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Original Research Article

Factors associated with spontaneous abortion and to implement a home based post abortion care protocol from a prevention perspective in a rural part of Odisha, South-Eastern India: a hospital based cross-sectional study

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ABSTRACT

Background: Spontaneous abortion (SA) is one of the most common unfavourable reproductive outcomes among women around the world, making maternal health promotion a major challenge. The aim of the current study was to identify the potential predictors associated with SA and recognized the need for providing home-based post-abortion care counselling to lower post abortion complications.

Methods: A hospital-based cross-sectional study was conducted among the rural women ages of 18 and 45 years who had experienced at least one spontaneous miscarriage of less than 20 weeks of pregnancy. Participants were interviewed using a standardized questionnaire that included demographic, socioeconomic, and reproductive health information. Home based post abortion care protocol was introduced among the target populations for prevention of post abortion complications and maternal satisfaction was assessed after one week of implementation.

Results: Of the 485 patients screened for eligibility, 24.12% had a history of at least one SA. The multivariate analysis revealed that occurrence of SA in our study is significantly associated with gravidity, multiparity, previous pregnancy complications, with a history of unfavourable fetal outcome and maternal comorbidities. Home based post abortion care protocol resulted higher maternal satisfaction and lower post abortion infection rate.

Conclusions: The findings of our study reveals multiple modifiable factors may increase the risk of spontaneous abortion. One of the community participatory interventions in terms of providing home based post abortion care module resulted a significant impact on improving maternal satisfaction and lower post abortion infection rate among rural women.

Keywords: Spontaneous abortion, reproductive health, recurrent spontaneous miscarriage, primary health care, risk factors, contraceptives

INTRODUCTION

One of the most common concerns a woman may face during early pregnancy is spontaneous abortion (SA), which is mainly caused by different Socioeconomic and medical factors.¹⁻³ A study on the incidence of abortion and unplanned pregnancy in India found that 14% of cases were SA or miscarriage.⁴ SA can result from even any kind

of anatomical structural defect which will affect pregnancy outcome.⁵⁻⁷ In spite of major focus on maternal and newborn care in past decade in India, pregnancy losses including miscarriage have not received much attention. In spite of various laws of abortion in year 1917 implemented still quality care to women facing approaching centers is unsatisfactory.⁸

In 2014, there were 37 abortions per 1000 women among age group 15-44 years in developing countries, compared with 27 per 1000 in the developed regions.⁹ As per the survey conducted in various six states of India in year 2015, approximately 15.6 million abortions took place in the year.⁴ Data from annual health survey (AHA) reported that abortion rate in Odisha in year 2012-2013 was 5.8.¹⁰ Knowledge regarding causes of abortion and reliable data are important aspect for prevention of fetal loss and hostile maternal outcome.¹¹ In year 1994 International conference on population and development (ICPD) stressed that most abortion related deaths can be preventable, and for reduction of maternal morbidity and mortality post abortion care should be prioritize.¹²

Socioeconomic factors played a persuasive part in the health and life expectancies of the pregnancy and impact on pregnant outcomes, it has been seen that risky behavioral and limited access to health benefits are shown by people belonging to low socio economic status.^{13,14} However, up till now, few studies have investigated specifically the relationship between socio-demographic factors and the occurrence of SA, and no consensus has been reached yet. Higher rates of early pregnancy losses also have been reported from malnutrition status and low hemoglobin and low BMI Index.¹⁵ Medical condition such as previous abortion count, history of diabetes, hypertension, thyroid abnormality also lead to negative reproductive health outcomes.¹⁶⁻¹⁹ Also availability of limited resources for maternity service, lack of awareness, misconception about the cause of abortion, cultural stigma and over all poor socioeconomic status limits women's access to quality maternity care.²⁰⁻²² In other hand there is lack of trained and experienced personnel's for providing quality information and counseling on post abortion care in rural health care centers of India.²³ Decisive information on prevalence and associated factors of abortion in Odisha is lacking.

It is the aim of the present study to assess the occurrence of SAs and self-reported data was obtained through a personal interview, to examine different factors, primarily socioeconomic factors, obstetrics factors and pre-existing disease conditions, which could potentially be predictors of the risk for SA. In addition, home based abortion care (HBAC) protocol was introduced among the target populations for prevention of post abortion complications.

METHODS

Study participants

Women in the reproductive age group of 18 to 45 years' old who had at least one spontaneous miscarriage within 20 weeks of gestation and were willing to sign the patient consent form were included in the study over the six-month data collection period.

Women who had history of SA admitted at Khordha district hospital was enrolled in the current study. Women

who did not give consent and not fully completed the interview were excluded. The sample size estimation for this study was calculated based on the report the prevalence of the abortion for one-year period was 14%.⁴ Open Epi software was used for sample calculation by considering a conservative design effect of 2.5 and taking confidence limit as 5% and 95% confidence level, a nonresponsive rate of 5%, the final sample size estimation was 485. Convenient sampling technique was used to select the participants.

Study setting

The study was conducted at selected rural health centre at Maternal and child health centre, Khordha district hospital, Odisha, which is the South-Eastern rural community of India. As per the census report, the district has a total rural population of 11, 67,357 of which 48% are female. Maternal and child health centre of this study setting conducts the antenatal clinic weekly basis and monthly approximately 600-800 women visits to the clinic exclusively for the antenatal services. It has a 6-bedded labour ward and as per the hospital record monthly approximately 300-400 deliveries are conducted and 30 Dilatation and Curettage (D&C) procedures are performed for abortions cases.

Study design

An outpatient hospital based cross-sectional study was conducted to examine potential predictors of the risk for occurrence of SA in women of reproductive age and implementation of HBAC protocol. The protocol was approved by the Institutional Ethical Committee (Ref: IEC/AIIMS BBSR/Nursing/2018-19/21) and formal permission to conduct the study was obtained from the chief district medical officer, Khurdha, Odisha. The researcher informed eligible patients about the study and recruited those who agreed to sign the patient consent form. To ensure patient confidentiality, each enrolled patient was assigned a unique patient identification number and interviewed separately. Each woman was counselled for use of set of care and advices mentioned in the HBAC module before their discharge from hospital.

Development of tool and HBAC module

The content validity of the tool was established by five experts from field of obstetrics and gynaecology. The overall content validity index of the instrument was appropriate which shows high value of Scale-Content Validity Item/Average (S-CVI/Ave=0.92) the Scale-Content Validity Item/Universal agreement (S-CVI/UN=0.86). The internal consistency of the tool was obtained by establishing Cronbach's α (0.845) and found to be reliable. The tool was converted to regional language (Odia) for understanding of the participants again Odia tool was retranslated into English for language validity which was done by language experts. HBAC booklet was developed by the researcher based on WHO

recommendation, related literatures and local cultural practices. The area of content was also validated by the team of experts and it was translated into the regional language (Odia) for providing necessary information about home based care after abortion which may help them to prevent further complications related to abortion procedure and planning for future pregnancy. The protocol consisting of set of instruction which covers self-care after abortion, warning signs after abortion, family planning, preconception counselling for women. The maternal satisfaction was assessed after one week of the implementation during their first follow up and contacted telephonically who couldn't attend the clinic after one week.

Outcome measures

The primary study outcome was assessment of the risk factors associated with SA which included socioeconomic factors, obstetrics factors, pre-existing maternal comorbidities (uterine abnormalities, infections, immunological factors, genetic disorders, clotting disorders and endocrine disorders) and personal habits (occupational exposure, smoking, drugs, alcohol consumption by husband). Secondary study outcome included to assess causes of abortion as perceived by the participants and assessment of the maternal satisfaction of using HBAC protocol and percentage of post abortion complications.

Ethical approval

The protocol was approved by the Institutional Ethical Committee of All India Institute of Medical Sciences (AIIMS), Bhubaneswar, Odisha (Ref: IEC/AIIMS BBSR/Nursing/2020-21/08) and formal permission to conduct the study was obtained from the authority of the study centre. Informed written consent was obtained from each participant before participating in the study.

Data analysis

Data were analysed using the SPSS software version 20. Descriptive statistics such as frequency and percentage were used for determining the demographic characteristic of participants, clinical profile of abortion, and perceived causes of abortion. Logistic regression was used to examine the factors associated with abortion. The Confidence interval for all these tests was kept constant as 95% and $p < 0.05$ as level of significance.

RESULTS

Occurrence of SA and socio-demographic characteristics of women

A total of 117 (24.12%) of the 485 patients who were evaluated for eligibility had a history of at least one SA. The rate of recurrent spontaneous miscarriage (RSM) was

07 (05.98%) among the 117 participants participating in the current study.

The majority of abortion cases 107 (91.45%) were of the age group 20-34 years, and 8 (06.83%) were aged 34 years or older. Mean of weeks of gestation at which abortion took place was eight weeks. All of the cases that were reported were married couples. The majority of the women, 234 (48.24%) had completed primary school education among which 58 (49.57%) reported with abortion. It indicates that women with a lower level of education had the higher proportion of SA. Women belonging to lower family income also reported higher rate of SA. As for employment status, higher proportion of unemployed women 112 (95.72%) reported abortions as compared to employed women. Regarding parity, more prevalence of abortion was reported by women having one or no delivery as compared with having 2 or more deliveries. More than half proportion of women (52.13%) had history of one abortion. Higher proportion of SA found among women with lower level of education, low socioeconomic status, unemployed women and women with less delivery history and one abortion history (Table 1).

Clinical profile of SA cases

The major risk factors identified in the enrolled patients were history of hypertensive disorders (23.93%), bacterial infection (24.78%), uterine fibroid (22.2%), cervical incompetence (13.7%), thyroid disease (19.65%), gestational diabetes mellitus (18.80%), PCOD (11.8%), immunological factors (10.5%) and clotting factors (9.4%). Other conditions such as uterine septum (0.47 %) and bicornuate uterus (0.47 %), and genetic factors (03.41%) were identified among minor number of patients.

Risk determinants for occurrence of SA

The logistic regression analysis showed that occurrence of SA was significantly associated with maternal economic status, multigravida mothers, women having more than two deliveries and having more than two living children, obstetric morbidity history, and complications during previous pregnancy. The strongest predictor for occurrence of SA was complications during previous pregnancy (OR=9.47). Other factors such as, women with a history of unfavourable fetal outcome (Recurrent abortions, early neonatal deaths, stillbirths, intrauterine fetal deaths, intrauterine growth retardation and congenital anomalies) (OR=2.95), having more than two or more previous births (OR=0.59) and multigravida mothers (OR=0.43) were more likely to have SA. The odd of occurrence of SA was 7.6 more among women with low socio economic status compared to women with higher socio economic status. Furthermore, other predictors such as older women (>34 years), those having more than two abortions, poor educational status and those were not using any type of contraception had a higher rate of occurrence

of SA compared to their counter parts, but these differences were not statistically significant (Table 2).

The logistic regression analysis showed that occurrence of SA was significantly associated with some pre-existing medical conditions such as uterine fibroid, cervical incompetence, history of hypertension, clotting factors and husband's Rh negative blood group. The strong predictors for occurrence of SA was cervical Incompetence (OR=5.67) followed by uterine fibroid (OR=2.48). The odd of occurrence of SA was more among women with a history of hypertensive disorders (OR=0.18), infection (OR=0.17) immunological factors (OR=0.34), and clotting disorders (OR=0.13) were more likely to have SA. compared to women with no such medical history (Table 3).

Maternal perception towards cause of abortion

Majority (44.9%) of them perceive abortion is continuation of pregnancy with fetal anomaly, 30.6% perceived it is just loss of fetus and 24.1% believed it may be a god punishment. Women were also asked their perception about causes of abortion, maximum women

perceived it was due to "lifting heavy objects" 63 (29.2%) and other perceived it may be due to infertility 44 (20.4%), past sins in life 43 (15.7%), family stress 23 (14.8%), family history of abortion 24 (11.1%), lack of nutrition 16 (7.4%) and smoking habits 3 (1.4%). Women also perceived the problem what they will encounter after undergoing abortion was severe pain (79.1%) and infertility (19%).

Maternal satisfaction and post abortion complications after implementation of HBAC protocol

The maternal satisfaction regarding the use of HBAC protocol received after the abortion was assessed through a structured interview schedule, using a 5-point Likert scale ranging from "very dissatisfied" to "very satisfied." All women had expressed their satisfaction after receiving the counselling sessions about HBAC protocol. In addition, post-abortion complications were assessed in terms of conditions requiring hospitalization, blood transfusion, intravenous fluids or intravenous antibiotics. After post implementation of HBAC protocol, approximately 13% had infection and maximum women (87%) had no infection history (Table 4).

Table 1: Demography and baseline characteristics of enrolled patients.

Sl. no.	Demographic characteristics	Total (n=485) N (%)	SA (n=117) N (%)
1.	Age (years)		
	<20	338 (69.69)	2 (01.70)
	20-34	112 (23.09)	107 (91.45)
	>34	35 (7.21)	8 (06.83)
2.	Women's education		
	Graduation	33 (6.80)	10 (08.54)
	High school	218 (44.94)	49 (41.88)
	Primary school	234 (48.24)	58 (49.57)
3.	Women's employment status		
	Unemployed	275 (56.70)	112 (95.72)
	Employed	210 (43.29)	05 (04.27)
4.	Family income		
	Rs. 11,708-19,515	174 (35.87)	11 (09.4)
	Rs. 3,908-11,707	311 (64.12)	106 (90.59)
5.	Marital status		
	Married	485 (100)	117 (100)
6.	Gravida		
	1	140 (28.86)	42 (35.89)
	2	105 (21.64)	30 (25.64)
	3	144 (29.69)	30 (25.64)
	>3	96 (19.79)	15 (12.82)
7.	Number of living children		
	0	158 (32.57)	48 (41.02)
	1	145 (29.89)	34 (29.05)
	2+	182 (37.52)	35 (29.91)
8.	H/O miscarriage		
	0	178 (36.70)	49 (41.88)
	1	264 (54.43)	61 (52.13)
	2	43 (08.86)	07 (05.98)

Continued.

Sl. no.	Demographic characteristics	Total (n=485) N (%)	SA (n=117) N (%)
	Contraceptive use		
9.	Yes	70 (14.43)	23 (19.65)
	No	415 (85.56)	94 (80.34)
	Any complication during pregnancy		
10.	Yes	390 (80.41)	44 (37.60)
	No	95 (19.58)	73 (62.39)
	Any complication during labour		
11.	Yes	336 (69.27)	28 (23.93)
	No	149 (30.72)	89 (76.06)
	Bad obstetrical history		
12	Yes	364 (75.05)	20 (17.09)
	No	121 (24.94)	97 (82.90)

Table 2: Association of socio-demographic and prenatal factors with spontaneous abortion(n=485).

Sl. no.	Characteristics	No abortion (n=368) N (%)	Spontaneous abortion (n=117) N (%)	OR (95%)	P value
	Age (years)				
1.	20-34	336 (75.8)	107(24.2)	Ref	Ref
	<20	05 (71.4)	02 (28.6)	1.25 (0.24-6.56)	0.787
	>34	27 (77.1)	8 (22.9)	0.93 (0.41-2.10)	0.863
	Women's education				
2.	Graduation	23 (69.7)	10 (30.3)	Ref	Ref
	High school	169 (77.5)	49 (22.5)	0.66 (0.29-1.49)	0.325
	Primary school	176 (75.2)	58 (24.8)	0.75 (0.34-1.68)	0.497
	Family income				
3.	11,708-19,515	163 (93.7)	11 (6.3)	Ref	Ref
	3,908-11,707	205 (65.9)	106 (34.1)	7.6 (3.98-14.73)	0.00*
	Gravida				
4.	1	98 (70.0)	42 (30.0)	Ref	Ref
	2	75 (71.4)	30 (28.6)	0.933 (0.53-1.6)	0.808
	3	114 (79.2)	30 (20.8)	0.614 (0.35-0.05)	0.077
	≥3	81 (84.4)	15 (15.6)	0.43 (0.22-0.83)	0.013*
	Parity				
5.	0	110 (69.9)	48 (30.4)	Ref	Ref
	1	107 (76.4)	33 (23.6)	0.70 (0.42-1.18)	0.188
	2	130 (79.3)	34 (20.7)	0.59 (0.36-0.99)	0.048*
	≥3	21 (91.3)	2 (8.7)	0.21 (0.49-0.96)	0.045*
	Living children				
6.	0	110 (69.6)	48 (30.4)	Ref	Ref
	1	111 (76.6)	34 (23.4)	0.70 (0.42-1.17)	0.176
	≥2	147 (80.8)	35 (19.2)	0.54 (0.33-0.90)	0.018*
	History of spontaneous abortion				
7.	0	129 (72.5)	49 (27.5)	Ref	Ref
	1	203 (76.9)	61 (23.1)	0.79 (0.51-1.22)	0.292
	≥2	36 (83.7)	7 (16.3)	0.51 (0.21-1.22)	0.133
	Complication during pregnancy				
8.	No	346 (82.6)	73 (17.4)	Ref	Ref
	Yes	22 (33.3)	44 (66.7)	9.47 (5.35-16.77)	<0.001*
	Complication during labour				
9.	No	308(77.6)	89(22.4)	Ref	Ref
	Yes	60 (68.2)	28 (31.8)	1.61 (0.972-2.68)	0.064
	Bad obstetrical history				
10.	No	344 (78.0)	97 (22.0)	Ref	Ref
	Yes	24 (54.5)	20 (45.5)	2.95 (1.56-5.57)	0.001*

Continued.

Sl. no.	Characteristics	No abortion (n=368) N (%)	Spontaneous abortion (n=117) N (%)	OR (95%)	P value
11.	Contraceptive use				
	Yes	47 (67.1)	23 (32.9)	Ref	Ref
	No	321 (77.3)	94 (22.7)	0.59 (0.34-1.03)	0.067

*Significant.

Table 3: Associated maternal co-morbidities and incidence of spontaneous miscarriage.

Sl. no.	Enrolled (n=485) Risk factors	No abortion N (%)	Spontaneous abortion N (%)	OR (95%)	P value
1.	Uterine anomalies				
	No	268 (75.1)	89 (24.9)	Ref	Ref
	Yes	100 (78.1)	28 (21.9)	0.84 (0.52-1.36)	0.489
2.	Uterine fibroid				
	No	330 (78.4)	91 (21.6)	Ref	Ref
	Yes	38 (59.4)	26 (40.6)	2.48 (1.43-4.30)	0.001*
3.	Cervical Incompetence				
	No	358 (78)	101(22)	Ref	Ref
	Yes	10 (38.5)	16(61.5)	5.67(2.49-12.88)	0.000*
4.	Endocrine disorders				
	No	309 (71.5)	95 (23.5)	Ref	Ref
	Yes	59 (72.8)	22 (27.2)	1.21 (0.70-2.08)	0.484
5.	History of hypertension				
	No	94 (55.3)	76 (44.7)	Ref	Ref
	Yes	274 (87.0)	41 (13.0)	0.18 (0.11-0.28)	<0.001*
6.	Genetic disorders				
	No	350 (75.3)	115 (24.7)	Ref	Ref
	Yes	18 (90.0)	2 (10.0)	0.33 (0.77-1.47)	0.150
7.	Clotting disorders				
	No	327 (74.0)	115(26.0)	Ref	Ref
	Yes	41 (95.3)	2(4.7)	0.13(0.33-0.58)	0.007*
8.	Infections				
	No	94 (55.3)	76 (44.7)	Ref	Ref
	Yes	274 (87.0)	40 (12.8)	0.17 (0.11-0.27)	<0.001*
9.	Immunological factors				
	No	334 (78.4)	113 (25.3)	Ref	Ref
	Yes	34 (89.5)	4 (10.5)	0.34 (0.12-1.00)	0.050*
11.	Prior exposure to radiation				
	No	255 (74.8)	86 (25.2)	Ref	Ref
	Yes	113 (78.5)	31 (21.5)	0.813 (0.510-1.29)	0.386
12.	Personal factors				
	No	290 (76.5)	89 (23.5)	Ref	Ref
	Yes	78 (73.6)	28 (26.4)	1.16 (0.714-1.91)	0.533

*Significant.

Table 4: Maternal satisfaction and post abortion complication (HBAC utilization).

Maternal satisfaction and post abortion complication		
A.	Maternal satisfaction (n=117)	N (%)
	Very satisfied	76 (64.95)
	Satisfied	30 (25.64)
	Fairly satisfied	11 (09.40)
B.	Post abortion infection (n=117)	
	Infection	15 (12.82)
	No infection	85 (87.18)

DISCUSSION

The occurrence of spontaneous miscarriage in India has been reported to be around 10% to 14% and 5.8% in Odisha in year 2012-2013.^{3,4} However, our study observed a much higher rate of proportionate prevalence for SA (24.12%) with the reference of total women delivered during six months' period at the study center.

Maternal age has long been recognized as a separate risk factor for miscarriage.² Women in India who were 31–49 years old at the time of their first birth were more likely to have a spontaneous miscarriage than women who were younger at the time of their first birth.²³ Miscarriage is reported to occur 10% of the time in women aged 20–24 years and 51% of the time in women aged 40–44 years.²⁴ A higher proportion of women belonging to age group 20-34 year experienced more SA was found in this study as well. Our finding was in consistent with study conducted in Nepal which reported more SA occurred in age group 25-34years.²⁵

Women with a high educational attainment had a lower incidence of SA than women with a low educational attainment, according to the current study findings. Educational attainment has long been recognized as a reliable measure of social status. A higher degree of education is linked to improved health by encouraging a healthier lifestyle.⁷ Current study found that higher rate of SA was among unemployed women which is in consist with study done in India at Mumbai found that higher rate of abortion among unemployed 89.4%.²¹ In the present study women with low family income reported more SA compared to higher, which is contradicted with the study done in Ghana which reported higher abortion rate among women belonging to richer family.²⁶

Our study had established that occurrence of SA was more among women with a history of hypertension. These findings are in consistent with study conducted by in Ethipoia which reported positive history of abortion in women with hypertension during pregnancy.²⁶ Cervical incompetence among women showed a significant association with occurrence of SA followed by uterine abnormality, this finding is consistence with a study conducted in Egypt which reported uterine fibroid affects 20-60% of women which leads to recurrent pregnancy losses.¹³

SA can be caused by environmental, genetic, anatomical, endocrine, thrombophilia, and viral illnesses.²² The proportion of SA was higher (12.6%) in individuals who had history of uterine abnormalities.⁶ According to our findings, 21.9% of women with uterine abnormalities had SA, with cervical incompetency and uterine fibroid being strong predictors. Previous research has indicated that viral and bacterial infections are both linked risk factors for recurrent miscarriage in patients with recurrent miscarriage.²⁸ Bacterial infections (22.0%) was discovered to be a substantial risk factor for abortion in our

investigation. Chromosomal abnormalities contribute to 50% of spontaneous miscarriages.²⁹ However, the number of chromosomal abnormalities found in this study was relatively low, which can be related to the absence of any diagnostic tests on the patients who were enrolled.

Our study may have some limitations. The first limitation is that HBAC protocol effectiveness could not assessed due to absence of control group, which may compromise the study's validity. Second, because the assessment of some self-reported abortion factors was collected, there is a possibility of response error due to respondent recollection bias.

CONCLUSION

This study found a higher prevalence of SA among rural women. Women with a lower socioeconomic class, multigravida mothers, women who had more than two deliveries and having more than two living children, women with a poor obstetric history, and women who had problems during prior pregnancies were all at a higher risk of SA. Uterine abnormalities like cervical incompetency and uterine fibroid was found to be the strong predictors of SA. Home based post abortion care protocol resulted a higher maternal satisfaction and lower post abortion infection rate. Finally, our research suggests that developing a community-level action plan for post abortion care and addressing wrong maternal perception towards abortion will help to improve reproductive quality of life among rural women.

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REFERENCES

1. Regan L, Rai R. Epidemiology and the medical causes of miscarriage. Best practice & research clinical obstetrics & gynaecology. 2000;14(5):839-54.
2. Andersen AM, Wohlfahrt J, Christens P, Olsen J, Melbye M. Maternal age and fetal loss: population based register linkage study. BMJ. 2000;320(7251):1708-12.
3. Patki A, Chauhan N. An epidemiology study to determine the prevalence and risk factors associated with recurrent spontaneous miscarriage in India. The Journal of Obstetrics and Gynecology of India. 2016;66(5):310-5.
4. Singh S, Shekhar C, Acharya R, Moore AM, Stillman M, Pradhan MR, et al. The incidence of abortion and unintended pregnancy in India, 2015. The Lancet Global Health 2018;6(1):e111-20.

5. Gao GP, Zhang RJ, Zhang XJ, Jia XM, Li XD, Li X, et al. Prevalence and associated factors of induced abortion among rural married women: A cross-sectional survey in Anhui, China. *Journal of Obstetrics and Gynaecology Research* 2015;41(3):383-91.
6. Galamb Á, Pethő B, Fekete D, Petrányi G, Pajor A. Uterine anomalies in women with recurrent pregnancy loss. *Orvosi Hetilap* 2015;156(27):1081-4.
7. Hu X, Miao M, Bai Y, Cheng N, Ren X. Reproductive factors and risk of spontaneous abortion in the jinchang cohort. *International Journal of Environmental Research and Public Health*. 2018;15(11):2444.
8. Gerdtts C, Vohra D, Ahern J. Measuring unsafe abortion-related mortality: a systematic review of the existing methods. *PloS one*. 2013;8(1):e53346.
9. Sedgh G, Bearak J, Singh S, Bankole A, Popinchalk A, Ganatra B, et al. Abortion incidence between 1990 and 2014: global, regional, and subregional levels and trends. *The Lancet* 2016;388(10041):258-67.
10. Sethi B. Annual health survey-Key highlights for Odisha. Government of Odisha. 2011.
11. Kochar PS, Dandona R, Kumar GA, Dandona L. Population-based estimates of still birth, induced abortion and miscarriage in the Indian state of Bihar. *BMC pregnancy and childbirth*. 2014;14(1):1-9.
12. Ganatra B, Tunçalp O, Johnston HB, Johnson BR, Gulmezoglu AM, Temmerman M. From concept to measurement: operationalizing WHO's definition of unsafe abortion. *Bulletin of the World Health Organization*. 2014;92:155.
13. Yassin KM. Incidence and socioeconomic determinants of abortion in rural upper Egypt. *Public Health* 2000;114(4):269-72.
14. Phelan JC, Link BG. Controlling disease and creating disparities: a fundamental cause perspective. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*. 2005;60(Special_Issue_2):S27-33.
15. Dhaded SM, Somannavar MS, Jacob JP, McClure EM, Vernekar SS, Yogesh Kumar S, et al. Early pregnancy loss in Belagavi, Karnataka, India 2014–2017: a prospective population-based observational study in a low-resource setting. *Reproductive Health* 2018;15(1):15-22.
16. Santos AP, Coelho ED, Gusmão ME, Silva DO, Marques PF, Almeida MS. Factors associated with abortion in women of reproductive age. *Revista Brasileira de Ginecologia e Obstetrícia*. 2016;38:273-9.
17. De Valk HW, van Nieuwaal NH, Visser GH. Pregnancy outcome in type 2 diabetes mellitus: a retrospective analysis from the Netherlands. *The Review of Diabetic Studies*. 2006;3(3):134.
18. Clark K, Barton JR, Istwan N, Rhea D, Desch C, Sibai A, et al. PP179. The influence of prior abortion on rates of gestational hypertension/pre-eclampsia and spontaneous preterm delivery in nulliparous women. *Pregnancy Hypertension: An International Journal of Women's Cardiovascular Health* 2012;2(3):337.
19. Iravani AT, Saeedi MM, Pakravesh J, Hamidi S, Abbasi M. Thyroid autoimmunity and recurrent spontaneous abortion in Iran: a case-control study. *Endocrine Practice* 2008;14(4):458-64.
20. WHO H. Sexual health and its linkages to reproductive health: an operational approach. Geneva: WHO. 2017.
21. Pallikadavath S, Stones RW. Maternal and social factors associated with abortion in India: a population-based study. *International Family Planning Perspectives*. 2006;4:120-5.
22. Berer M. Making abortions safe: a matter of good public health policy and practice. *Bulletin of the World Health Organization* 2000;78:580-92.
23. Maharana B. Correlates of Spontaneous and Induced Abortion in India: an investigation using a nationwide large scale survey data. *International Institute for Population Sciences, Mumbai, India*; 2011.
24. Larsen EC, Christiansen OB, Kolte AM, Macklon N. New insights into mechanisms behind miscarriage. *BMC medicine*. 2013;11(1):1-0.
25. Yogi A, KC P, Neupane S. Prevalence and factors associated with abortion and unsafe abortion in Nepal: a nationwide cross-sectional study. *BMC pregnancy and childbirth*. 2018;18(1):1-0.
26. Hinkosa L, Tamene A, Gebeyehu N. Risk factors associated with hypertensive disorders in pregnancy in Nekemte referral hospital, from July 2015 to June 2017, Ethiopia: case-control study. *BMC Pregnancy and Childbirth*. 2020;20(1):1-9.
27. Saleh HS, Mowafy HE, Hameid AA, Sherif HE, Mahfouz EM. Does uterine fibroid adversely affect obstetric outcome of pregnancy? *BioMed research international* 2018; 2018.
28. Nigro G, Mazzocco M, Mattia E, Di Renzo GC, Carta G, Anceschi MM. Role of the infections in recurrent spontaneous abortion. *The Journal of Maternal-Fetal & Neonatal Medicine*. 2011;24(8):983-9.
29. Gonçalves RO, Santos WV, Sarno M, Cerqueira BA, Gonçalves MS, Costa OL. Chromosomal abnormalities in couples with recurrent first trimester abortions. *Revista Brasileira de Ginecologia e Obstetrícia*. 2014;36:113-7.

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