male or no children in India, irrespective of place of residence (Tables 3, 4 and 5, model 3). The women who belong to the poor wealth quintile in rural India were 26% more likely to access unsafe abortion services than their wealthy counterparts. Furthermore, the women with uneducated spouses were 92% more likely to access unsafe abortion services compared to higher educated spouses in rural settings (Table 4, model 3).

**Discussion**

The prevalence and determinants of unsafe abortion were evaluated in the current study in both rural and urban settings in India. It has been demonstrated that women’s age, geographical region, sex composition of the living children, and husband’s level of education are important predisposing and need factors of unsafe abortion in India, both in rural and urban settings. Our findings support the commonsense predisposing factors to unsafe abortion, as concluded by Andersen in the Indian context [7]. However, household wealth status and unmet need for family planning were found to be enabling and need factors of unsafe abortion, particularly in rural India.

In line with prior studies in India [18, 31] and elsewhere [30], the present study found that unsafe abortion was more prevalent in rural than urban areas. A study by Banerjee & Andersen (2012) revealed that women residing in rural areas are often compelled to abort their pregnancies under untrained providers because of inadequate access to safe abortion procedures and a lack of knowledge about the location of safe abortion [7]. In support of these barriers, several prior studies [28, 32] have exhibited the lack of availability of primary health centres (PHCs) along with untrained health care providers in community health centres (CHCs) as the major hindrances to the utilization of safe abortion services in a rural setting. In addition, women in rural settings usually have a lower degree of autonomy and a high unmet need for family planning, which eventually leads them to access unsafe abortion practices [7, 24].

In line with Andersen’s behavioural model, our study also found geographical region as an important predisposing factor of healthcare utilization in the Indian context [7, 29]. Regarding geographical region, the prevalence of unsafe abortion was found to be significantly high in the rural central and eastern regions and may be aggravated due to the existence of socio-economic deprivation and the availability of limited healthcare services [19]. Both high socio-economic poverty and poor maternal healthcare services in rural central and eastern regions negatively affect safe health care service utilization, as suggested by many prior studies [33]. Andersen (1995) also mentioned that regional inequality in terms of the economy, healthcare facilities, and socio-cultural aspects shapes levels of healthcare utilization [29].

We found that early reproductive women had a higher likelihood of unsafe abortion than advanced reproductive
### Table 4  Odds ratios of unsafe abortion from multivariate binary logistic regression models, NFHS-4 rural India, 2015–16

| Explanatory variables                  | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|----------------------------------------|---------------------|---------------------|---------------------|
| **Geographical region**                |                     |                     |                     |
| South (Ref.)                           | 1.00                | 1.00                | 1.00                |
| Central                                | 5.47*** (3.81,7.85) | 5.54*** (3.86,7.95) | 5.93*** (4.48,7.85) |
| Eastern                                | 5.87*** (3.96,8.71) | 5.78*** (3.88,8.6)  | 5.20*** (3.89,6.96) |
| North-Eastern                          | 2.39*** (1.58,3.63) | 2.23*** (1.46,3.41) | 2.15*** (1.62,3.89) |
| West                                   | 1.5 (0.91,2.45)     | 1.45 (0.88,2.38)    | 0.89 (0.56,1.42)    |
| Northern                               | 3.22*** (2.17,4.77) | 3.27*** (2.24,8.6)  | 2.58*** (1.93,5.1)  |
| **Women's age**                        |                     |                     |                     |
| 40+ (Ref.)                             | 1.00                | 1.00                | 1.00                |
| 35–39                                  | 1.18 (0.74,1.89)    | 1.18 (0.74,1.89)    | 1.35** (1.01,1.82)  |
| 30–34                                  | 1.28 (0.82,1.99)    | 1.27 (0.81,1.98)    | 1.48*** (1.12,1.95) |
| 25–29                                  | 1.62*** (1.04,2.52) | 1.64* (1.05,2.55)   | 2.03*** (1.54,2.67) |
| 20–24                                  | 1.93*** (1.21,3.08) | 1.90** (1.19,3.05)  | 2.27*** (1.69,3.04) |
| 15–19                                  | 5.80*** (2.68,12.57)| 5.45*** (2.49,11.92)| 2.69*** (1.71,4.24) |
| **Caste/Class**                        |                     |                     |                     |
| General (Ref.)                         | 1.00                | 1.00                | 1.00                |
| OBCs                                   | 1.05 (0.85,1.3)     | 1.03 (0.84,1.27)    | 1.04 (0.89,1.22)    |
| STs/SCs                                | 1.08 (0.85,1.37)    | 1.06 (0.83,1.34)    | 1.16 (0.93,1.22)    |
| **Women's education**                  |                     |                     |                     |
| Secondary/Higher (Ref.)                | 1.00                | 1.00                | 1.00                |
| Primary                                | 1.1 (0.84,1.45)     | 1.04 (0.79,1.38)    | 1.01 (0.84,1.21)    |
| No education                           | 1.03 (0.79,1.33)    | 0.94 (0.72,1.24)    | 1.05 (0.88,1.24)    |
| **Religion**                           |                     |                     |                     |
| Non-Muslim (Ref.)                      | 1.00                | 1.00                | 1.00                |
| Muslim                                 | 1.15 (0.92,1.43)    | 1.15 (0.92,1.44)    | 0.85 (0.7,1.03)     |
| **Husband's Education**                |                     |                     |                     |
| Secondary/Higher (Ref.)                | 1.00                | 1.00                | 1.00                |
| Primary                                | 0.52 (0.26,1.02)    | 0.48 (0.24,0.96)    | 1.27 (0.85,1.89)    |
| No education                           | 1.42 (0.66,3.07)    | 1.41 (0.65,3.07)    | 1.92*** (1.27,2.90) |
| **Sex composition of children**        |                     |                     |                     |
| No living child (Ref.)                 | 1.00                | 1.00                | 1.00                |
| Daughter Only                          | 1.63*** (1.12,2.42) | 1.64*** (1.10,2.43) | 1.64*** (1.26,2.13) |
| Son Only                               | 1.62* (1.08,2.43)   | 1.64* (1.09,2.47)   | 1.12 (0.74,1.3)     |
| Both                                   | 2.22*** (1.53,3.3)  | 2.2*** (1.48,3.27)  | 1.66*** (1.28,2.16) |
| **Wealth Status**                      |                     |                     |                     |
| Rich (Ref.)                            | 1.00                | 1.00                | 1.00                |
| Middle                                 | 1.15 (0.9,1.45)     | 1.14 (0.96,1.35)    | 1.26*** (1.10,1.50) |
| Poor                                   | 1.04 (0.77,1.4)     | 1.04 (0.77,1.4)     | 1.26*** (1.10,1.50) |
| **Exposure to mass media**             |                     |                     |                     |
| Yes (Ref.)                             | 1.00                | 1.00                | 1.00                |
| No                                     | 1.22 (0.98,1.52)    | 1.03 (0.9,1.17)     | 1.03 (0.74,1.44)    |
| **Women's working status**             |                     |                     |                     |
| Yes (Ref.)                             | 1.00                | 1.00                | 1.00                |
| No                                     | 0.84 (0.55,1.28)    | 1.28 (0.97,1.7)     | 1.28 (0.97,1.7)     |
| **Women's Autonomy**                   |                     |                     |                     |
| Yes (Ref.)                             | 1.00                | 1.00                | 1.00                |
| No                                     | 0.84 (0.55,1.28)    | 1.28 (0.97,1.7)     | 1.28 (0.97,1.7)     |
women in both rural and urban India, which is consistent with research from Pakistan [34] and Nepal [30] but dissimilar with findings from Ghana [35]. Many previous studies suggested that a lack of knowledge about safe abortion service providers, the legal process of abortion, and the high unmet need for contraception for spacing increased the burden of unsafe abortion among early reproductive women in India and elsewhere [19–21, 34–36]. Furthermore, the likelihood of unsafe abortion was found to be significantly higher among early reproductive women (15–19 years), particularly in urban settings in India. Therefore, further study is needed to explore why the practice of unsafe abortion is so common among the early reproductive age group in metropolitan India.

There was no significant association between women’s level of education or autonomy and the risk of unsafe abortion practice in India. The result was similar to the previous study in India [19] but dissimilar to the findings from Nepal [30]. Furthermore, the insignificant association between women’s education and autonomy and choice of abortion care indicates that Indian women have limited power to make healthcare decisions. At the same time, the husband’s education was protective in performing induced abortions through unsafe methods in rural settings. The result suggested that all major health care decisions in a household are generally taken by the male member, and improving the level of education increases the utilization of safe health services in rural India [37].

Another interesting finding of our study is that the likelihood of unsafe abortions was found to be higher among women who had only daughters than among those who had only sons. This finding is consistent with several previous studies [18, 38]. The possible explanation for the prevailing variation lies in the practice of sex-selective abortions among women with only daughters, which often remained clandestine and were performed in unsafe settings [39, 40]. However, further study is needed to explore the patterns of unsafe abortion by region with high fertility and low sex ratio to understand better the association between sex-selective abortion or unwanted birth abortions and the risk of unsafe abortion practice.

Among the need factors, the unmet need for family planning was found as a significant determinant of unsafe abortion in India; the result is consistent with prior studies in Ghana [41]. Furthermore, women with an unmet need for family planning are more likely to perform unsafe abortions in rural settings. The unmet need for family planning is positively associated with unintended pregnancy, as suggested by many previous studies [18, 21, 41]. Most unintended pregnancies have been terminated through unsafe methods to minimize the cost of abortion and sidestep the legal procedure of induced abortion in India [24, 42].

In this study, household economic status was found as a function of healthcare decisions in India, particularly in rural settings; the findings support Andersen’s behavioral model. The socio-economically deprived individuals in rural settings mainly sought treatment from untrained healthcare providers [33]. As a result, women from socio-economically disadvantaged groups in rural settings who wanted to have an induced abortion typically sought untrained healthcare professionals.

### Policy implications

Our current study’s findings reveal some policy implications. First, an in-depth investigation into the reasons for unsafe abortions in high-focus regions in India is required. Second, safe abortion facilities at the village or ward level are required to ensure service availability and accessibility on the ground level. Third, it could be possible to prevent unsafe abortion by enhancing reproductive health services and reducing unintended

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**Table 4** (continued)

| Explanatory variables | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|-----------------------|---------------------|---------------------|---------------------|
| **Unmet need**        |                     |                     |                     |
| No (Ref)              | 1.00                |                     |                     |
| Yes                   | 1.20*** (1.05,1.37) |                     |                     |
| **Gestation week**    |                     |                     |                     |
| ≤ 8 weeks (Ref)       | 1.00                |                     |                     |
| 9–12 weeks            | 1.00 (0.81,1.24)    |                     |                     |
| ≥ 13 weeks            | 0.95 (0.82,1.11)    |                     |                     |

*OR* odds ratio, *CI* Confidence interval, *Ref* Reference category

*** *p < 0.001  
**  *p < 0.01  
*  *p < 0.05
| Explanatory variables | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|-----------------------|---------------------|---------------------|---------------------|
| **Geographical region** |                     |                     |                     |
| South (Ref.)          | 1.00                | 1.00                | 1.00                |
| Central               | 1.34* (1.18)        | 5.95*** (4.50,7.87) | 5.64*** (3.92,8.11) |
| Eastern               | 1.44*** (1.09,1.9)  | 5.21*** (3.89,6.96) | 5.90*** (3.96,8.80) |
| North-Eastern         | 1.98*** (1.51,2.61) | 2.16*** (1.60,2.9)  | 2.21*** (1.45,3.38) |
| West                  | 2.27* (1.73,3.04)   | 0.88 (0.56,1.41)    | 1.46 (0.89,2.41)    |
| Northern              | 2.83*** (1.81,4.45) | 2.57*** (1.89,3.49) | 3.35*** (2.25,4.98) |
| **Women’s age**       |                     |                     |                     |
| 40+ (Ref.)            | 1.00                | 1.00                | 1.00                |
| 35–39                 | 1.30* (1.01,1.66)   | 1.34* (1.01,1.81)   | 1.19 (0.75,1.91)    |
| 30–34                 | 1.39** (1.11,1.76)  | 1.45** (1.10,1.91)  | 1.27 (0.81,1.99)    |
| 25–29                 | 1.86*** (1.48,2.35) | 2.00*** (1.52,2.63) | 1.65** (1.05,2.57)  |
| 20–24                 | 2.16*** (1.68,2.76) | 2.25*** (1.68,3.01) | 1.89*** (1.18,3.04) |
| 15–19                 | 3.24*** (2.24,7.6)  | 2.70*** (1.72,4.25) | 5.43*** (2.48,11.88) |
| **Caste/Class**       |                     |                     |                     |
| General (Ref.)        | 1.00                | 1.00                | 1.00                |
| OBC                   | 1.06 (0.91,1.23)    | 1.04 (0.89,1.22)    | 1.04 (0.84,1.28)    |
| ST/SC                 | 1.21** (1.03,1.42)  | 1.17 (0.99,1.38)    | 1.05 (0.82,1.34)    |
| **Women’s education** |                     |                     |                     |
| Secondary/Higher (Ref.) | 1.00          | 1.00                | 1.00                |
| Primary               | 1.08 (0.91,1.28)    | 1.01 (0.84,1.21)    | 1.05 (0.79,1.38)    |
| No education          | 1.14 (0.98,1.33)    | 1.04 (0.88,1.23)    | 0.94 (0.71,1.24)    |
| **Religion**          |                     |                     |                     |
| Non-Muslim (Ref.)     | 1.00                | 1.00                | 1.00                |
| Muslim                | 0.86 (0.71,1.04)    | 0.85 (0.7,1.03)     | 1.16 (0.92,1.45)    |
| **Husband’s Education** |                   |                     |                     |
| Secondary/Higher (Ref.) | 1.00          | 1.00                | 1.00                |
| Primary               | 1.29 (0.87,1.93)    | 1.25 (0.84,1.86)    | 1.23 (0.24,1.95)    |
| No education          | 1.98*** (1.32,2.97) | 1.89*** (1.26,2.86) | 1.12* (1.03,1.19)   |
| **Sex composition of children** |                  |                     |                     |
| No living child (Ref.) | 1.00          | 1.00                | 1.00                |
| Daughter Only         | 1.65*** (1.28,2.13) | 1.68*** (1.32,1.88) | 1.60** (1.07,2.38)  |
| Son Only              | 0.99 (0.75,1.3)     | 1.01 (0.77,1.34)    | 1.19** (1.06,1.40)  |
| Both                  | 1.71*** (1.32,2.21) | 1.73*** (1.35,2.25) | 2.11*** (1.41,3.14) |
| **Wealth Status**     |                     |                     |                     |
| Rich (Ref.)           | 1.00                | 1.00                | 1.00                |
| Middle                | 1.14 (0.96,1.35)    | 1.15 (0.9,1.45)     | 1.05 (0.77,1.41)    |
| Poor                  | 1.27** (1.07,1.51)  | 1.05 (0.77,1.41)    |                     |
| **Exposure to mass media** |                |                     |                     |
| Yes (Ref.)            | 1.00                | 1.00                | 1.00                |
| No                    | 1.04 (0.91,1.18)    | 1.22 (0.97,1.52)    |                     |
| **Women’s working status** |               |                     |                     |
| Yes (Ref.)            | 1.00                | 1.00                | 1.00                |
| No                    | 1.04 (0.74,1.45)    | 0.68 (0.42,1.12)    |                     |
| **Women’s Autonomy**  |                     |                     |                     |
| Yes (Ref.)            | 1.00                | 1.00                | 1.00                |
| No                    | 1.29 (0.98,1.72)    | 0.82 (0.53,1.25)    |                     |
pregnancies. Finally, a collaborative negotiation among community-level religious, political, administrative, health representatives and people will be beneficial in spreading fundamental understanding about the updated Medical Termination of Pregnancy Act, 2021, and safe abortion services to the grass-roots level.

Strengths and limitations
The current study has several merits: First, this is the first study to contextualize factors that contribute to unsafe abortion in urban and rural settings. Second, this study systematically examines the similarities and differences between pre-defined factors for healthcare utilization by Andersen and the Indian context. These will be useful for researchers and policymakers to formulate more lenient abortion legislation and healthcare coverage with considering the prevalent risk factors for unsafe abortion in rural and urban India.

Despite having certain advantages, the study also had significant drawbacks. First, the extent of unsafe abortion practices may differ because the data was gathered through self-reporting. Second, the study is restricted to capturing causal relationships between outcome and explanatory variables because of the cross-sectional structure of the data. The current study did not consider other individual-level factors such as self-reluctance to use safe abortion treatments due to stigma, in-law’s disapproval, and societal factors. Finally, selection bias in the study sample may impact the outcomes.

Conclusion
The present study found significant rural-urban divides in unsafe abortion practices based on socio-demographic status. Young women were the most vulnerable regarding unsafe abortion practices in India, particularly in urban settings. The geographical disparity in unsafe abortion practice was found noticeable in India, suggesting that geographical region is an important predisposing factor of reproductive healthcare utilization. Wealth status and unmet need for family planning were found to be enabling and need factors for unsafe abortions in rural India. The present study suggests that there is a need for multi-sectorial programs to reach the target groups with high-unsafe abortion practices. Furthermore, government intervention should also focus on promoting exposure to the local mass media to enhance knowledge and understanding of safety measures for pregnancy termination.

Abbreviations
OR: Odds ratio; IIPS: International Institute for Population Sciences; NFHS: National Family Health Survey; MTP: Medical Termination of Pregnancy; SCs/STs: Scheduled tribes and castes; OBCs: Other Backward Classes; CI: Confidence interval.

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Authors’ contributions
MR and KCD conceptualized and designed the study and written the manuscript. MR and NK conducted statistical analysis. KCD, PD and PC assisted with writing/editing. AR and MR prepared the final draft of the manuscript. All authors read and approved the final manuscript.

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Table 5 (continued)

| Explanatory variables | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) |
|-----------------------|---------------------|---------------------|---------------------|
| Unmet need            |                     |                     |                     |
| No (Ref)              | 1.00                | 1.00                | 1.00                |
| Yes                   | 1.18 (0.96,1.45)    | 1.22 (0.99,1.49)    | 1.23 (1.00,1.51)    |
| Gestation week        |                     |                     |                     |
| ≤8 weeks (Ref)        | 1.00                | 1.00                | 1.00                |
| 9–12 weeks            | 0.76 (0.55,1.06)    | 0.81 (0.58,1.11)    | 0.81 (0.58,1.11)    |
| ≥13 weeks             | 0.85 (0.68,1.05)    | 0.88 (0.71,1.11)    | 0.88 (0.71,1.11)    |

OR: odds ratio, CI: Confidence interval, Ref: Reference category
*** p < 0.001
** p < 0.01
* p < 0.05
books in nationally and internationally recognized journals. The author has published several research articles in highly recognized journals including BMC Public Health, BMC Women’s Health, Journal of Health Management, Children, Geo Journal, Indian Journal of Labour Economics, Spatial and Spatio-temporal Epidemiology, PLoS ONE, International Journal of Infectious Diseases, and OMEGA-Journal of Death and Dying.

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**Availability of data and materials**

The dataset analysed during the current study are available in the Demo-graphic and Health Surveys (DHS) repository, https://dhsprogram.com/data/available-datasets.cfm.

**Declarations**

**Ethics approval and consent to participate**

This study is based on secondary data which is available in the public domain. Therefore, ethical approval is not required for conducting this study.

**Consent for publication**

Not applicable.

**Competing interests**

The authors have no competing interests.

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