ORIGINAL ARTICLE

Impact of Unintended Pregnancy on Maternal and Neonatal Outcomes

Reza Omani-Samani[1] · Mehdi Ranjbaran[1] · Maryam Mohammadi[1] · Arezoo Esmailzadeh[2] · Mahdi Sepidarkish[1] · Saman Maroufizadeh[1] · Amir Almasi-Hashiani[1]

About the Author

Dr. Reza Omani-Samani has been academic staff of Royan Institute (as a referral center for fertility in I. R. Iran) for 14 years, and currently he is the head of Department of Epidemiology and Reproductive Health. His interested research filed is health reproduction and bioethics.

Reza Omani-Samani is Asst Prof., MD, head of Epidemiology Department at Royan Institute, Ph.D in Bioethics, Department of Epidemiology and Reproductive Health, Reproductive Epidemiology Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran. Mehdi Ranjbaran is a researcher at Royan Institute, Ph.D in Epidemiology, Department of Epidemiology and Reproductive Health, Reproductive Epidemiology Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran. Maryam Mohammadi is a researcher at Royan Institute, M.Sc in Biostatistician, Department of Epidemiology and Reproductive Health, Reproductive Epidemiology Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran. Arezoo Esmailzadeh is Asst Prof., MD, Gynecologist, Faculty of Medicine, Department of Gynecology, Zahedan University of medical sciences, Zahedan, Iran. Mahdi Sepidarkish is a researcher at Royan Institute, Ph.D in Epidemiology, Department of Epidemiology and Reproductive Health, Reproductive Epidemiology Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran. Saman Maroufizaeh is a researcher at Royan Institute, Ph.D in Biostatistician, Department of Epidemiology and Reproductive Health, Reproductive Epidemiology Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran. Amir Almasi-Hashiani is a researcher at Royan Institute, Ph.D in Epidemiology, Department of Epidemiology and Reproductive Health, Reproductive Epidemiology Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Tehran, Iran.

✉ Amir Almasi-Hashiani
  amiralmasi2007@gmail.com

1 Department of Epidemiology and Reproductive Health, Reproductive Epidemiology Research Center, Royan Institute for Reproductive Biomedicine, ACECR, Bani Hashem Place, Hafez St., P.O. Box: 16635148, Tehran, Iran

2 Department of Obstetrics and Gynecology, Zahedan University of Medical Sciences, Zahedan, Iran

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Abstract

Background Pregnancy outcomes might be affected by unintended pregnancy such as preeclampsia, preterm birth, cesarean section and low birth weight. The aim of the present study is to assess the association between unintended pregnancy and pregnancy outcomes.

Methods This was a cross-sectional study conducted in 103 hospitals in Tehran, Iran, in July 2015. The data were collected by trained midwives. The interested independent variable was unintended pregnancy and also preeclampsia, weight gain during pregnancy, preterm birth, cesarean section and low birth weight were considered as interested outcomes, and the association of unintended pregnancy and interested outcomes were assessed.

Results Out of 5152 cases, 1021 (19.82%) cases were unintended pregnancy. There was no significant relationship between unintended pregnancy and low birth weight (adjusted OR 0.67, 95% CI 0.403–1.13, $P = 0.138$), the risk of preterm birth (adjusted OR 1.15, 95% CI 0.850–1.57, $P = 0.351$) and preeclampsia (adjusted OR 1.21, 95% CI 0.846–1.75, $P = 0.289$). The results of multiple linear regression model showed that the mean difference between two groups was 0.70 kg, and weight gain mean in unintended pregnant women significantly was lower than unintended pregnant women (mean difference = 0.70, 95% CI 0.14–1.26 kg, $P = 0.014$). Multiple logistic regression showed that after adjusting confounders, there was a significant relationship between unintended pregnancy and cesarean section, and the adjusted odds of cesarean section in unintended pregnant women was 1.32 times of intended pregnant women (95% CI 1.07–1.63, $P = 0.009$).

Conclusion We found higher risk of cesarean section and inappropriate weight gain during pregnancy as adverse outcomes of unintended pregnancy in adjusted model.

Keywords Gestational weight gain · Preterm birth · Low birth weight · Cesarean delivery · Unintended pregnancy

Introduction

Unintended pregnancy is known as one of the most important public health issues and is defined as pregnancies that are mistimed, unplanned or unwanted at the time of conception [1]. The outcomes of the unwanted pregnancy also apply to social spectrum, such as family welfare. This type of pregnancy is a grave concern which should be addressed from various aspects such as human right and a public health [1, 2].

In 2012, 85 million pregnancies which was 40% of all pregnancies were unintended worldwide, of these, 50, 13 and 38% ended in abortion, miscarriage and unplanned birth [3]. In Iran, despite all the efforts of the government about family planning, only about 55.4% use contraceptive methods [4] and unwanted pregnancy prevalence in Iran equals 30.6% [5]. The failure of these methods might be due to their complications and some demographic factors such as age, education are the most important reasons for not using these methods and unintended pregnancies [4]. Unintended pregnancy and its complications are followed by adverse consequences for the women and the society including abortions and maternal death [6, 7]. According to the reports from World Health Organization, about 21.6 million (18.5 million in developing countries) women experience an unsafe abortion each year worldwide and 47,000 women die from unsafe abortion complications each year (approximately 13% of all maternal deaths) [8].

Several studies have been conducted in the context of unwanted pregnancy adverse effects [6, 7]. Unwanted pregnancy is associated with an increase in intentional abortion, preterm delivery, low birth weight, and some ensuing complications related to pregnancy [9–11]. It is well known that newborn health is strongly affected by unwanted pregnancy [2]. It is argued that most of unwanted pregnancy occurs in developing countries bearing adverse and ripple effect of it on health, economic and social development of societies. Various pregnancy outcomes might be affected by unintended pregnancy such as preeclampsia, preterm birth, cesarean section and low birth weight. The aim of the present study is to assess the association between unintended pregnancy and pregnancy outcomes.

Materials and Methods

A hospital-based cross-sectional study was conducted and 5170 deliveries from 103 hospitals in Tehran (Capital of Iran) were included in this research in 2015. The desired data was collected from medical centers with obstetrics and gynecology wards. The required data was gathered at the time of delivery or 2 or 3 days later for unstable women. The sampling process was carried out for 2 weeks, and the data was collected by 103 trained midwives or nurses.

Variables

In this paper, the interested independent variable was unintended pregnancy, for this purpose, a question asked by the midwives or nurses to the women who had delivered. Preeclampsia, weight gain during pregnancy, preterm birth, cesarean section and low birth weight were

considered as interested outcomes, and the association of unintended pregnancy and interested outcomes was assessed. At these associations mother's age, mother's education, father's education, mother's occupation, pre-pregnancy BMI, number of previous pregnancies, number of previous delivery and number of spontaneous abortions were considered as confounding variables, and their effects were controlled with a logistic regression model.

Ethical Consideration

The current study was allowed by the Ethical Committee of Royan Institute, Tehran, Iran (Ethical code: 91000357). For all participants, the aims of the study were clearly presented at the beginning of the study. Confidentiality and secrecy of pregnant women were guaranteed, and an unwritten informed consent was obtained from all subjects.

Statistical Analysis

Quantitative and qualitative variables described as mean (Standard Deviation) and frequency (percentage), respectively, and crude and adjusted odds ratio were used to evaluate the relationship of interested risk factor and outcomes. Asset-based, consumption expenditure, and income are three established methods to determine the economic status. In the present study, economic status of pregnant women was measured based on the asset base method. In asset base method, participants were asked regarding having some assets, likes freezer, dish washing machines, private cars, vacuum cleaner, handicraft carpet, three-dimensional TV, side by side refrigerator, a microwave, laptop computer, smart phone, the number of rooms and area of residence. Principal components analysis (PCA) was used to compute the score of the economic status of

these pregnant women. Univariate and multiple logistic regressions were used to analysis the data. Akaike information criterion (AIC) of models was calculated to assess the fitting of the logistic regression models, and the model with the lowest AIC was considered as a final model. All statistical analysis was done by Stata software (Stata Corp LP, College Station, TX Stata). P value less than 0.05 was considered as a significant level.

Results

In this study, 5152 cases were included in the analysis (18 cases were excluded because of missing data in outcome variable), 1021 cases were unintended pregnancy (19.82%) and 4131 cases were intended pregnancy. The mean of mother's age, father's age and mother's pre-pregnancy BMI were 29.23 (SD = 5.74), 33.54 (SD = 5.93) and 24.91 (SD = 4.32), respectively. The majority of mothers were housewife ($n = 4509$, 87.5%). In terms of mothers and fathers education level, most of them were diploma (12 years education) 40.08 and 35.52%. More information is provided in Table 1.

Unintended Pregnancy and Preeclampsia

The prevalence of preeclampsia in intended and unintended pregnant women was 4.62 and 5.98%, respectively. The results showed that unadjusted odds of PE in unintended pregnant women were 1.31 times of intended pregnant women (OR 1.31, 95% CI 0.97–1.76, $P = 0.073$) (Table 2). After adjusting for potential confounders, the results of multiple logistic regression showed that there is no significant relationship between unintended pregnancy and PE (adjusted OR 1.21, 95% CI 0.846–1.75, $P = 0.289$).

Table 1 The frequency of demographic and clinical factors based on intended or unintended pregnancy

Variables		Intended pregnancy	Unintended pregnancy
Mother's age	Mean (SD)	29.00 (5.35)	30.10 (5.57)
Father's age	Mean (SD)	33.33 (5.77)	34.56 (6.37)
Mothers BMI	Mean (SD)	28.82 (4.24)	25.30 (4.64)
Preeclampsia	No	3939 (80.42%)	959 (19.58%)
	Yes	191 (75.79%)	61 (24.21%)
Preterm birth	Term	3638 (80.72%)	869 (19.28%)
	Preterm	359 (75.90%)	114 (24.10)
Type of delivery	Vaginal delivery	1139 (80.55%)	275 (19.45%)
	Cesarean section	2786 (80.43%)	678 (19.75%)
Birth weight	Normal	3693 (80.40%)	900 (19.60%)
	LBW	220 (82.71%)	46 (17.29%)
Parity status	0	1046 (90.72%)	107 (9.28%)
	1 or more	3085 (77.14%)	914 (22.86%)

Table 2 Impact of unintended pregnancy on maternal and neonatal outcomes and neonatal outcomes when compared with intended pregnancy

Variables	Unadjusted estimate			Adjusted estimate		
	OR	95% CI	*P* value	OR	95% CI	*P* value
Preeclampsia	1.31	0.97–1.76	0.073	1.12	0.846–1.75	0.289
Preterm birth	1.32	1.06–1.66	0.012*	1.15	0.850–1.57	0.351
Cesarean section	1.00	0.86–1.17	0.921	1.32	1.07–1.63	0.009*
Low birth weight	0.85	0.61–1.18	0.357	0.67	0.403–1.13	0.138

*Statistically significant

Unintended Pregnancy and Weight Gain During Pregnancy

The mean of weight gain during pregnancy in intended and unintended pregnant women were 13.66 (SD = 6.68) and 12.58 (SD = 6.89), respectively, unintended pregnant women had significantly lower weight gain. The results of multiple linear regression model showed that after adjusting for potential confounders the mean difference between two groups was 0.70 kg, and weight gain mean in unintended pregnant women significantly was lower than unintended pregnant women (mean difference = 0.70, 95% CI 0.14–1.26 kg, *P* = 0.014).

Unintended Pregnancy and Preterm Birth

This study showed that there is a significant difference in terms of preterm birth occurrence in intended and unintended pregnant women (8.98 vs. 11.60%, *P* = 0.012), and the odds of preterm birth in unintended pregnant women was 1.32 times of intended pregnant women (95% CI 1.06–1.66) (Table 2), but after adjusting for confounders, there was no significant relationship between unintended pregnancy and the risk of preterm birth (adjusted OR 1.15, 95% CI 0.850–1.57, *P* = 0.351).

Unintended Pregnancy and Cesarean Section

The results showed that the prevalence rate of cesarean section in intended and unintended group was considerably high (70.98 vs. 71.17%), but there was no significant difference between two groups (OR 1.00, 95% CI 0.86–1.17, *P* = 0.921) (Table 2). Multiple logistic regression showed that after adjusting for aforementioned confounders, there was a significant relationship between unintended pregnancy and cesarean section and the adjusted odds of cesarean section in unintended pregnant women was 1.32 times of intended pregnant women (95% CI 1.07–1.63, *P* = 0.009).

Unintended Pregnancy and Low Birth Weight

In this study, 266 cases (5.47%) were low birth weight (LBW), and the prevalence rate on LBW in intended and unintended pregnant women were 5.63 and 4.86%, respectively (OR 0.85, 95% CI 0.61–1.18, *P* = 0.357) (Table 2). Even after adjusting for aforementioned confounder variables, there was no significant relationship between unintended pregnancy and low birth weight (adjusted OR 0.67, 95% CI 0.403–1.13, *P* = 0.138).

Parity and unintended pregnancy

In this study, 22.34% of women were nulliparous and 77.66% were primiparous or multiparous. The prevalence of unintended pregnancy in nulliparous was 9.28% and in primiparous or multiparous was 22.86% (Table 2). The odds of unintended pregnancy in primiparous or multiparous was 2.89 times compared to nulliparous (OR 2.89, 95% CI 2.34–3.58, *P* = 0.001). After adjusting confounder variables, it was revealed that there is a significant relationship between unintended pregnancy and parity, i.e., the odds of unintended pregnancy in primiparous or multiparous was 2.39 times in compared to nulliparous (OR 2.39, 95% CI 1.91–2.99, *P* = 0.001).

Discussion

Based on the results of multiple logistic regression after adjusting for potential confounders, we found that weight gain mean in unintended pregnant women significantly was lower than intended pregnant women. The adjusted odds of cesarean section in unintended pregnant women were 1.32 times of intended pregnant women, and also there is a significant relationship between unintended pregnancy and parity. But we did not find any significant relationship between unintended pregnancy with PE, LBW and also preterm birth.

We found that the weight gain of mothers with unintended pregnancy was lower than intended pregnancy. Our literature review showed that unintended pregnancy can lead to cost and series adverse outcomes for mother, baby, family and even the community [12–14]. Evidence has shown that while antenatal and delivery care decrease in women with unintended pregnancy, maternal risk

behaviors such as alcohol and illicit drug use and cigarette smoking increase [2, 15]. Therefore, behavior such as not paying attention to proper weight gain during pregnancy is predictable in these women.

In the present study, we did not find any significant relationship between unintended pregnancy with PE, LBW and also preterm birth. But in the study conducted in Ghana, the prevalence of unintended pregnancy among women with PE was reported 32.6% which was high [16]. Also the risk of preterm birth and LBW was reported high in the unintended pregnancies [2]. Shah et al. in a systematic review found an increased risk of preterm and LBW among unintended pregnancies [17]. It may be because that many factors predict this birth outcomes [18, 19], and we adjusted some of them. As we have seen, our univariate analysis results were consistent with existing literature. Different methods of measurement and classification of intention in pregnancy is another reason for inconsistency between studies [2].

In our study, odds of cesarean section in unintended pregnant was more than intended but literature did not support this finding. Increased odds in our study may be because of others factors and study characteristics that affect cesarean section. High sample size and multiple analyses, which allowed assessing the effect of potential confounders, were the main strengths of this study.

One of the main limitations of the study was that only delivered women were assessed. Usually, they do not want to report if their pregnancy was intended or unintended. Another limitation of this study is that we could not estimate the causal effect of unintended pregnancy on maternal and neonatal outcomes because of the nature of the study (i.e., cross-sectional study).

Conclusion

We found higher risk of cesarean section, inappropriate weight gain during pregnancy as adverse outcomes of unintended pregnancy in adjusted model. By preventing unintended pregnancy, we can prevent adverse effects on maternal and child health and subsequently maternal morbidity and mortality.

Compliance with Ethical Standards

Conflict of interest ROS has received research grants from Royan Institute. All authors report no conflict of interest.

Ethical approval The study was approved by the Ethical Committee of Royan Institute. All procedures performed in studies involving human participants were in accordance with the ethical standards of the research institution and/or nationwide research committee and in compliance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

References

1. Yazdkhasti M, Pourreza A, Pirak A, et al. Unintended pregnancy and its adverse social and economic consequences on health system: a narrative review article. Iran J Public Health. 2015;44(1):12–21.
2. Gipson JD, Koenig MA, Hindin MJ. The effects of unintended pregnancy on infant, child, and parental health: a review of the literature. Stud Fam Plann. 2008;39(1):18–38.
3. Sedgh G, Singh S, Hussain R. Intended and unintended pregnancies worldwide in 2012 and recent trends. Stud Fam Plann. 2014;45(3):301–14.
4. Sadat-Hashemi SM, Ghorbani R, Majdabadi HA, et al. Factors associated with contraceptive use in Tehran, Iran. Eur J contracept Reprod Health Care. 2007;12(2):148–53.
5. Moosazadeh M, Nekoei-moghadam M, Emrani Z, et al. Prevalence of unwanted pregnancy in Iran: a systematic review and meta-analysis. Int J Health Plan Manag. 2014;29(3):e277–90.
6. Tsui AO, McDonald-Mosley R, Burke AE. Family planning and the burden of unintended pregnancies. Epidemiol Rev. 2010;32(1):152–74.
7. Trussell J. The cost of unintended pregnancy in the United States. Contraception. 2007;75(3):168–70.
8. Ahman E, Shah I. Unsafe abortion: global and regional estimates of the incidence of unsafe abortion and associated mortality in 2008. 2011.
9. Morse JE, Ramesh S, Jackson A. Reassessing unintended pregnancy: Toward a patient-centered approach to family planning. Obstet Gynecol Clin N Am. 2017;44(1):27–40.
10. Hall KS, Dalton VK, Zochowski M, et al. Stressful life events around the time of unplanned pregnancy and women's health: exploratory findings from a national sample. Matern Child Health J. 2017;21(6):1336–48.
11. Biggs MA, Upadhyay UD, McCulloch CE, et al. Women's mental health and well-being 5 years after receiving or being denied an abortion: a prospective, longitudinal cohort study. JAMA Psychiatry. 2017;74(2):169–78.
12. Singh A, Singh A, Mahapatra B. The consequences of unintended pregnancy for maternal and child health in rural India: evidence from prospective data. Matern Child Health J. 2013;17(3):493–500.
13. Bahk J, Yun SC, Kim YM, et al. Impact of unintended pregnancy on maternal mental health: a causal analysis using follow up data of the Panel Study on Korean Children (PSKC). BMC Pregnancy Childbirth. 2015;15:85.
14. Lete I, Hassan F, Chatzitheofilou I, et al. Direct costs of unintended pregnancy in Spain. Eur J contracept Reprod Health Care. 2015;20(4):308–18.
15. Orr ST, James SA, Reiter JP. Unintended pregnancy and prenatal behaviors among urban, Black Women in Baltimore, Maryland: The Baltimore Preterm Birth Study. Ann Epidemiol. 2008;18(7):545–51.
16. Adu-Bonsaffoh K, Seffah JD. Linking unintended pregnancy to the burden of pre-eclampsia in a tertiary hospital in Ghana. J West Afr Coll Surg. 2015;5(4):17–29.

17. Shah PS, Balkhair T, Ohlsson A, et al. Intention to become pregnant and low birth weight and preterm birth: a systematic review. Matern Child Health J. 2011;15(2):205–16.

18. Vakilian K, Ranjbaran M, Khorsandi M, et al. Prevalence of preterm labor in Iran: a systematic review and meta-analysis. Int J Reprod BioMed. 2015;13(12):743–8.

19. Ranjbaran M, Jafary-Manesh H, Sajjadi-Hazaneh L, et al. Prevalence of low birth weight and some associated factors in Markazi Province, 2013–2014. World J Med Sci. 2015;12(3):252–8.