DETERMINANTS OF SHORT INTER PREGNANCY INTERVAL: A SYSTEMATIC REVIEW

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ABSTRACT:

BACKGROUND: *Optimal birth spacing is very much important for maternal, fetal and neonatal health. Short interpregnancy interval (SIPI) is one of the major concerns of health care providers and is often associated with many modifiable and non-modifiable risk factors / determinants.*

OBJECTIVE: *To review determinants of short interpregnancy interval in existing literature*

METHODOLOGY: *This systematic review was conducted at department of Biostatistics, Faculty of Medicine, Universiti Sultan Zainal Abidin, Medical Campus, Kuala Terengganu, Malaysia. Online search engines and networks were used to find full length papers available freely in peer reviewed journals, with clear methodology and written in English language. A total of 2100 articles were initially found and after careful screening 12 articles were included. Articles that applied odds ratio (OR) or adjusted odds ratios (AOR) as statistical measures were finally selected.*

RESULTS: *The top 10 determinants of SIPI were found as female age < 25 years (AOR =12.16), breast feeding < 24 months (AOR=9.6), Sub-optimum breast-feeding (AOR = 7.01), breast feeding < 1 year (AOR = 6.18), last child female (AOR = 5.73), maternal age 19-24 years (AOR = 5.4), maternal age 26-30 years (AOR = 5.20), poor wealth index(AOR = 4.89), no family planning (OR = 3.95), not having desire to have the last child (AOR = 3.63).*

CONCLUSION: *Maternal age, less breastfeeding, low socio-economic status and lack of family planning are major determinants of SIPI. Complex features and disparities are found in literature mostly due to inconsistent operational definition of SIPI used in these studies.*

Keywords: Risk factors, logistic regression, odd ratio, pregnancy, birth spacing Word count 249.

INTRODUCTION

The duration between two consecutive live births is termed as birth spacing and it begins immediately after birth of the first child [1]. The transition of fertility in Pakistan is relatively low [2]. Population like Pakistan with high fertility rate has significant association with short IPIs as reported in literature. Therefore, it has become a global interest of all international health agencies as well as other family planning programmers to increase the interpregnancy interval and consequently birth spacing and improve maternal and child health outcomes [3]. As birth spacing is still a challenge for the reproductive health of developing and under-developing countries, the women living in these regions have higher risk of perinatal deaths due to SIPI [4].

Literature has reported a number of maternal, genetic, environmental and social risk factors for SIPI but the most important ones include maternal age [1] low socio-economic status, social and cultural ideals [5], ethnic differences, low level of education, profession of husband, parity, duration of breastfeeding, gender of the next child, not using contraceptive methods soon after the birth, unawareness about the interpregnancy intervals as well as family planning, the patterns of menstrual cycle, smoking, history of miscarriage, the status of survival of newborn, multiple births, unplanned pregnancy [6, 9]and mode of delivery [10].

One study showed a significant association of SIPI with maternal age. More than 65% of teenage mothers aged 15-19 years had SIPI, followed by women aged 20-29 years (35%) and women of older age were mostly reported to have longer IPIs [11]. Another study reported that females not having a Bachelor's degree were twice likely to have SIPI compared to those with a Bachelor's degree (23 vs. 13%). Similarly, unmarried females have higher chances of SIPI compared to married females (24 versus 19%) [11]. Considering the implications of SIPI on health of mother and children, it is therefore important to adhere to optimal birth spacing and use of contraceptive methods to achieve this [12]. Identification of modifiable risk factors of SIPI can also help prevent it, which are comparatively less studied [12].

Hence, the current study is deigned to explore determinants of short interpregnancy interval reported in existing literature. This study can help to establish guidelines to convince and achieve normal birth gap. By achieving appropriate birth spacing, maternal and neonatal morbidity and mortality me be reduced.

MATERIALS AND METHODS

This study was planned and conducted at department of Biostatistics, Faculty of Medicine, Universiti Sultan Zainal Abidin, Medical Campus, Kuala Terengganu, Malaysia. This systematic review was conducted to explore determinants of short interpregnancy interval reported in existing literature**.** The literature was searched through internet search engines and network searching via Google Scholar, PubMed, Research Gate and Scopus using specific key words. BOLEAN search strategy was opted and keywords, solely and using operative terms of and/or were used to find literature. Keywords included "interpregnancy interval", "birth spacing", "short inter pregnancy", "risk factors of SIPI", "determinants of SIPI" and others. Paper published in peer reviewed journals, having clear methodology and objective, freely available, written in English language were also searched and included in this systematic review. Studies were excluded if articles were paid, had copyright or permission issues or where interpregnancy interval was used as dependent variable. Two internal reviewers independently made final selection and articles were included in this study.

A total of 2100 articles were initially found and after very careful screening 12 articles are included in this systematic review. Articles that applied odds ratio (OR) or adjusted odds ratios (AOR) as statistical measures were finally selected. All published studies were found initially, after careful screening only 12 studies were included in final analysis. In final table, study name, total sample size, percentage for short inter pregnancy interval is given in text or if it was not present in the text it was calculated as percentages or number of cases having short interpregnancy interval, which were calculated and taken in round number if needed. The findings are placed in tables with headings as Factors (this was the main variable used as determinant of SIPI), categories (the sub groups of the determinants that was used to calculate magnitude of risk of SIPI in presence of factor) and statistics used [Odds ratio or adjusted odds ratio with or without 95% confidence interval (CI)]. Graphical presentation was given for determinants using their respective OR/AOR using SPSS version 22.

RESULTS

A total of 12 studies were finally taken in this study, in which the possible determinants of short interpregnancy interval identified were maternal age, age at first marriage, females education, husband related factors, socioeconomic status, female's job status, family planning, unintended pregnancy, breast feeding, irregular menstruation, sex of children, parity, number of child, death of previous child, minority, health facility, previous SIPI. Among these 12, studies a total of 53 factors were explored.

Top 10 factors explored

The top 10 determinants of SIPI were found as female age < 25 years (AOR =12.16)[9], breast feeding < 24 months (index child) (AOR=9.6)[13], Sub-optimum breast-feeding (AOR = 7.01)[14], breast feedingless than 1 year (AOR = 6.18)[15], last child female (AOR = 5.73)[12], maternal age 19-24 years (AOR = 5.4)[13], maternal age 26 to 30 years (AOR = 5.20)[9], poor wealth index(AOR = 4.89)[6], no family planning (OR = 3.95)[15], not having desire to had the last child (AOR = 3.63)[14]

Analysis of sub Category with higher OR / AOR

The most common factors among sub categories were female's age < 25 years [AOR = 12.16, 95% CI (4.72, 31.30)[9]], younger age at first marriage [AOR = 2.10, 95% CI (1.19, 3.69)[16]], low educational status [AOR = 3.05, 95% CI (1.68, 3.83)[16], poor wealth index [AOR= 4.89, 95% CI (1.81, 13.25)[6]], no family planning [OR=3.95, 95% CI (2.21, 7.05)[15]], unplanned pregnancy [OR = 2.9, 95% CI: 2.2, 3.9)[17]], breast feeding for < 24 months (index child) [AOR= 9.6, 95% CI (8.93, 19.39)[13]], irregular menstruation [AOR = 2.17 (95% CI 1.40, 3.37)][9], last child female [AOR = 5.73, 95% CI (3.18, 10.310)[12]], parity >3 [AOR = 3.12, 95% CI (1.42, 6.84)[9]], living children > 4 [OR=2.77, 95% CI (1.77-4.33)[14]], death of the preceding child [AOR = 1.97, 95% CI (1.59, 2.45)[18]], being Muslim [AOR = 2.02, 95% CI (1.20, 3.40)[14]], long distance from health facility [AOR = 1.32, 95% CI (1.11–1.56)[18]] and previous history of SIPI [AOR = 2.5, 95% CI (1.48, 4.11)[13]]. The detailed results are given in Table-1.

TABLE-1: Determinants of SIPI in 12 studies

Factors	Categories	Statistics used	Ref
Maternal Age	19-24 years	AOR = 5.4, 95% CI (1.54, 8.9)	13
	Age < 25 years	AOR = 12.16, 95% CI (4.72, 31.30)	9
	26 to 30 years	AOR = 5.20, 95% CI (2.62, 10.32)	9
	31 to 35 years	AOR = 2.90, 95% CI (1.50, 5.64)	9
	Older age	OR = 1.7, 95% CI (1.1, 2.5)	17
	Change in age as one year	OR = 1.11, 95% CI (1.08, 1.15)	4
Age at first marriage	20-24 years	AOR = 1.37, 95% CI (1.18–1.60)	18
	25-29 years	AOR = 1.65, 95% CI (1.20–2.25)	18
	Younger age at first marriage	AOR = 2.10, 95% CI (1.19, 3.69)	16
Females Education	Secondary education or higher	AOR = 1.26, 95% CI (1.09, 1.45)	4
	No formal education	AOR = 2.36	12
	Higher education	AOR = 2.11	9
Husband's related factors	Low educational status	AOR = 3.05, 95% CI (1.68, 3.83)	16
	Higher education	AOR = 1.32, 95% CI (1.01, 1.73)	18
	Unemployed	AOR = 1.23, 95% CI (1.04, 1.45)	18
Socioeconomic status	Poor wealth index	AOR= 4.89, 95% CI (1.81, 13.25)	6
	Poorest wealth quintile	AOR = 1.82, 95% CI (1.39, 2.39),	18
	Poorer wealth quintile	AOR = 1.58; 95% CI: 1.21, 2.06),	18
	Middle wealth quintile	AOR = 1.61; 95% CI: 1.24, 2.10),	18
	Richer wealth quintile	AOR = 1.54; 95% CI: 1.19, 2.00),	18
Female's job status	Being unemployed	AOR = 1.16, 95% CI (1.03, 1.31)	18
Family planning	No family planning	OR=3.95, 95% CI (2.21, 7.05)	15
	Non-use of contraceptive	AOR = 2.44, 95% CI (1.55, 3.82)	14
	Modern contraceptive use	AOR = 2.79, 95% CI (1.58, 4.940)	19
	Modern contraceptive use	AOR = 1.94, 95% CI (1.09, 3.45	16
Unintended pregnancy	Unintended pregnancy	AOR = 2.88, 95% CI (1.88, 4.40)	9
	Unplanned pregnancy	OR = 2.9, 95% CI: 2.2, 3.9)	17
	unintended pregnancy	OR=1.85, 95% CI (1.23, 2.79)	14
Breast feeding	Less than 1 year	OR=6.18, 95% C1 3.59, 10.62)	15
	Less duration of breastfeeding	AOR = 3.09, 95% CI (1.38, 6.96)	16

	Sub-optimum breastfeeding	AOR = 7.01. 95% CI (3.64, 13.46)	14
	for less than 24 months (index child)	AOR= 9.6, 95% CI (8.93, 19.39)	13
Irregular menstruation	Irregular menstruation	AOR = 2.17 (95% CI 1.40, 3.37)	9
	Irregular menstruation	OR = 1.7, 95% CI (1.1, 2.5)	17
	Absence of Male child	OR = 3.38	19
sex of children	Last child female	AOR = 5.73, 95% CI (3.18, 10.310)	12
	Female sex of index child	AOR = 1.964, 95% CI (1.05 3.96)	16
	One unit increase in parity	OR= 1.46, 95% C.I (1.22, 1.76)	15
Parity	>3	AOR = 3.12, 95% CI (1.42, 6.84)	9
	High parity	OR = 1.9, 95% CI (1.1, 3.1)	17
	No of children < 4	OR = 1.91	19
Number of child	Increased total number of children born before the index child	AOR = 1.07, 95% CI (1.03, 1.10)	18
	Living children > 4	OR=2.77, 95% CI (1.77-4.33)	14
Death of previous child	Death of the preceding child	AOR = 1.97, 95% CI (1.59, 2.45)	18
Region	Being Muslim	AOR = 2.02, 95% CI (1.20, 3.40)	14
Health facility	Long distance	AOR = 1.32, 95% CI (1.11–1.56)	18
Previous SIPI	Previous birth interval of less than 24 months	OR=1.78, 95% CI (1.19, 2.69)	14
	Previous history of SIP	AOR = 2.5, 95% CI (1.48, 4.11)	13
	Not having desire to had the last child	AOR = 3.63, 95% CI (2.23, 5.91)	14
Other factors	Did not desire any more children	OR=1.84, 95% CI (1.23-2.76)	14
	Monogamous type of marriage	OR = 1.89	19

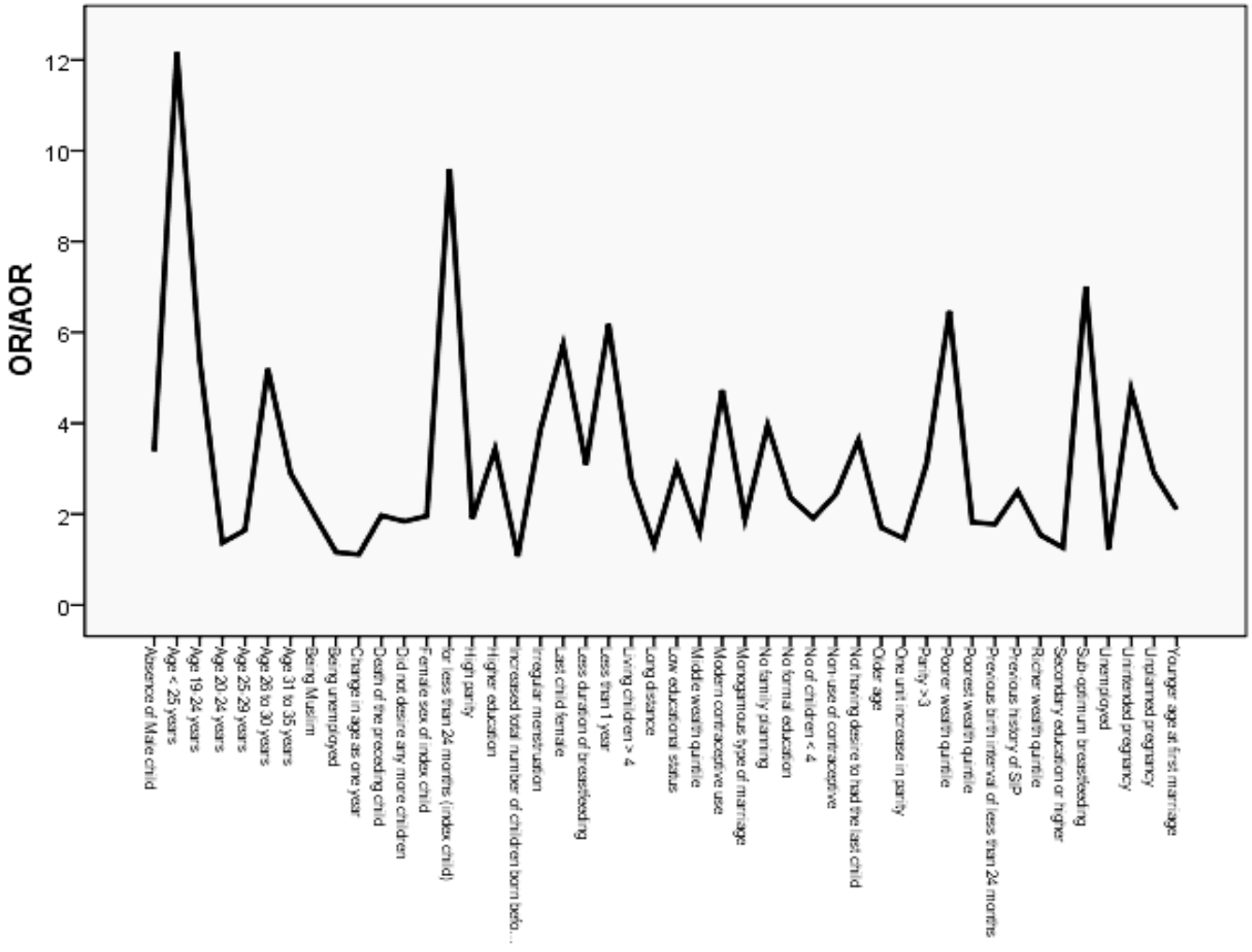

Fig-1: Determinants of SIPI

DISCUSSION

Inappropriate birth spacing is an established risk factor for a number of maternal and natal complications [20]. It is therefore recommended to start aggressive measures on community and national scale specially by improving awareness about better birth spacing and providing accessibility to contraceptive methods [20, 21]. Although a number of studies have been published regarding identification of risk factors of SIPI, but some modifiable risk factors are still not well reported. Some common risk factors include women's own body's response to childbearing, status of previous delivery, gender of the last child, the preference of spouse regarding size of the family, accessibility to contraceptive methods and usage, socio-demographic determinants such as low level of education, age of the mother, bad housing situation, habit of smoking, low monthly income and area of living and ethnic minorities as well [4, 6, .9. 10. 12. 15, 17, 19, 22, 23].

Yet, the risk factors of SIPI are not straightforward in causative direction but are of highly complex nature with much variation according to biological, geographical and other differences. Therefore, these variations need to be taken into account before devising any strategies to increase birth spacing to optimum level and prevent incidence of SIPI. [18] In this regard, primary focus should be given to modifiable risk factors like educational level, socio-economic status, and the duration of breastfeeding. Moreover, provision of health education specially of reproductive health and proper use of contraceptive methods can encourage mothers for timely contraception, family planning and improvement in feto-maternal health outcome [24]. An observational study in United States reported that birth interval <18 months is significantly associated with modest risk of worse health outcomes and significantly associated with major adverse outcomes for women with interval < 6 months. Therefore, it is important to advise women to avoid planning next pregnancy in less than 6 months and counsel them about potential risks and benefits of conceiving next child < 18 months of previous birth [25].

However, despite of available data, disparities in reported risk factors is too wide due to many reasons, the commonest one being difference in clinical definitions of SIPI. Also, establishing the risk factors in a simple causative manner is also not as easy due to multifaceted nature of SIPI [26]. Therefore, more studies are recommended to understand the nature and determinants of SIPI according to uniform clinical definition and complexity of risk factors [27].

CONCLUSIONS

This study concludes that determinants for SIPI are multifaceted and of complex nature. Most common risk factors identified included maternal age, less breastfeeding, low socio-economic status and lack of family planning are major determinants of SIPI. Moreover, there are disparities and variations in reported determinants quite possibly due to difference of clinical definitions of SIPI used, health facility provision, and reginal variation, choices of couples and refusal of family planning methods. Devising strategies to control modifiable risk factors can prevent SIPI and improve maternal and natal health outcomes.

REFERENCES

1. Yohannes S, Wondafrash M, Abera M, Girma E. Duration and determinants of birth interval among women of child bearing age in Southern Ethiopia. BMC pregnancy and childbirth. 2011;11(1):38.
2. Mahmood A. Birth spacing and family planning uptake in Pakistan: evidence from FALAH. 2012:[Online available at]: https://knowledgecommons.popcouncil.org/departments_sbsr-rh/122/. Retrieved on Jan 2019.
3. Wendt A, Gibbs CM, Peters S, Hogue CJ. Impact of increasing inter-pregnancy interval on maternal and infant health. Paediatr Perinat Epidemiol. 2012;26:239-58.
4. De Jonge HC, Azad K, Seward N, Kuddus A, Shaha S, Beard J, et al. Determinants and consequences of short birth interval in rural Bangladesh: a cross-sectional study. BMC Pregnancy Childbirth. 2014;14(1):427.
5. Lilungulu A, Matovelo D, Kihunrwa A, Gumodoka B. Spectrum of maternal and perinatal outcomes among parturient women with preceding short inter-pregnancy interval at Bugando Medical Centre, Tanzania. Mat Health, Neonatol and Perinatol. 2015;1(1):1-7.
6. Hailu D, Gulte T. Determinants of Short Interbirth Interval among Reproductive Age Mothers in Arba Minch District, Ethiopia. Int J Reprod Med. 2016;2016:Article ID 6072437, 17 pages.
7. Gemmill A, Lindberg LD. Short interpregnancy intervals in the United States. Obs & Gynecol. 2013;122(1):64-71.
8. Conde-Agudelo A, Rosas-Bermudez A, Castaño F, Norton MH. Effects of birth spacing on maternal, perinatal, infant, and child health: a systematic review of causal mechanisms. Stud Fam Plan. 2012;43(2):93-114.
9. Mardiana O, Nor MA, Norliza A. Role of sociodemographic, obstetric history and planning of pregnancy in predicting short interpregnancy interval among antenatal mothers in Klang, Selangor. Med J Malaysia. 2019;74(2):151-9.
10. Owonikoko KM, Adeniji O, Oke OF, Fawole AA, Adeniji AO. Determinants of inter-pregnancy interval in Ogbomoso: an unmet need for contraceptive usage. Int J Reprod Contracept Obstet Gynecol. 2015;4(2):316-21.
11. Copen CE, Thoma ME, Kirmeyer S. Interpregnancy intervals in the United States: data from the birth certificate and the national survey of family growth. Natl Vital Stat Rep. 2015;64(3):1-10.
12. Mayanja Ronald M, Mubiru Musa M, Masembe Sezalio M, Nkonwa Innocent M. Factors Associated with Short Births Intervals among Women Delivering at Mbarara Hospital. J Health Med Nursin. 2016;26(19):14-9.
13. Yadeta D, Seifadin A. Duration of Birth Interval and Associated Factors among Married Women in Dodota Woreda, Arsi Zone, Ethiopia. J Health Educ Res Dev. 2016;7(1):1-9.
14. Gebrehiwot SW, Abera G, Tesfay K, Tilahun W. Short birth interval and associated factors among women of child bearing age in northern Ethiopia, 2016. BMC Women's Health. 2019;19(1):85.
15. Hassan MHM, Mahmood NMZN. Prevalence and Factors Associated with Short Birth Spacing among

Malay Women in Kota Bharu, Kelantan, Malaysia. Int Med J. 2008;15(2):131-6.
16. Ayane GB, Desta KW, Demissie BW, Assefa NA, Woldemariam EB. Suboptimal child spacing practice and its associated factors among women of child bearing age in Serbo town, JIMMA zone, Southwest Ethiopia. Contracept Reproduct Med. 2019;4(1):1-8.
17. Kaharuza FM, Sabroe S, Basso O. Choice and chance: determinants of short interpregnancy intervals in Denmark. Acta Obstet Gynecol Scand. 2001;80(6):532-8.
18. Shifti DM, Chojenta C, G. Holliday E, Loxton D. Individual and community level determinants of short birth interval in Ethiopia: A multilevel analysis. PloS one. 2020;15(1):e0227798.
19. Bassey G, Nyengidiki TK, Dambo ND. Determinants of interpregnancy interval among parturient in Port Harcourt, Nigeria. Sahel Med J. 2016;19(4):180.
20. Exavery A, Mrema S, Shamte A, Bietsch K, Mosha D, Mbaruku G, et al. Levels and correlates of non-adherence to WHO recommended inter-birth intervals in Rufiji, Tanzania. BMC Pregnancy Childbirth. 2012;12(152):1471-2393.
21. DeFranco EA, Seske LM, Greenberg JM, Muglia LJ. Influence of interpregnancy interval on neonatal morbidity. Am J Obstet Gynecol. 2015;212(3):386(e1-9).
22. Karkee R, Lee AH. Birth spacing of pregnant women in Nepal: a community-based study. Front Public Health. 2016;4:1-5.
23. Gemmill A, Lindberg LD. Short interpregnancy intervals in the United States. Obstet Gynecol. 2013;122(1):64.
24. Owonikoko KM, Adeniji O, Oke OF, Fawole AA, Adeniji AO. Determinants of Inter-Pregnancy Interval in Ogbomoso: An Unmet Need for Contraceptive Usage. Int J Reproduct, Contracept, Obstetr Gynecol. 2015;4(2):316-21.
25. Chen I, Jhangri GS, Chandra S. Relationship between interpregnancy interval and congenital anomalies. Am J Obstet Gynecol. 2014;210(6):564. e1-. e8.
26. Hanley GE, Hutcheon JA, Kinniburgh BA, Lee L. Interpregnancy interval and adverse pregnancy outcomes. Obstet Gynecol. 2017;129(3):408-15.
27. Bujold E, Gauthier RJ. Risk of uterine rupture associated with an interdelivery interval between 18 and 24 months. Obstet Gynecol. 2010;115(5):1003-6.